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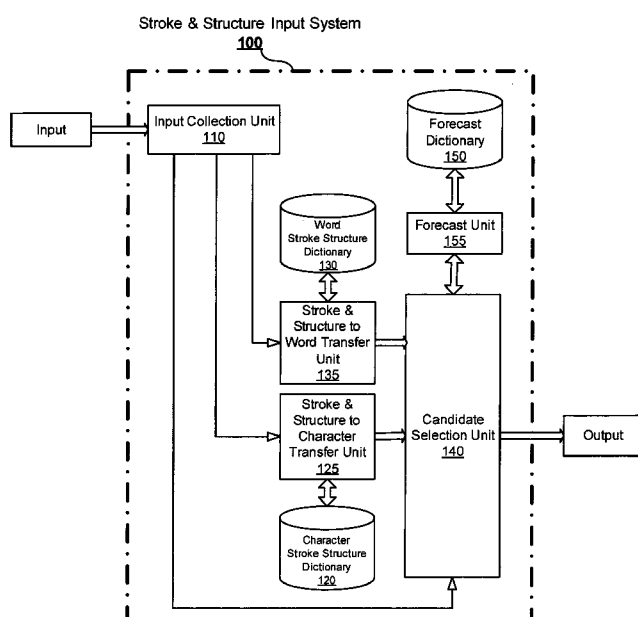
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(54) Title: STROKE AND STRUCTURE INPUT METHOD AND SYSTEM

FIG. 1



(57) Abstract: The present invention provides a stroke and structure input system and a stroke and structure input method for inputting texts with strokes and structures such as Chinese, Japanese and Korean languages. The stroke and structure input system according to the present invention comprises: a character stroke structure dictionary, a word stroke structure dictionary, an input collection unit, a stroke and structure to character transfer unit, a stroke and structure to word transfer unit, a candidate selection unit, wherein the structure information can be used as separators between multiple characters, which may improve the input efficiency. Additionally, the stroke and structure input system according to the present invention may further comprise a forecast dictionary and a forecast unit for providing a forecast function. The stroke and structure input system according to the present invention may further comprise a stroke sequence free unit, which may find the desired character even if a user inputs with a wrong stroke sequence.

DESCRIPTION

TITLE OF INVENTION

STROKE AND STRUCTURE INPUT METHOD AND SYSTEM

5 TECHNICAL FIELD

The invention relates to a stroke and structure input method used in an electronic device, and more particularly, to a stroke and structure input method and a related system for inputting texts with strokes and structures such as Chinese,
10 Japanese and Korean languages. The inventive stroke and structure input method and the related system may be widely applied in devices which need information input, such as an embedded system, a desktop computer, a portable computer, a touchpad system, an E-dictionary, a learning machine and so
15 on.

BACKGROUND ART

Researches have been widely conducted in a stroke and structure input method field. A user may input strokes and structures of characters to achieve selection and input of
20 candidate characters. The stroke and structure input method may search for related characters or words using the strokes and the structures. The introduction of the character structure may improve the input efficiency.

Reference 1 (CN101122831A) discloses a numeral symmetry code stroke input method, which may input Chinese characters one by one through 10 kinds of Chinese structures and 5 kinds of Chinese strokes. In the numeral symmetry code stroke input method, candidates for the Chinese character may be produced by the Chinese structures and the Chinese strokes.

Reference 2 (CN1336578A) discloses a Chinese input method based on numeric keyboard, which may input Chinese characters through 3 kinds of Chinese structures and 5 kinds of Chinese strokes. In the Chinese input method, the Chinese structure(s) may be on the front, and the Chinese stroke(s) may be on the back. A complex rule may be defined for a combination of the structure and the stroke.

However, Reference 1 has disadvantages as follows:

(1) only one Chinese character may be input every time, but two or more Chinese characters cannot be input every time;

(2) it is required that the Chinese character should be Input with a correct stroke sequence; otherwise, the method cannot provide correct Chinese candidates; and

(3) the Chinese structures are too many (10 kinds)

for users to remember.

