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(54) **Title**: METHOD AND APPARATUS FOR HANDWRITING INPUT

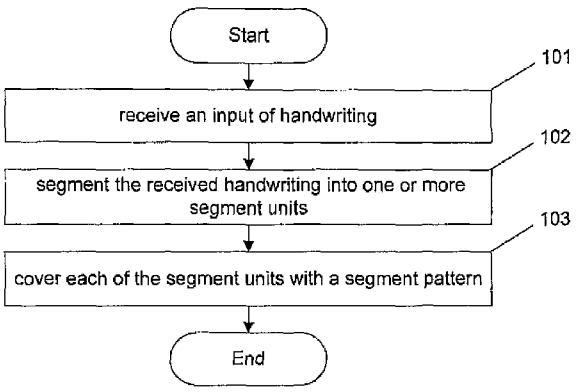


Fig. 1

(57) **Abstract**: Disclosed is a method and an apparatus for handwriting input. The method may comprise: receiving an input of handwriting; segmenting the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and covering each of the segment units with a segment pattern.

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METHOD AND APPARATUS FOR HANDWRITING INPUT

FIELD OF THE INVENTION

The present invention relates to information input technology, and more particularly, to a method and device for handwriting input.

BACKGROUND OF THE INVENTION

Nowadays most touch devices (e.g. mobile devices with a touch screen) have a large touch screen and can detect and show the positions of continuously-input handwriting. This means users can write more than one word on the screen each time. This continuous input is usually called continuous handwriting input, compared to character-by-character input. To get the real meaning of those continuously-input handwriting, they need to be segmented and then recognized as one or more segment units of real meaning. In the prior art, there are already many techniques for segmenting and recognizing continuously-input handwriting.

According to the prior art, when a user performs handwriting on a handwriting-input device, he/she however does not know what kind of segmentation is performed by the device to input handwriting, so that he/she cannot edit, delete, copy or paste results of the segmentation conveniently.

Therefore, there is a need in the art for a technical solution capable of presenting to users a result of

segmentation of continuously-input handwriting so as to make it convenient for a user to modify the result of segmentation.

SUMMARY OF THE INVENTION

In view of the problems discussed above, the present invention is intended to provide a method and device for handwriting input.

According to a first aspect of the present invention, there is provided a method for handwriting input, which method may comprise: receiving an input of handwriting; segmenting the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and covering each of the segment units with a segment pattern.

According to a second aspect of the present invention, there is provided an apparatus for handwriting input, which device may comprise: receiving means configured to receive an input of handwriting; segmenting means configured to segment the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and covering means configured to cover each of the segment units with a segment pattern.

According to a third aspect of the present invention, there is provided an electronic device comprising the aforesaid apparatus for handwriting input.

According to a fourth aspect of the present invention, there is provided a mobile device, which may comprise:

a memory having computer instructions stored therein; a processor configured to, when executing the stored instructions, perform the steps of receiving an input of handwriting; segmenting the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and covering each of the segment units with a segment pattern.

According to a fifth aspect of the present invention, there is provided a computer storage medium having computer instructions stored therein. The computer instructions are executed to receive an input of handwriting; segment the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and cover each of the segment units with a segment pattern.

According to an embodiment of the present invention, each segment unit obtained when the continuously-inputted handwriting is segmented is covered by a segment pattern. Each segment pattern may be presented in different colors, brightness, flicker and so on. When there is a need to modify a segment unit, the segment unit may be selected and highlighted and then is subjected to various operations.

Other features and advantages of the present invention will become apparent from the description of the preferred embodiments explaining the principles of the present invention, when taken in conjunction with the figures.

BRIEF DESCRIPTION ON THE DRAWINGS

As the present invention is better understood, other objects and effects of the present invention will become more apparent and easy to understand from the following description, taken in conjunction with the figures wherein:

Fig. 1 is a flowchart of a method for handwriting input according to an embodiment of the present invention;

Figs. 2a and 2b are schematic views of the method for handwriting input according to the embodiment illustrated in Fig. 1;

Fig. 3 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention;

Figs. 4a and 4b are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 3;

Fig. 5 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention;

Figs. 6a and 6b are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 5;

Fig. 7 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention;

Figs. 8a to 8c are schematic views of the method for modifying a segment unit according to the embodiment

illustrated in Fig. 7;

Fig. 9 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention;

Figs. 10a to 10c are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 9;

Fig. 11 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention;

Figs. 12a to 12c are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 11;

Fig. 13 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention;

Figs. 14a and 14b are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 13;

Fig. 15 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention; and

Fig. 16 is a block diagram of a device for handwriting input according to another embodiment of the present invention.

Like reference numerals designate the same, similar, or corresponding features or functions throughout the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiments of the present invention will be explained and described in more detail with reference to the figures. It is to be understood that the figures and embodiments of the present invention are for illustration only and not limiting the protection scope of the present invention.

For the purpose of clarity, the terms employed in the present invention are explained first.

1. Handwriting

Handwriting is one or more markings that are input by users on a touch screen. It may be, for example, characters of eastern words, characters of western words, punctuation marks, symbols in formulae, user-defined graphics or a table, etc.

Handwriting may consist of one or more points, each of which may be represented using a variety of known techniques including Cartesian coordinate (e.g. (x,y)), polar coordinate (e.g. (r,θ)), three dimensional coordinate (e.g. (x,y,z), (r,θ,t), (x,y,t(time), etc.), four dimensional coordinate (e.g. (x,y,z,t), (r,θ,ρ,t) , etc.), and other known techniques in the art. The position of handwriting may include the two-dimensional, three-dimensional or three-dimensional coordinates of all points constituting the handwriting, and may comprise the size of an area determined by sequentially linking the outmost points of the handwriting, which area may be in a shape of, for example, a smallest rectangle, a

smallest circle, a smallest ellipse, etc. which is capable of covering all points of the handwriting.

2. Segment unit

A segment unit is defined as a group of handwriting which have real meaning and may be obtained through segmenting and recognizing handwriting using a variety of segmenting algorithms. There are many practical algorithms that segment and recognize input handwriting to obtain one or more segment units of real meaning in the art. The present invention may use any existing or future segmenting algorithm to segment and recognize input handwriting, and details thereof are omitted here in order not to confuse the focal point of the present invention.

After the handwriting in a segment unit are deleted, this segment unit may be empty.

3. Segment pattern

A segment pattern is graphics that is capable of at least partially covering handwriting, and preferably, it is graphics that entirely covers handwriting. A segment pattern may be determined in dependence upon the position of handwriting. For example, it is possible to determine the coordinate of a segment pattern in dependence upon the coordinates of points constituting the handwriting and to determine the size of a segment pattern in dependence upon an area capable of covering all points of the handwriting.

A segment pattern may be in various shapes, such as a circle, an ellipse, a triangle, a rectangle, a polygon, an irregular shape, or any other shape.

A segment pattern may be presented in different colors, brightness, flicker, or a combination thereof. When a segment pattern is selected, it may be highlighted in the foregoing manner(s) or other available manner.

It is to be understood that a device for handwriting input according to the embodiment of the present invention may be an arbitrary device with handwriting input capability, such as a handwriting-input pad, and may be used for mobile telephones, personal digital assistants, personal computers, and other electronic devices.

Fig. 1 is a flowchart of a method for handwriting input according to an embodiment of the present invention. Figs. 2a and 2b are schematic views of the method for handwriting input according to the embodiment illustrated in Fig. 1.

To being with, in step 101, handwriting being input is received. The input handwriting may be, for example, a group of handwriting that is continuously input by a user to the touch screen of a mobile device using fingers or a stylus.

Specifically, handwriting may be input to means that supports continuous input of handwriting in the embodiments of the present invention. This the current embodiment, the handwriting input by the user may be “女子七项全能” as illustrated in Fig. 2a.

In step 102, the received handwriting is segmented into one or more segment units.

Any handwriting segmenting methods in the prior art may be utilized to segment handwriting that is received

continuously on the touch screen, so as to obtain one or more segment units of real meaning. As there are existed segmenting algorithms already in the prior art, details thereof are omitted.

In the current embodiment, the received handwriting "女子七项全能" is segmented into six segment units containing "女," "子," "七," "项," "全," and "能," respectively.

In step 103, each segment unit is covered by a segment pattern.

According to an illustrative embodiment of the present invention, the position of handwriting in a segment unit is first obtained. For example, the position of handwriting in a segment unit may be obtained in dependence upon the coordinates of points of the handwriting in the segment unit containing "女."

Next, a segment pattern is determined based on the obtained position.