The disadvantages of Reference 2 are

(4) the rule of the combination of the structure and
5 the stroke is too complex. The number of the
strokes for each Chinese character or word is
limited by a code length, which causes a more
complex combination rule; and

(5) it is required that the Chinese should be input
10 with a correct stroke sequence. Otherwise, the
method cannot provide correct Chinese
candidates.

Therefore, the current stroke and structure input method
15 does not well balance input relationships between the stroke
and the structure, requires that the user must know the correct
stroke sequence of the Chinese character, and cannot provide a
correct result for a wrong stroke sequence at all, which cause a
significantly inconvenience for the user's input.

20 SUMMARY OF INVENTION

In order to solve the above problems existed in the prior
art, the present invention provides a stroke and structure input
method and a related system, wherein related characters or
25 words may be searched for using strokes and structures, the

searched characters or words may be output in a specific order, and the character structures may be used as separators of continuously input multiple characters. Thus, the input efficiency may be improved.

5

Additionally, in order to avoid a problem in which a candidate character cannot be provided due to a wrong user input stroke sequence, the present invention further provides an alternative stroke sequence free input function. The stroke
10 sequence free input function means that the user may input characters or words in the wrong stroke sequence. This is an alternative function, and the user may select to enable or disable such a function, which may be convenient for those who are not familiar with the stroke sequence (by enabling the
15 stroke sequence free input function), and also will not bring any interference and inconvenience for those who are familiar with the stroke sequence (by disabling the stroke sequence free input function). When the user enables the stroke sequence free
20 input function, the stroke and structure input method and the related system of the present invention will change the stroke sequence input by the user, and search for related characters and words according to various combinations of the stroke sequences.

25 According to a first aspect of the present invention, a

stroke and structure input system is provided. The stroke and structure input system comprises: a character stroke structure dictionary, adapted to store records formed by encoding characters according to strokes and structures of the characters; a word stroke structure dictionary, adapted to store records formed by encoding words according to strokes and structures of characters which constitute the words; an input collection unit, adapted to process input information from an input device for distinguishing stroke information, structure information and selection information; to provide the stroke information and/or the structure information in the input information to a stroke and structure to character transfer unit, when it is determined based on the input stroke information and/or the structure information that one character is to be input; to provide the stroke information and/or the structure information in the input information to a stroke and structure to word transfer unit, when it is determined based on the input stroke information and/or the structure information that a word is to be input; and to provide the selection information in the input information to a candidate selection unit, when it is determined based on the input selection information that one candidate character or candidate word is to be selected; the stroke and structure to character transfer unit, adapted to search the character stroke structure dictionary for a candidate character matched with the input stroke information and/or

structure information; the stroke and structure to word transfer unit, adapted to search the word stroke structure dictionary for a candidate word matched with the input stroke information and/or structure information; the candidate selection unit, adapted to present the candidate character provided by the stroke and structure to character transfer unit and/or the candidate word provided by the stroke and structure to word transfer unit, and to output the selected candidate character or candidate word according to the input selection information, wherein the structure information is used as separators between multiple characters.

Preferably, the stroke and structure input system further comprises a forecast dictionary, adapted to store at least one of relationships between characters, relationships between characters and words, relationships between words, and relationships between words and characters; a forecast unit, adapted to search the forecast dictionary for a candidate character and/or a candidate word matched with the selected candidate character or candidate word, wherein the candidate selection unit is further adapted to present the candidate character and/or candidate word provided by the forecast unit, and to output the selected candidate character or candidate word according to the input selection information.

Preferably, the stroke and structure input system further comprises: a stroke sequence free unit, adapted to perform a stroke sequence free processing on the records stored in the character stroke structure dictionary and the word stroke structure dictionary, so that a same character corresponds to all of possible stroke sequence combinations, and a same word corresponds to all of possible stroke sequence combinations.

Preferably, the input collection unit comprises: a stroke sequence free unit, adapted to perform a stroke sequence free processing on the stroke information to be provided to the stroke and structure to character transfer unit and/or the stroke and structure to word transfer unit; to change a sequence of a plurality of strokes belonging to one character by taking the structure information as borders to provide all of possible stroke combinations, so as to form all of possible stroke information and/or structure information corresponding to the input stroke information and/or structure information, wherein the stroke and structure to character transfer unit or the stroke and structure to word transfer unit searches the character stroke structure dictionary or the word stroke structure dictionary for a candidate character or a candidate word matched with the all of possible stroke information and/or structure information.

According to a second aspect of the present invention, a stroke and structure input method is provided. The stroke and structure input method comprises: encoding characters according to strokes and structures of the characters, storing the encoded characters in a character stroke structure dictionary; encoding words according to strokes and structures of characters which constitute the words, storing the encoded words in a word stroke structure dictionary; processing input information from an input device for distinguishing stroke information, structure information and selection information; searching the character stroke structure dictionary for a candidate character matched with the stroke information and/or structure information in the input information and presenting the candidate character, when it is determined based on the input stroke information and/or the structure information that one character is to be input; searching the word stroke structure dictionary for a candidate word matched with the stroke information and/or structure information in the input information and presenting the candidate word, when it is determined based on the input stroke information and/or the structure information that a word is to be input; when it is determined based on the input selection information that one candidate character or candidate word is to be selected, outputting the selected candidate character or candidate word, wherein the structure information is used as separators

between multiple characters.

Preferably, the stroke and structure input method further comprises: forecasting a candidate character and/or a candidate word matched with the selected candidate character or candidate word, and presenting the candidate character and/or candidate word; and when it is determined based on the input selection information that one candidate character or candidate word is to be selected, outputting the selected candidate character or candidate word.

Preferably, the stroke and structure input method further comprises: performing a stroke sequence free processing on records stored in the character stroke structure dictionary and the word stroke structure dictionary, so that a same character corresponds to all of possible stroke sequence combinations, and a same word corresponds to all of possible stroke sequence combinations.

Preferably, the input collection method comprises: performing a stroke sequence free processing on the stroke information firstly, when it is determined based on the stroke information and/or structure information that one character or word is to be input; changing a sequence of a plurality of strokes belonging to one character by taking the structure

information as borders to provide all of possible stroke combinations, so as to form all of possible stroke information and/or structure information corresponding to the input stroke information and/or structure information, wherein the character stroke structure dictionary or the word stroke structure dictionary is searched for a candidate character or a candidate word matched with the all of possible stroke information and/or structure information, and the candidate character or the candidate word is presented.

In the present invention, the strokes of the characters may be defined according to the following table:

Stroke	Remarks
一	Including 横(一), 提(一)
丨	Including 竖(丨), 竖勾(乚)
丿	Including 撇(丿), 点(丶), 捺(㇏)
㇏	Including 折(㇏), 竖折(乚), 横折(㇔), 横勾(乚)
All	All strokes

The structures of the characters may be defined according to the following table:

Structure	Remarks
Left to Right	Including <i>Left to Right</i> , <i>Left to Middle to Right</i>
Above to Below	Including <i>Above to Below</i> , <i>Above to Middle to Below</i>
Surround	Including <i>Surround</i> , <i>Surround from</i>

	<i>above, Surround from below, Surround from left, Surround from right.</i>
Others	Other structures except above
All	All structures

According to the above definitions, the characters or words may be encoded, and the strokes and the structures of the characters may be mapped on the input device.

5

In the present invention, the input device may be a computer keyboard, which may map the strokes “—, |, J, ㄣ, All” on keys “Q, W, E, R, T” respectively, and map the structures “Left to Right, Above to Below, Surround, Others, All” on keys
 10 “A, S, D, F, G”; or

the input device may be a digital keypad, which may map the strokes “—, |, J, ㄣ, All” on keys “1, 2, 3, 4, 5” respectively, and map the structures “Left to Right, Above to Below, Surround, Others, All” on keys “7, 8, 9, *, 0”
 15 respectively; or

the input device may be a touchpad, which may map the strokes “—, |, J, ㄣ, All” on different areas on the touchpad respectively, and map the structures “Left to Right, Above to Below, Surround, Others, All” on different areas on the
 20 touchpad respectively.