For example, it is possible to determine edges and gravity center of the handwriting, the smallest rectangle or ellipse capable of covering the handwriting, and so on in dependence upon the points constituting the handwriting in a segment unit. Hence, graphics capable of at least partially covering the handwriting in the segment unit can be determined, and the graphics' coordinate can be determined in dependence upon the coordinates of the points constituting the handwriting. In this way, a segment pattern for covering the segment unit can be obtained.

Alternatively, a segment pattern may be in a shape

of a circle, an ellipse, a triangle, a rectangle, a polygon, an irregular shape, and so on that at least partially covers each segment unit. Preferably, a segment pattern is graphics that entirely covers the handwriting in a segment unit.

Afterwards, the segment units are covered using the determined segment patterns.

It is to be understood that a segment pattern covering a segment unit does not mean the user certainly can see the covering procedure. On the contrary, this covering step may be performed in background and only used for associating a segment unit with its segment pattern.

Then the flow of Fig. 1 ends.

Alternatively, the method for handwriting input of the present invention may further comprise step of presenting a segment pattern. A segment pattern may be presented in different colors, brightness, flicker, or a combination thereof. For example, the segment pattern covering each segment unit may be shown as a blue ellipse.

After the handwriting input ends, the first segment unit may be selected automatically as a selected segment unit. The user may also select a segment unit covered by a segment pattern by clicking on the segment pattern according to his own needs. In addition, after the segment pattern is selected, it may be highlighted. For example, if the segment unit containing "女" is selected, it is presented in pink so as to indicate more clearly and explicitly that this segment unit is selected.

Alternatively, the method for handwriting input according to the embodiments of the present invention may

further comprise step of modifying a segment unit using a segment pattern. Various approaches may be adopted for modifying a segment unit. For example, Figs. 3, 5, 7, 9, 11, and 13 illustrate embodiments in which a segment unit is modified using a segment pattern, which will be described in detail below.

Fig. 3 is a flowchart of a method for modifying a segment unit according to an embodiment of the present invention. In this embodiment, original handwriting in a segment unit is replaced by new handwriting that is input directly to the segment pattern of this segment unit. Figs. 4a and 4b are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 3.

To being with, in step 301, an input of handwriting in a segment pattern is received.

Assume that in this embodiment there are six segment units containing "女," "子," "七," "项," "全," and "能," respectively. If the user wants to modify the segment unit containing "全," he may directly input new handwriting, e.g. "不," to the segment pattern of this segment unit without firstly deleting the original handwriting in the segment unit. At this moment, the new handwriting is received, i.e., the newly-input handwriting "不" is received, as shown in Fig. 4a.

In step 302, the handwriting in the segment unit is deleted.

In step 303, the received handwriting is used as handwriting in the segment unit.

As shown in Fig. 4b, after steps 302 and 303 are

performed, the original handwriting (“全”) in the segment unit is replaced with the new handwriting (“不”).

Then the flow of Fig. 3 ends.

With the embodiment illustrated in Fig. 3, the user is allowed to modify the handwriting in a segment unit covered by a segment pattern, by directly inputting handwriting to the segment pattern without clicking on other functional key to perform complex operation, at any time. In this way, convenience is provided for the user to perform operation, and the user experience is improved.

Fig. 5 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention. In this embodiment, determination is made as to whether to delete existed handwriting in a segment unit covered by a segment pattern, by determining whether handwriting received at the segment pattern is a deletion identifier.

The deletion identifier is a symbol indicative of a delete operation. If it is determined that a deletion identifier is received at a segment pattern, then the handwriting in a segment unit covered by the segment pattern is deleted. The deletion identifier may be predefined and stored in a memory that is accessible by the apparatus for handwriting input of the present invention. The deletion identifier may be an arbitrary symbol including a punctuation mark such as cross (“×”), check mark (“√”) and slash (“/” or “\”), a character such as a character of eastern or western words, user-defined graphics and so on.

Figs. 6a and 6b are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 5.

To being with, in step 501, an input of handwriting in a segment pattern is received.

Assume that in this embodiment there are six segment units containing "女," "子," "七," "项," "全," and "能," respectively. If the user wants to delete the handwriting " 全 ," he may directly input special handwriting that matches a predefined deletion identifier to the segment pattern covering a segment unit containing the handwriting "全," without clicking on or selecting other functional key to perform this deletion.

In this step, the handwriting received at the segment pattern covering a segment unit containing "全" is as shown in Fig. 6a.

In step 502, determination is made as to whether the received handwriting matches the predefined deletion identifier.

Assume that in this embodiment, the predefined deletion identifier is a cross ("×"). In this step, whether the received handwriting as shown in Fig. 6a matches the predefined deletion identifier ("×") needs to be determined. In the prior art, there are various methods for determining whether handwriting matches a symbol, such as methods used in handwriting recognition, character matching and handwriting identification, so details thereof are omitted.

If it is determined that the received handwriting matches the predefined deletion identifier, this means

the operation the user desires is a delete operation, and the flow goes to step 503. Otherwise, it is determined that the user wants to replace the original handwriting in a segment unit covered by a segment pattern with the newly-input handwriting, and the flow goes to step 504.

In step 503, the received handwriting and the handwriting in the segment unit is deleted.

After step 503 is performed, the handwriting ("全") in the segment unit is deleted, and the user-input handwriting (the cross) being received is also deleted. In this way, no handwriting will be present in the segment pattern covering this segment unit, and the segment unit is empty at this moment, as shown in Fig. 6b.

As described above, if it is determined that the received handwriting does not match the predefined deletion identifier, the flow goes to step 504 in which the handwriting in the segment unit is deleted.

In step 505, the received handwriting is used as handwriting in the segment unit.

Like steps 302 and 303, after steps 504 and 505 are performed, the handwriting originally contained in the segment unit is replaced with the received handwriting.

Then the flow of Fig. 5 ends.

With the embodiment illustrated in Fig. 5, the user is allowed to delete the handwriting in a segment unit covered by a segment pattern, by directly inputting specific handwriting to the segment pattern without clicking on other functional key to perform complex operation. In this way, it is convenient for a user to perform operations, and the user experience is improved.

Fig. 7 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention. In this embodiment, when a segment unit is empty, if the user inputs new handwriting to the segment pattern covering the segment unit, a new segment unit and its corresponding segment pattern may be obtained by segmenting the handwriting. That is, the previous segment unit and segment pattern are replaced with the newly obtained segment unit and segment pattern.

Figs. 8a to 8c are schematic views of the method for segmenting a segment unit according to the embodiment illustrated in Fig. 7. Fig. 8a illustrates a scenario before the method of Fig. 7 is performed, in which two segment patterns covering two segment units are illustrated. In a breakdown, the first segment unit is empty, and the second one contains the handwriting "牌." Hence, no handwriting is presented in the segment pattern covering the first segment unit, and the handwriting "牌"is presented in the segment pattern covering the second segment unit.

In step 701, an input of handwriting in a segment pattern is received.

Assume in this embodiment the user wants to obtain "金银牌" and the user has inputted the handwriting as shown in Fig. 8b to the segment pattern covering the first segment unit. Then the handwriting in the segment pattern covering the first segment unit, as shown in Fig. 8b, is received in step 701.

In step 702, the segment unit and segment pattern are deleted.

In this embodiment, the original segment unit and the segmented pattern covering this segment unit are no longer needed; instead, a new segment unit is obtained by segmenting the received handwriting, and the corresponding segment pattern is determined. Hence, the original segment unit and its corresponding segment pattern are deleted in this step.

In step 703, the received handwriting is segmented into obtain one or more new segment units.

Like step 102, in step 703 the received handwriting may be segmented using various methods for segmenting handwriting in the prior art. In this embodiment, the received handwriting is segmented into two segment units containing “金” and “银,” respectively.

In step 704, a segment pattern for covering the new segment units is determined.

In step 705, the new segment units are covered using the determined segment pattern.

The segment pattern covering the new segment unit is determined by obtaining the position of the handwriting in the segment unit and the segment unit is covered by the determined segment pattern in steps 704 and 705, just like step 103.

Segmentation approaches may be determined using various approaches. For example, it may be determined based on the position of handwriting in a segment unit. Specifically, the coordinate of a segment pattern may be determined in dependence upon the coordinates of points constituting the handwriting, and the size of the segment pattern can be determined in dependence upon an area that

covers all of the points constituting the handwriting.

In step 706, the segment pattern that covers the new segment units is presented.

As shown in Fig. 8c, the segment pattern covering two new segment units that contain "金" and "银," respectively, are presented as two ellipses.

The flow of Fig. 7 then ends.