The present invention may achieve advantageous

technical effects as follows:

- (1) the stroke and structure input method is greatly convenient for those who are not familiar with related pronunciation input, e.g. users, travelers and foreign-language learners who are not familiar with Chinese Pinyin input method;
- (2) Chinese words may be input conveniently with the stroke and structure input method, while the stroke input method can only input one Chinese character. Thus, the input efficiency is significantly improved; and
- (3) the stroke sequence is not limited. The stroke and structure input method may output the desired candidate character or word, even if the user input with the wrong stroke sequence.

BRIEF DESCRIPTION OF DRAWINGS

The above and other objects, features and advantages of the present invention will be more apparent from the following preferred embodiments illustrated with reference to the figures.

Fig. 1 shows a schematic block diagram of a stroke and structure input system 100 according to the present invention.

Fig. 2 shows a schematic operating flowchart of an input collection unit 110.

Fig. 3 shows an operating flowchart of a stroke and

structure to character transfer unit 125.

Fig. 4 shows an operating flowchart of a stroke and structure to word transfer unit 135.

5 Fig. 5 shows an operating flowchart of a candidate selection unit 140.

Fig. 6 shows an operating flowchart of a forecast unit 155.

Figs. 7A show exemplary embodiments of the present invention embodied on a desktop computer.

10 Figs. 7B show exemplary embodiments of the present invention embodied on a desktop computer.

Figs. 8A show exemplary embodiments of the present invention embodied on a mobile phone.

Figs. 8B show exemplary embodiments of the present invention embodied on a mobile phone.

15 Fig. 9 shows an exemplary embodiment of the present invention embodied on a touchpad system.

Figs. 10A show exemplary embodiments of a stroke and structure input method according to the present invention.

20 Figs. 10B show exemplary embodiments of a stroke and structure input method according to the present invention.

Figs. 10C show exemplary embodiments of a stroke and structure input method according to the present invention.

Figs. 10D show exemplary embodiments of a stroke and structure input method according to the present invention.

25 Figs. 10E show exemplary embodiments of a stroke and

structure input method according to the present invention.

Fig. 11 shows a schematic block diagram of a stroke and structure input system 100A according to a variant of the present invention, which may provide a stroke sequence free input function.

Fig. 12 shows a schematic block diagram of a stroke and structure input system 100B according to another variant of the present invention, which may provide a stroke sequence free input function.

Figs. 13A show comparisons between examples without a stroke sequence free input function and those with a stroke sequence free input function.

Figs. 13B show comparisons between examples without a stroke sequence free input function and those with a stroke sequence free input function.

Figs. 13C show comparisons between examples without a stroke sequence free input function and those with a stroke sequence free input function.

Same or similar structures and steps are indicated by same or similar reference numbers in all of the drawings of the present invention.

DESCRIPTION OF EMBODIMENTS

Preferred embodiments of the present invention will be

detailed with reference to the drawings. In the following description, details and functions unnecessary to the present invention are omitted so as not to obscure the concept of the invention.

5

A stroke and structure input method and a related system according to the present invention mainly solve problems as follows:

- (1) Using character structures as separators to input
10 characters continuously; and
- (2) Input without a stroke sequence. That is, users
do not have to know or remember a correct stroke
sequence of characters.

15 Hereinafter, Chinese characters will be taken as an example to describe the stroke and structure input method and the related system. However, this is only for illustration but not for limitation. The skilled in the art may apply the present invention to other characters which have strokes and
20 structures, which also fall into the protection scope of the present invention.

The following are a stroke definition and a structure definition in the stroke and structure input method and the
25 related system of the present invention.

Table 1 Stroke Definition

#	Stroke	Representation	Remarks
1	横	—	Including 横(一), 提(一)
2	竖		Including 竖(), 竖勾(丿)
3	撇	丿	Including 撇(丿), 点(丶), 捺(㇏)
4	折	ㄟ	Including 折(ㄟ), 竖折(乚), 横折(ㄣ), 横勾(乛)
5	All	?	All strokes

5

Table 2 Structure Definition

#	Structure	Representation	Remarks	Example
1	Left to Right	→	Including Left to Right, Left to Middle to Right	提
2	Above to Below	↓	Including Above to Below, Above to Middle to Below	吉
3	Surround	○	Including Surround, Surround from above, Surround from below, Surround from left, Surround from right.	围
4	Others	◇	Other structures except above	上
5	All	?	All structures	

Fig. 1 shows a schematic block diagram of a stroke and structure input system 100 according to the present invention.