The method for modifying a segment unit of the present invention may further comprise the step of setting a logical relation, which may be precedence order or other logical relation (e.g. the relation expressed by a mathematical formula). The step of setting a logical relation may be, specifically, using the logical relation between the deleted segment unit and the unmodified segment unit as the logical relation between the new segment unit and the unmodified segment unit. Thus, the two new segment units containing "金" and "银" are in such a logical relation to the segment unit containing "牌" that they precede the latter, and a result from recognizing handwriting in each segment unit is "金"→ "银" → "牌," instead of "牌"→ "金" → "银" obtained in order of writing time.

Fig. 9 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention.

Figs. 10a to 10c are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 9. Before the method of Fig. 9 is performed, the user has inputted the handwriting "女子

七项全能”, the handwriting has been segmented into several segment units using the method for handwriting input of the present invention and the segment patterns for covering each segment unit have been determined. Fig. 10a illustrated six segment units that are covered a respective segment pattern. Among them, the first segment unit contains the handwriting “女,” and the second segment unit contains the handwriting “子.”

In step 901, input handwriting is received.

In this embodiment, as shown in Fig. 10b, the handwriting inputted by the user is a curve similar to a circle that may be a non-closed or closed curve.

In step 902, determination is made as to whether the received handwriting encircles handwriting in at least two segment units or not.

In the embodiments of the present invention, the term “encircle” means when received handwriting is a closed curve, the closed curve at least contains part of the points of the handwriting in a segment unit.

In this step, it is first judged whether the closed curve contains the handwriting in a segment unit when the received handwriting is closed. Then it is judged whether the contained handwriting separately belong to two or more segment units. If the received handwriting encircles handwriting in at least two segment units, the flow then goes to step 903; otherwise, the flow ends.

In this embodiment, the received handwriting entirely encircles the handwriting “女” and “子” which separately belong to different segment units. Therefore, it is determined that the received handwriting encircles

the handwriting in two segment units.

In another embodiment, the received handwriting may be encircles part of the handwriting "女" and part of the handwriting "子." In this case, since part of the handwriting "女" and part of the handwriting "子" belong to different segment units, it is determined that the received handwriting encircles the handwriting in two segment units.

In step 903, the segment patterns that cover the at least two segment units are deleted.

In step 904, the encircled handwriting are merged into a new segment unit.

In step 905, a segment pattern for covering the new segment unit is determined.

The segment pattern covering the new segment unit is determined by obtaining the positions of the handwriting in the segment units and the new segment unit is covered by the determined segment pattern in steps 904 and 905, just like step 103.

In step 906, the new segment unit is covered by the determined segment pattern.

In step 907, the segment pattern that covers the new segment unit is presented.

As shown in Fig. 10c, the segment pattern covering the new segment unit containing "好" is presented as an ellipse and presented to be selected currently.

The flow of Fig. 9 then ends.

Fig. 11 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention.

Figs. 12a to 12c are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 11. Before the method of Fig. 11 is performed, the user has inputted the handwriting "女子七项全能", the handwriting has been segmented into several segment units using the method for handwriting input of the present invention and the segment patterns for covering each segment unit have been determined. Fig. 12a illustrated five segment units that are covered by corresponding segment patterns respectively. Among them, the first segment unit contains the handwriting "女".

In step 1101, an input of handwriting is received.

In this embodiment, handwriting inputted by the user is a curve similar to a circle that may be a non-closed or closed curve, as shown in Fig. 12b.

In step 1102, determination is made as to whether the received handwriting encircles only part of handwriting in one segment unit or not.

In this step, it is first judged whether the closed curve contains the handwriting when the received handwriting is closed. Then it is judged whether the contained handwriting belongs to only one segment unit. If the received handwriting encircles only part of handwriting in one segment unit, the flow then goes to step 1103; otherwise, the flow ends.

In this embodiment, the received handwriting entirely encircles the left half of the handwriting "女" and only belongs to the segment unit that contains the handwriting "女." Therefore, it is determined that the

received handwriting encircles only part of handwriting in one segment unit.

In step 1103, the segment pattern that covers the segment unit is deleted.

In step 1104, the segment unit is divided into two new segment units, one of which contains the part of handwriting and the other of which contains the remaining handwriting.

In the embodiment, the first new segment unit contains the handwriting "女", and the second new segment unit contains the handwriting "子".

In step 1105, the segment pattern for covering each of the new segment unit is determined.

In step 1106, each of the new segment unit is covered by the determined segment pattern.

In step 1107, the segment pattern that covers each of the new segment unit is presented.

As shown in Fig. 12c, the segment pattern that covers the new segment unit containing "女" is presented as an ellipse, and the segment pattern that covers the new segment unit containing "子" is presented as another ellipse.

The flow of Fig. 11 then ends.

Fig. 13 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention. In this embodiment, one or more segment units covered by one of more segment patterns associated with handwriting received at one segment pattern, are selected by determining whether the handwriting is a selection identifier or not, so as to

make centralized modifications to handwriting in these segment units.

The selection identifier is a symbol indicative of a selection operation. When it is determined that a selection identifier is received at a segment pattern, then one or more segment units covered by one of more segment patterns associated with the handwriting are selected. The selection identifier may be predefined and stored in a memory that is accessible by the device for handwriting input of the present invention. It may be an arbitrary symbol including a punctuation mark such as break line ("﹏"), underline ("_") and double underline ("‗"), a character such as a character of eastern or western words, user-defined graphics and so on.

Figs. 14a and 14b are schematic views of the method for modifying a segment unit according to the embodiment illustrated in Fig. 13.

In step 1301, an input of handwriting is received.

Assume that in this embodiment there are six segment units containing "女," "子," "七," "项," "全," and "能," respectively. If the user wants to select four segment units containing "女," "子," "七," and "项" at one time, he may directly input special handwriting that matches a predefined selection identifier to the segment pattern covering these four segment units without clicking on or selecting other functional key to perform this deletion.

The handwriting being received in this step is as shown in Fig. 14a.

In step 1302, determination is made as to whether the received handwriting matches the predefined

selection identifier.

Assume that in this embodiment, the predefined deletion identifier is an underline ("_"). In this step, whether the received handwriting as shown in Fig. 14a matches the predefined selection identifier ("_") needs to be determined. In the prior art, there are various methods for determining whether handwriting matches a symbol, so details thereof are omitted.

If a match is determined, i.e., the user wants to perform a selection operation, the flow then goes to step 1303; otherwise, the flow ends.

In step 1303, it is determined that which segment pattern is selected in dependence upon the received handwriting.

In this embodiment, the handwriting inputted by the user passes through four segment pattern covering four segment units that contain "女," "子," "七," and "项," respectively. It is thus determined what are selected are these four segment patterns, as shown in Fig. 14b.

In step 1304, the received handwriting is deleted.

In step 1305, centralized modifications are made to the handwriting in segment units covered by the selected segment patterns. Then the flow ends.

As described above, if it is determined that the received handwriting does not match the predefined selected symbol, the flow then ends.

In other embodiments, the user-input handwriting being received may not come into contact with the segment patterns. The coordinates of the start point and end point of the received handwriting may form a set range

with any of the upper, lower, left and right sides of the handwriting. The position of handwriting in each segment unit is compared with the set range; if the coordinate of a point of handwriting in a segment unit falls within the range, it is determined that the segment unit containing the handwriting is selected.

Fig. 15 is a flowchart of a method for modifying a segment unit according to another embodiment of the present invention. In this embodiment, segment units covered by one or more segment patterns are selected by determining the one or more segment patterns associated with the received handwriting. Different from the embodiment illustrated in Fig. 13, neither a selection identifier needs to be defined in advance nor received handwriting needs to match the selection identifier in this embodiment.

In step 1501, an input of handwriting is received.

In step 1502, segment patterns that are associated with the received handwriting are determined.

There may be various implementations of "association." For example, if the position of a point contained by received handwriting falls within the area of a segment pattern, the handwriting is then associated with the segment pattern; or if the shortest distance from the position of a point contained in received handwriting to a segment pattern is less than a predefined threshold, the handwriting is then associated with the segment pattern; or if the received handwriting intersects with handwriting in a segment unit covered by a segment pattern, the handwriting is then associated with the segment unit.

In step 1503, centralized modifications are made to segment units covered by the associated segment patterns.

The flow of Fig. 15 then ends.

Fig. 16 is a block diagram of an apparatus 1600 for handwriting input according to another embodiment of the present invention. The apparatus 1600 may comprise receiving means 1610, segmenting means 1620, and covering means 1630.

Receiving means 1610 may be used for receiving input handwriting. The handwriting may be input from any area of a handwriting-input pad or from a segment pattern. It may be characters of eastern words, characters of western words, punctuation marks, symbols in formulae, user-defined graphics or tables.

Segmenting means 1620 may be used for segmenting the received handwriting into one or more segment units, each of which being defined as a group of handwriting having a real meaning.

Covering means 1630 may be used for covering each segment unit with a segment pattern. The covering means may comprise: means for obtaining the position of handwriting in the segment unit; means for determining graphics, which is capable of at least partially covering the handwriting, as the segment pattern based on the position; and means for covering the segment unit with the determined segment pattern. Preferably, the segment pattern may be a graphics entirely covering the handwriting.

The apparatus 1600 may further comprise presenting means 1640. Presenting means 1640 may present a segment

pattern in different colors, brightness, flicker or a combination thereof. Further, the presenting means may be used for highlighting the selected segment pattern. A segment pattern may be presented as a circle, an ellipse, a triangle, a rectangle, a polygon, or an irregular shape.

The apparatus 1600 may further comprise modifying means 1650. Modifying means 1650 may be used for modifying a segment unit by selecting a segment pattern that covers this segment unit.

Modifying means 1650 may comprise means for deleting handwriting in the segment unit and means for using received handwriting as handwriting in the segment unit.

Modifying means 1650 may comprise means for determining whether received handwriting matches a predefined deletion identifier or not and means for deleting the received handwriting and handwriting in the segment unit if matching.

Modifying means 1650 may comprise: means for deleting the segment unit and the segment pattern; means for segmenting the received handwriting into one or more new segment units; means for determining a segment pattern for covering the new segment units; means for covering the new segment units with the determined segment pattern; and means for presenting the segment pattern that covers the new segment units. Further, the modifying means may comprise means for using the logic relation of the deleted segment unit to the unmodified segment unit as the logical relation of the new segment unit to the unmodified segment unit

Modifying means 1650 may comprise means for, in case

that received handwriting encircles handwriting in at least two segment units, deleting the segment patterns that cover the at least two segment units, merging the encircled handwriting into a new segment unit, determining a segment pattern for covering the new segment unit, covering the new segment unit with the determined segment pattern covering and presenting the segment pattern that covers the new segment unit.

Modifying means 1650 may comprise means for performing the following operations in case that received handwriting encircles part of handwriting in one segment unit: deleting the segment pattern that covers the segment unit; dividing the segment unit into two new segment units, one of which contains the part of handwriting and the other of which contains the remaining handwriting; determining segment patterns for covering each of the new segment unit; covering each of the new segment unit with the determined segment patterns; presenting the segment patterns that cover each of the new segment unit.

Modifying means 1650 may comprise: means for determining whether received handwriting matches a predefined selection identifier; and means for, in case of a match, determining which segment pattern is selected based on the received handwriting, deleting the received handwriting and making centralized modifications to handwriting in segment units covered by the selected segment pattern.

Modifying means 1650 may comprise: means for determining which segment patterns are associated with

received handwriting; and means for making centralized modifications to segment units covered by the associated segment patterns.

The present invention further relates to a handwriting-input mobile terminal, which comprises a storage medium having the following program codes stored therein: a program code for receiving an input of handwriting; a program code for segmenting the received handwriting into one or more segment units, each of which is defined as a group of handwriting having a real meaning; and a program code for covering each of the segment units with a segment pattern.

The present invention further provides an electronic device comprising the apparatus for handwriting input.

The present invention further provides an electronic device, which may comprise: a memory having computer instructions stored therein; a processor configured to, when executing the stored instructions, perform the steps of receiving an input of handwriting, segmenting the received handwriting into one or more segment units, each of which is defined as a group of handwriting having a real meaning, and covering each segment unit with a segment pattern.

The present invention further provides a computer storage medium having computer instructions stored therein and performing the steps of , when the computer instructions are executed, receiving inputted handwriting, segmenting the received handwriting into one or more segment units, each of which is defined as a group of handwriting having a real meaning, and covering

each segment unit with a segment pattern.

The disclosed methods of the present invention may be implemented in software, hardware or a combination of software and hardware. The hardware part may be implemented using a dedicated logic, and the software part may be stored in a memory and be implemented by a proper instruction implementing system, such as a microprocessor, a personal computer (PC) or a mainframe.

Those skilled in the art will recognize that the present invention may also be embodied in a computer program product arranged on a signal carrier medium to be used for any proper data processing system. Such signal carrier medium can be a transmission medium or a recordable medium used for machine readable information, including a magnetic medium, optical medium or other proper medium. Examples of a recordable medium include a floppy or magnetic disc in a hard disc drive, an optical disc for an optical drive, a magnetic tape, and other medium those skilled in the art can conceive. Those skilled in the art will further recognize that any communication terminal with proper programming means can perform steps of the method of the present invention as embodied in a program product for example.

It should be noted that in order to make the present invention easier to be understood, the foregoing description omits some technical details that are well known to those skilled in the art but might be essential to the implementation of the present invention.

The specification of the present invention has been presented for purposes of illustration and description,

and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and alterations will be apparent to those of ordinary skill in the art.

Therefore, the embodiments were chosen and described in order to better explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand that all modifications and alterations made without departing from the spirit of the present invention fall into the protection scope of the present invention as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A method for handwriting input, comprising:

receiving an input of handwriting;

segmenting the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and

covering each of the segment units with a segment pattern.

2. The method according to Claim 1, further comprising:

presenting the segment pattern by means of color, brightness, flicker or a combination thereof.

3. The method according to Claim 1, further comprising:

highlighting a segment pattern when the segment pattern is selected.

4. The method according to Claim 1, wherein covering each segment unit with a segment pattern comprises:

obtaining the position of handwriting within each segment unit;

determining, based on the position, a graphics that is capable of at least partially covering the handwriting as a segment pattern; and

covering the segment unit with the determined segment pattern.

5. The method according to Claim 4, wherein the segment pattern is a graphics entirely covering the handwriting.

6. The method according to any one of Claims 1 to 5, wherein the segment pattern is in a shape of a circle, an ellipse, a triangle, a rectangle, a polygon or an irregular shape.

7. The method according to Claim 1, further comprising:

modifying a segment unit by selecting the segment pattern covering the segment unit.

8. The method according to Claim 7, wherein modifying of a segment unit comprises:

receiving an input of handwriting in the segment pattern;

deleting handwriting in the segment unit; and

using the received handwriting as handwriting in the segment unit.

9. The method according to Claim 7, wherein modifying of a segment unit comprises:

receiving an input of handwriting in the segment pattern;

determining whether the received handwriting matches a predefined deletion identifier or not; and

if matching, deleting the received handwriting and handwriting in the segment unit.

10. The method according to Claim 7, wherein modifying of a segment unit comprises:

receiving an input of handwriting in the segment pattern;

deleting the segment unit and the segment pattern;

segmenting the received handwriting into one or more new segment units;

determining segment patterns for covering the new segment units;

covering the new segment units with the determined segment patterns; and

presenting the segment patterns that covers the new segment units.

11. The method according to Claim 10, further comprising:

maintaining a logic relation between the deleted segment unit and the unmodified segment unit as the logical relation between the new segment unit and the unmodified segment unit.

12. The method according to Claim 7, wherein modifying a segment unit comprises:

receiving an input of handwriting;

if the received handwriting encircles handwriting in at least two segment units, then

deleting segment patterns covering the at least two segment units,

merging the encircled handwriting into a new

segment unit,

determining a segment pattern for covering the new segment unit,

covering the new segment unit with the determined segment pattern, and

presenting the segment pattern that covers the new segment unit.

13. The method according to Claim 7, wherein modifying a segment unit comprises:

receiving an input of handwriting;

if the received handwriting encircles only part of handwriting in one segment unit, then

deleting the segment pattern that covers the segment unit;

dividing the segment unit into two new segment units, wherein one of which contains the part of handwriting and the other of which contains the remaining handwriting;

determining segment pattern for covering each of the new segment units;

covering each of the new segment units with the determined segment patterns; and

presenting the segment patterns that cover each of the new segment unit.

14. The method according to Claim 7, wherein modifying a segment unit comprises:

receiving an input of handwriting;

determining whether the received handwriting

matches a predefined selection identifier;

if matching, then

determining which segment pattern is selected based on the received handwriting,

deleting the received handwriting, and

making centralized modifications to handwriting in the segment unit covered by the selected segment pattern.

15. The method according to Claim 7, wherein modifying a segment unit comprises:

receiving an input of handwriting;

determining which segment patterns are associated with the received handwriting; and

making centralized modifications to segment units covered by the associated segment patterns.

16. The method according to Claim 1, wherein the handwriting is characters of eastern words, characters of western words, punctuation marks, symbols in formulae, or user-defined graphics or tables.