10

As shown in Fig. 1, the stroke and structure input system 100 according to the present invention may comprise an input collection unit 110, a character stroke structure dictionary 120,

a word stroke structure dictionary 130, a stroke and structure to character transfer unit 125, a stroke and structure to word transfer unit 135, a candidate selection unit 140, a forecast dictionary 150 and a forecast unit 155.

5

The input collection unit 110 may collect input information from an input device, and process the input information for distinguishing stroke information, structure information and selection information.

10

The character stroke structure dictionary 120 may be used for storing characters, stroke and structure information of the characters, and use frequencies of the characters.

15

The stroke and structure to character transfer unit 125 may transfer the stroke information and the structure information from the input collection unit 110 into candidate characters.

20

The word stroke structure dictionary 130 may be used for storing words, stroke and structure information of the words, and use frequencies of the words. A word may consist of one or more characters. The stroke and structure information of the word may come from the stroke and structure information of characters constituting the word, which may be identical with

25

the stroke and structure information of the characters constituting the word, or may be modified and simplified to a certain extent.

5 The stroke and structure to word transfer unit 135 may transfer the stroke information and the structure information from the input collection unit 110 into candidate words.

10 The candidate selection unit 140 may present the candidate characters provided by the stroke and structure to character transfer unit 125, the candidate words provided by the stroke and structure to word transfer unit 135 and/or the candidate characters and/or the candidate words provided by the forecast unit 155. Here, a presentation order of the
15 candidate characters and/or the candidate words may be determined according to the use frequencies of the candidate characters and/or the candidate words. Then, the candidate selection unit 140 may output a currently selected candidate character or candidate word, according to the selection
20 information from the input collection unit 110.

 The forecast dictionary 150 may be used for storing at least one of relationships between characters, relationships between characters and words, relationships between words, and relationships between words and characters. Alternatively,
25

the forecast dictionary 150 may store use frequencies of the above relationships.

The forecast unit 155 may search for new candidate
5 characters and/or candidate words to return to the candidate
selection unit 140 based on the currently selected candidate
character or candidate word output by the candidate selection
unit 140, according to the forecast dictionary 150. Here, the
use frequencies of the new candidate characters and/or
10 candidate words may utilize the use frequencies in the
character stroke structure dictionary 120 and the word stroke
structure dictionary 130, and may also be different values of
the use frequencies of the relationships stored in the forecast
dictionary 150.

15 Alternatively, the candidate selection unit 140 may also
update the use frequency of the currently selected candidate
character or candidate word in the character stroke structure
dictionary 120 or the word stroke structure dictionary 130,
20 according to the currently selected candidate character or
candidate word. Also, the candidate selection unit 140 may
update the use frequencies of the related relationships between
the currently selected candidate characters or candidate words
in the forecast dictionary 150, according to the currently
25 selected candidate characters or candidate words.

In the specification, the “use frequency” represents numbers of the characters, words or relationships being selected. Alternatively, the use frequency may be automatically updated with use of the stroke and structure input system according to the present invention.

Fig. 2 shows a schematic operating flowchart of the input collection unit 110.

As shown in Fig. 2, in step S210, the input collection unit 110 may firstly determine whether the input information from the input collection unit 110 is the stroke information or the structure information or not.

If the input information is the stroke information or the structure information (“Yes” in step S210), the input collection unit 110 may determine in step S220 whether it is a character. In step S220, the input collection unit 110 may determine whether the input information contains the structure information. If the input information contains at least one structure information, and also contains the stroke information and/or structure information following the at least one structure information, it may be determined that the input is at least two characters. On the contrary, if the input information

does not contain the structure information but only contain the stroke information, or the input information only contains single structure information and there is no other information following the structure information, it may be determined that the input is one character. When it is determined that only one character is input ("Yes" in step S220), the input information may be provided to the stroke and structure to character transfer unit 125. When it is determined that a plurality of characters are input ("No" in step S220), the input information may be provided to the stroke and structure to word transfer unit 135.