17. An apparatus for handwriting input, comprising:

receiving means configured to receive an input of handwriting;

segmenting means configured to segment the received handwriting into one or more segment units, each of the segment units being defined as a group of handwriting having a real meaning; and

covering means configured to cover each of the

segment units with a segment pattern.

18. The apparatus according to Claim 17, further comprising:

presenting means configured to presenting the segment pattern by means of color, brightness, flicker or a combination thereof.

19. The apparatus according to Claim 17, further comprising:

presenting means configured to highlight a segment pattern when the segment pattern is selected.

20. The apparatus according to Claim 17, wherein the covering means comprises:

means for obtaining the position of handwriting within the segment unit;

means for determining a graphics that is capable of at least partially covering the handwriting as a segment pattern based on the position; and

means for covering the segment unit with the determined segment pattern.

21. The apparatus according to Claim 20, wherein the segment pattern is a graphics entirely covering the handwriting.

22. The apparatus according to any one of Claims 17 to 21, wherein the segment pattern is in a shape of a circle, an ellipse, a triangle, a rectangle, a polygon or an

irregular shape.

23. The apparatus according to Claim 17, further comprising:

modifying means for modifying a segment unit by selecting the segment pattern that covers the segment unit.

24. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting in the segment pattern, and the modifying means comprises:

means for deleting handwriting in the segment unit; and

means for using the received handwriting as handwriting in the segment unit.

25. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting in the segment pattern, and the modifying means comprises:

means for determining whether the received handwriting matches a predefined deletion identifier or not; and

means for deleting the received handwriting and handwriting in the segment unit if matching.

26. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting in the segment pattern, and the modifying

means comprises:

means for deleting the segment unit and the segment pattern;

means for segmenting the received handwriting into one or more new segment units;

means for determining a segment pattern for covering the new segment units;

means for covering the new segment units with the determined segment patterns; and

means for presenting the segment patterns that covers the new segment units.

27. The apparatus according to Claim 26, wherein the modifying means further comprises:

means for maintaining a logic relation between the deleted segment unit and the unmodified segment unit as the logical relation between the new segment unit and the unmodified segment unit.

28. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting, and the modifying means comprises:

means for, if the received handwriting encircles handwriting in at least two segment units, performing the operations of:

deleting segment patterns that cover the at least two segment units,

merging the encircled handwriting into a new segment unit,

determining a segment pattern for covering the

new segment unit,

covering the new segment unit with the determined segment pattern, and

presenting the segment pattern that covers the new segment unit.

29. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting, and the modifying means comprises:

means for, if the received handwriting encircles only part of handwriting in one segment unit, performing the operations of:

deleting the segment pattern that covers the segment unit;

dividing the segment unit into two new segment units, wherein one of which contains the part of the handwriting and the other of which contains the remaining handwriting;

determining segment patterns for covering each of the new segment units;

covering each of the new segment units with the determined segment patterns; and

presenting the segment patterns that cover each of the new segment unit.

30. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting, and the modifying means comprises:

means for determining whether the received handwriting matches a predefined selection identifier;

and

means for, if matching, determining which segment pattern is selected based on the received handwriting, deleting the received handwriting, and making centralized modifications to handwriting in the segment unit covered by the selected segment pattern.

31. The apparatus according to Claim 23, wherein the receiving means comprises means for receiving an input of handwriting, and the modifying means comprises:

means for determining which segment patterns are associated with the received handwriting; and

means for making centralized modifications to segment units covered by the associated segment patterns.

32. The apparatus according to Claim 23, wherein the handwriting is characters of eastern words, characters of western words, punctuation marks, symbols in formulae, or user-defined graphics or tables.

33. An electronic device, comprising an apparatus according to Claim 17.

34. The electronic device according to Claim 33, wherein the electronic device is a mobile device.

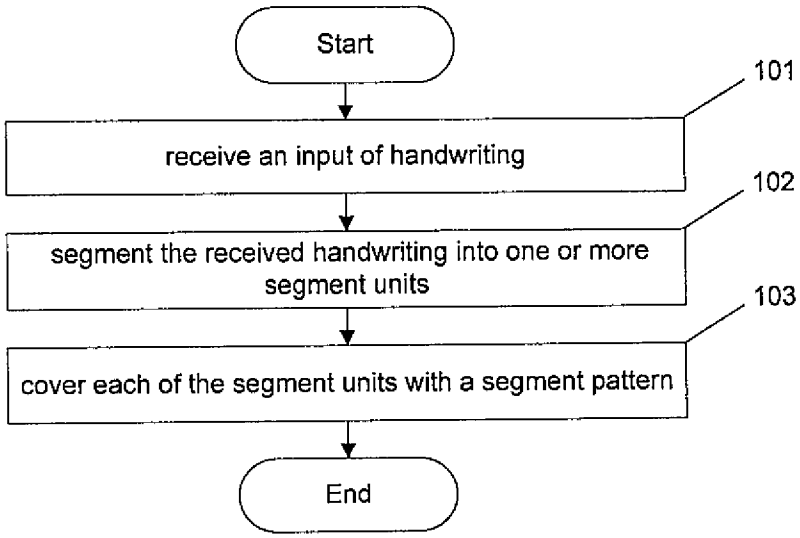


Fig. 1



Fig. 2a

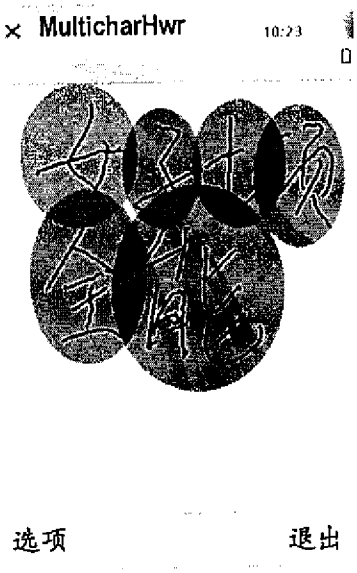


Fig. 2b

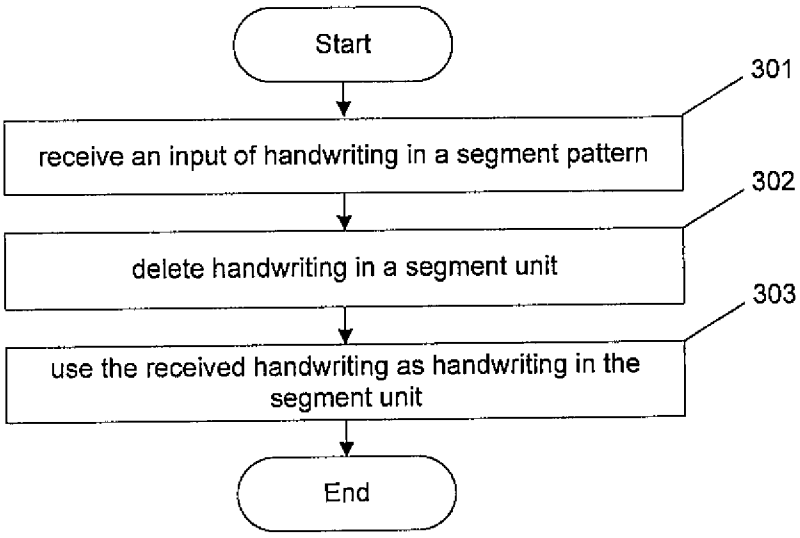


Fig. 3

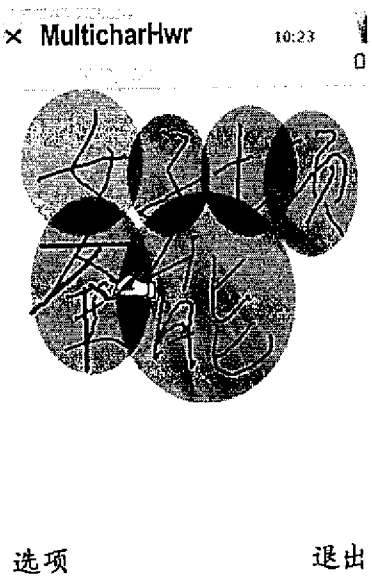


Fig. 4a

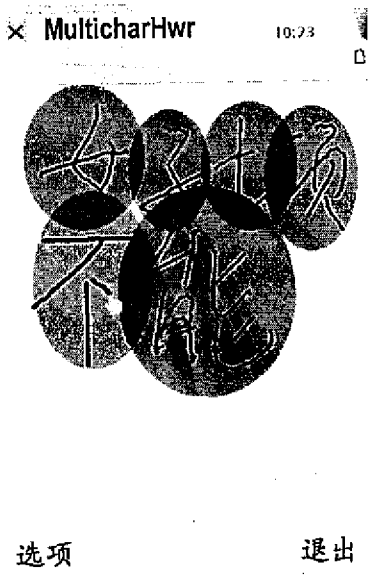


Fig. 4b

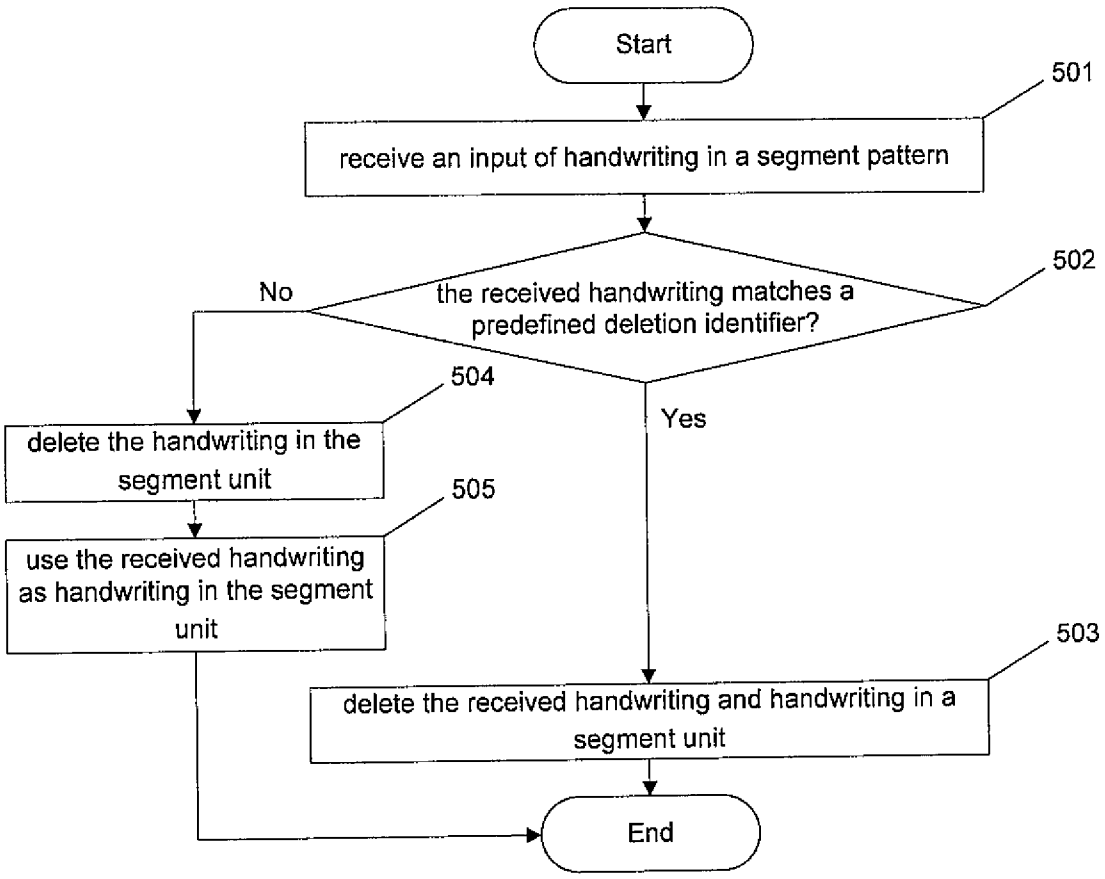


Fig. 5

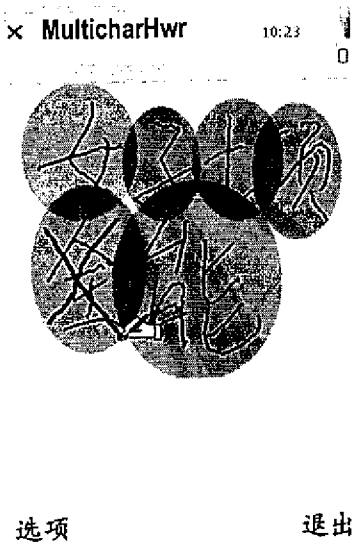


Fig. 6a

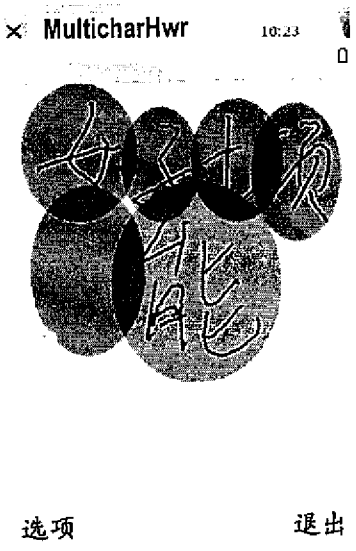


Fig. 6b

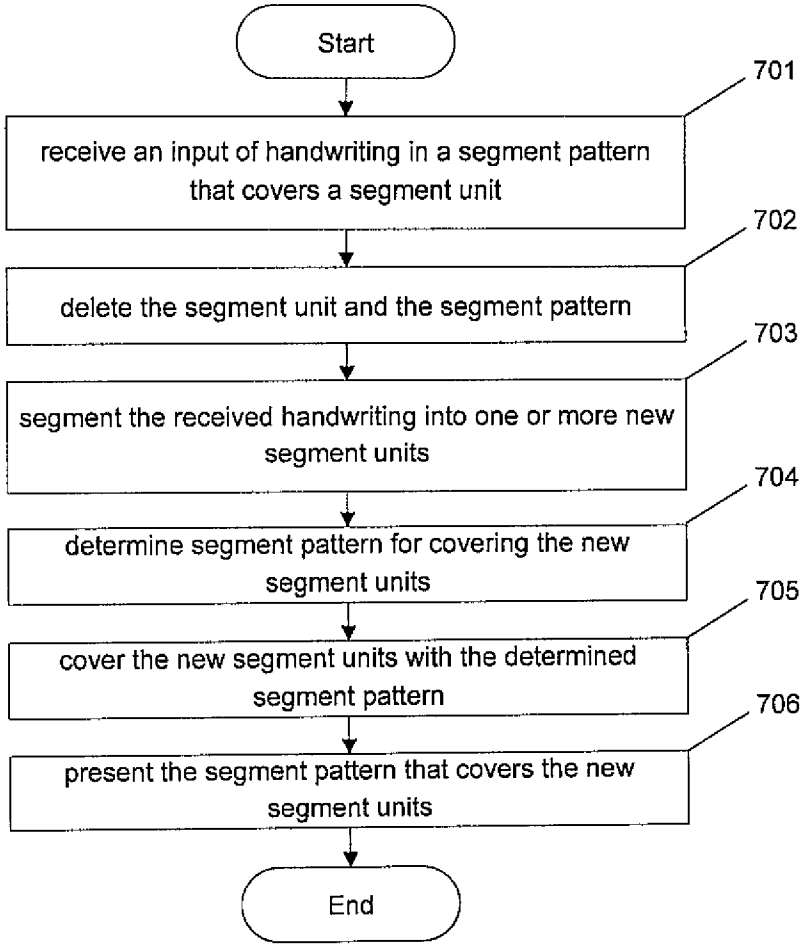


Fig. 7

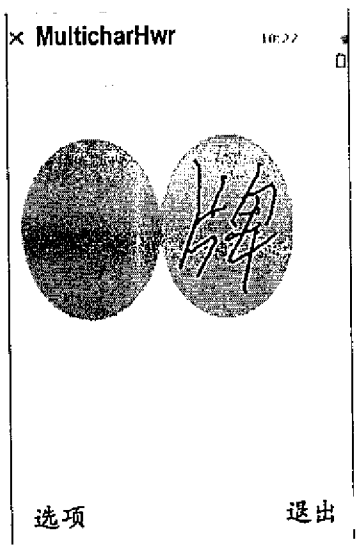


Fig. 8a



Fig. 8b



Fig. 8c

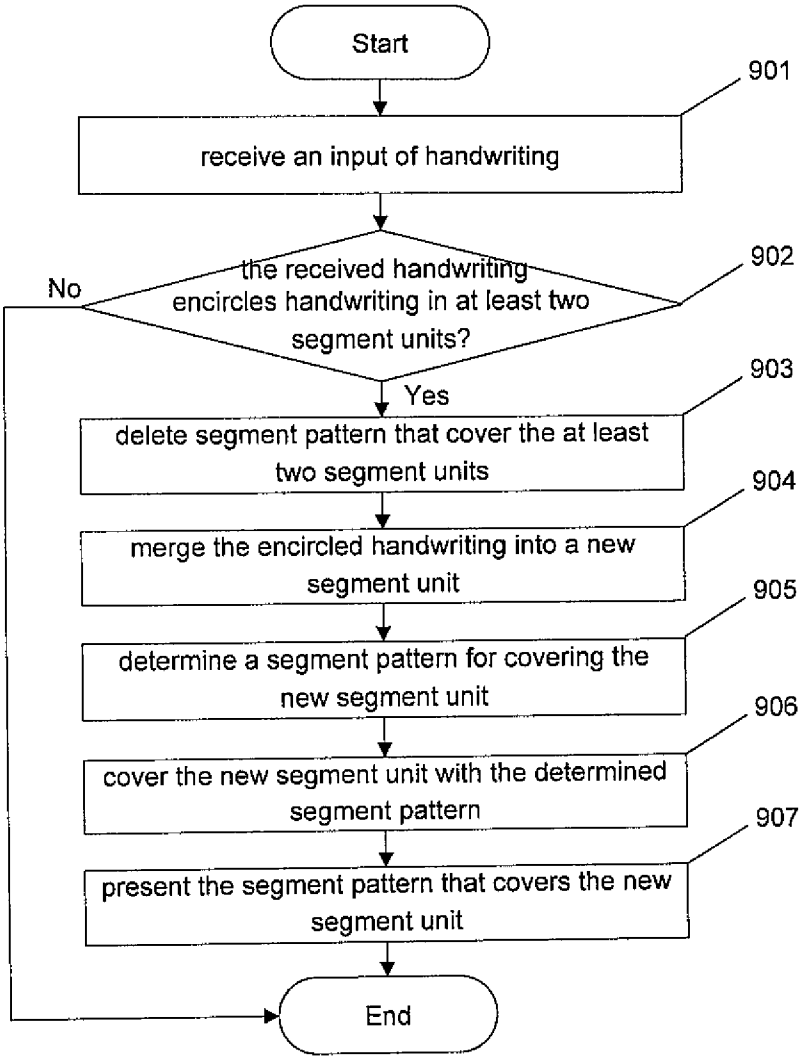


Fig. 9

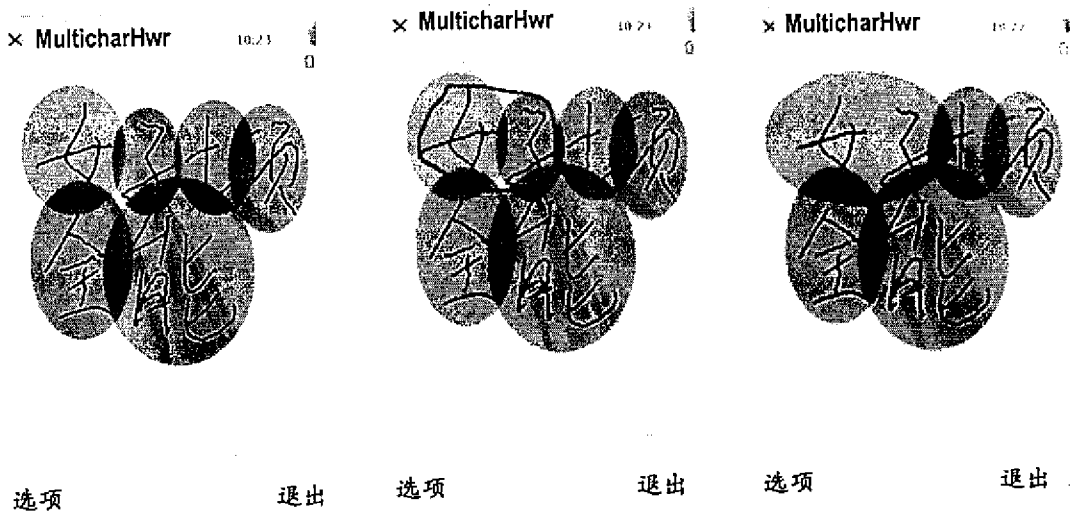


Fig. 10a Fig. 10b Fig. 10c

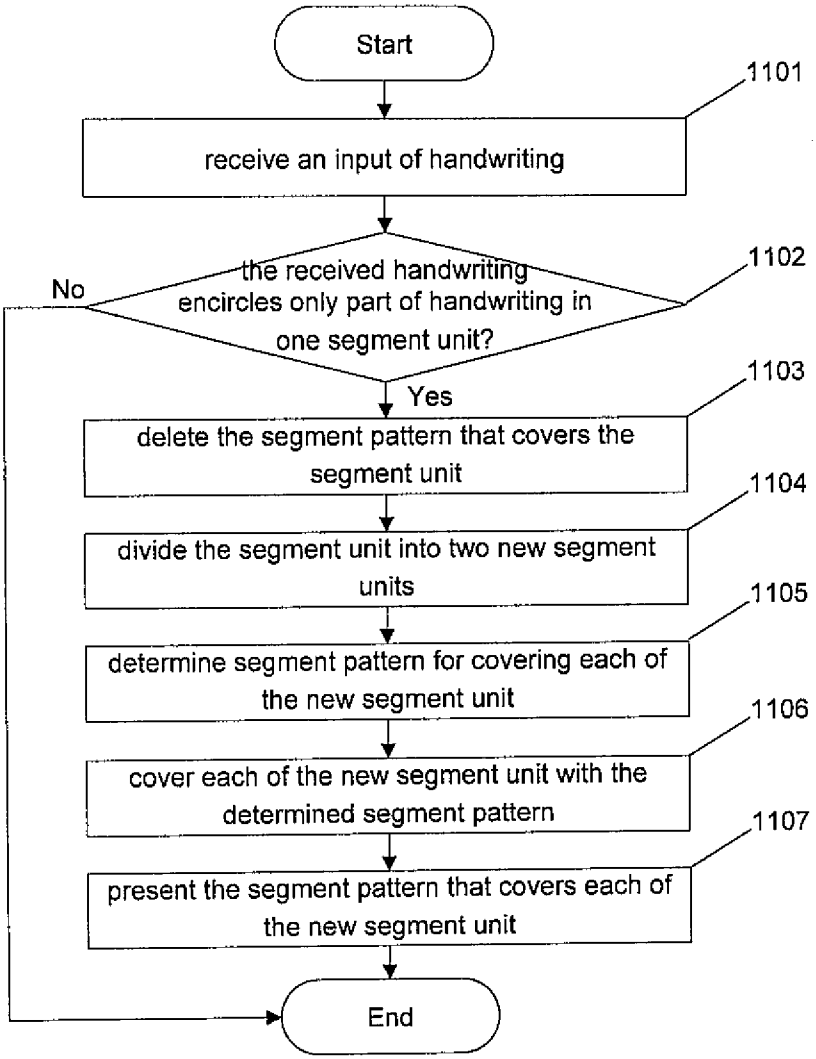


Fig. 11

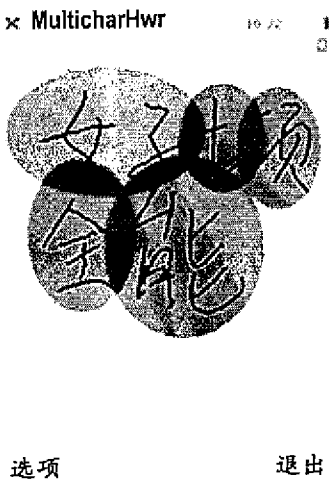


Fig. 12a

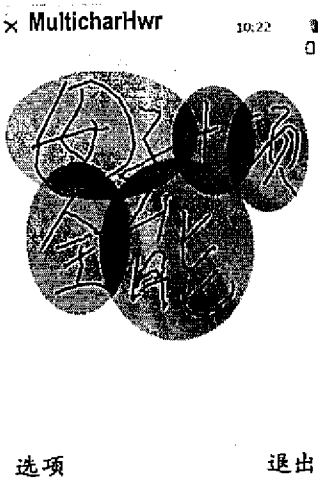


Fig. 12b

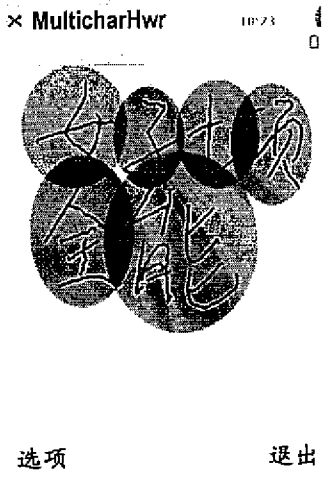


Fig. 12c

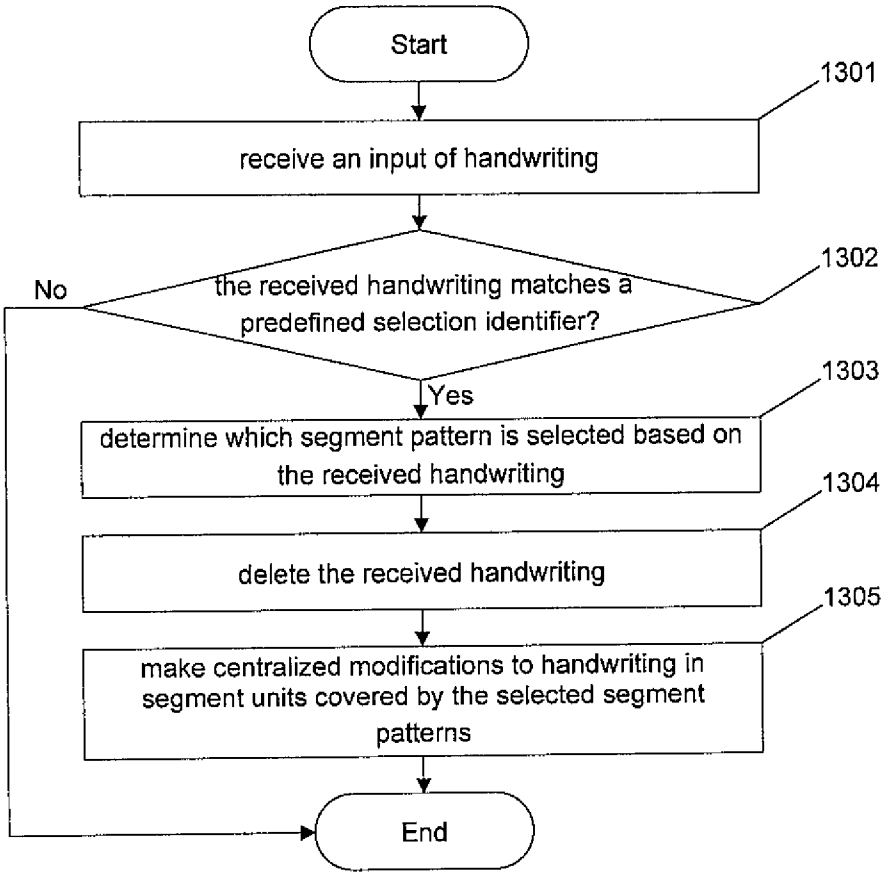


Fig. 13

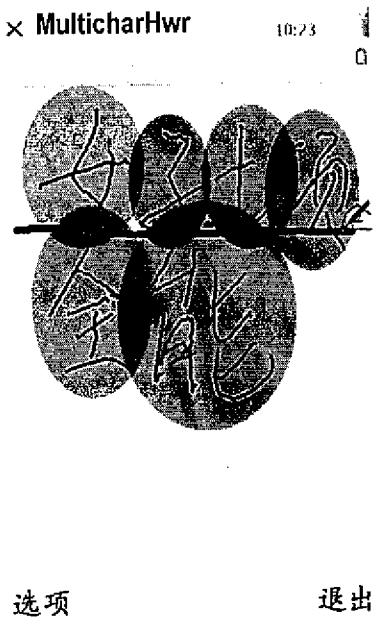


Fig. 14a

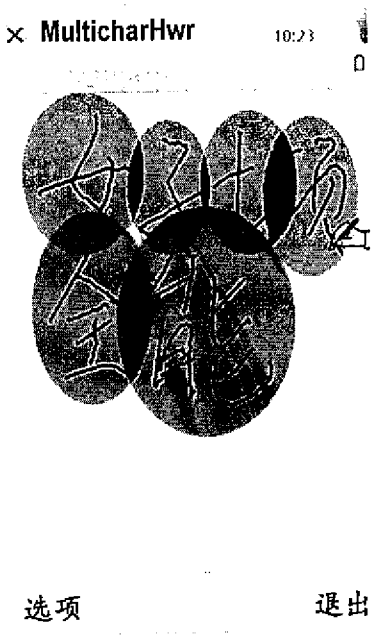


Fig. 14b

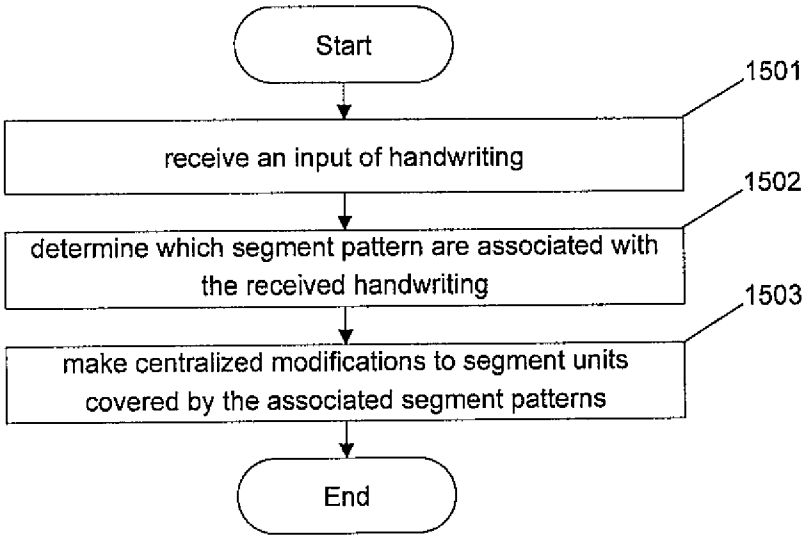

Start
1501
receive an input of handwriting
1502
determine which segment pattern are associated with the received handwriting
1503
make centralized modifications to segment units covered by the associated segment patterns
End

Fig. 15

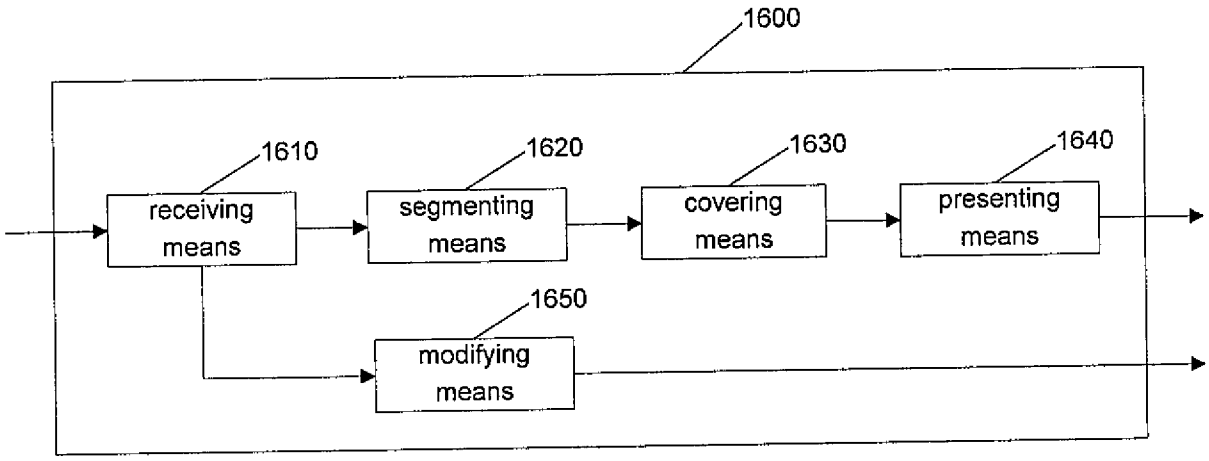

1600
1610
receiving means
1620
segmenting means
1630
covering means
1640
presenting means
1650
modifying means

Fig. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2010/070929

A. CLASSIFICATION OF SUBJECT MATTER

G06F3/033 (2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G06F3/-; G06K9/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPI, EPODOC, CPRS,CNKI, handwriting, input, segment, cover, pattern, edit, modify, delete

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN1131773A (SHARP KK) 25 Sep. 1996 (25.09.1996) the whole document	1-34
A	CN1260526A (IBM CORP et al.) 19 Jul. 2000(19.07.2000) the whole document	1-34
A	CN1138909A (MOTOROLA INC) 25 Dec.1996(25.12.1996) the whole document	1-34
A	JP2003337921A (SHARP KK) 28 Nov.2003(28. 11.2003) the whole document	1-34
A	JP2004272377A (RICOH KK) 30 Sep.2004(30. 09.2004) the whole document	1-34

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 May 2010(31.05.2010)	**10 Jun. 2010 (10.06.2010)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer DENG,Qian Telephone No. (86-10)62411669

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2010/070929

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN1131773A	25.09.1996	EP0720084A2	03.07.1996
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