On the other hand, if the input information is not the stroke information or the structure information ("No" in step S210), the input collection unit 110 may determine in step S230 whether the input information is the selection information or not. If the input information is the selection information ("Yes" in step S230), the input collection unit 110 may provide the input information to the candidate selection unit 140. If the input information is not the selection information ("No" in step S230), the input collection unit 110 may discard the input information, and does not perform any operation any more.

Fig. 3 shows an operating flowchart of the stroke and structure to character transfer unit 125.

As shown in Fig. 3, in step S310, the stroke and structure to character transfer unit 125 may issue an instruction of searching for candidate characters matched with the input stroke information and/or structure information from the input collection unit 110 to the character stroke structure dictionary 120, according to the input stroke information and/or structure information. Then, in step S320, the stroke and structure to character transfer unit 125 may obtain a search result returned from the character stroke structure dictionary 120, which contains the candidate characters matched with the input stroke information and/or structure information and the use frequencies thereof. Finally, in step S330, the stroke and structure to character transfer unit 125 may order the obtained candidate characters according to the use frequencies of the candidate characters, and provide the ordered candidate characters to the candidate selection unit 140.

Fig. 4 shows an operating flowchart of the stroke and structure to word transfer unit 135.

As shown in Fig. 4, in step S410, the stroke and structure to word transfer unit 135 may issue an instruction of searching for candidate words matched with the input stroke information and structure information from the input collection unit 110 to

the word stroke structure dictionary 130, according to the input stroke information and structure information. Then, in step S420, the stroke and structure to word transfer unit 135 may obtain a search result returned from the word stroke structure dictionary 130, which contains the candidate words matched with the input stroke information and/or structure information and the use frequencies thereof. Finally, in step S430, the stroke and structure to word transfer unit 135 may order the obtained candidate words according to the use frequencies of the candidate words, and provide the ordered candidate words to the candidate selection unit 140.

Fig. 5 shows an operating flowchart of the candidate selection unit 140.

As shown in Fig. 5, in step S510, the candidate selection unit 140 may present the candidate characters provided by the stroke and structure to character transfer unit 125, the candidate words provided by the stroke and structure to word transfer unit 135, and/or the candidate characters and/or candidate words provided by the forecast unit 155. Then, in step S520, the candidate selection unit 140 may obtain the selection information from the input collection unit 110, and output the currently selected candidate character or candidate word. Alternatively, after the step S520 is completed, the

candidate selection unit 140 may also update, in step S530, the use frequency of the currently selected candidate character or candidate word in the character stroke structure dictionary 120 or the word stroke structure dictionary 130, according to the currently selected candidate character or candidate word, and/or may also update the use frequencies of the related relationships between the currently selected candidate characters or candidate words in the forecast dictionary 150, according to the currently selected candidate characters or candidate words.

Fig. 6 shows an operating flowchart of the forecast unit 155.

As shown in Fig. 6, in step S610, the forecast unit 155 may issue an instruction of searching for the candidate characters and/or candidate words matched with the input currently selected candidate character or candidate word, according to the currently selected candidate character or candidate word from the candidate selection unit 140. Then, in step S620, the forecast unit 155 may obtain a search result returned from the forecast dictionary 150, which contains the candidate characters and/or candidate words matched with the input currently selected candidate character or candidate word and the use frequencies thereof. Finally, in step S630, the

forecast unit 155 may order the obtained candidate characters and/or candidate words according to the use frequencies of the candidate characters and the candidate words, and provide the ordered candidate characters and/or candidate words to the candidate selection unit 140.

Figs. 7A and 7B show exemplary embodiments of the present invention embodied on a desktop computer.

As shown in Fig. 7A, an input schematic diagram of an input sequence "EEQSQ" is displayed on a screen. Accordingly, Fig. 7B shows positions of stroke input keys and structure input keys. As shown in Fig. 7B, stroke inputs and structure inputs may be mapped on the keyboard of the desktop computer respectively. Tables 3 and 4 show specific mapping relationships.

Table 3 Stroke Mapping

#	Stroke	Representation	Key
1	横	—	Q
2	竖		W
3	撇	丿	E
4	折	→	R
5	All	?	T

Table 4 Structure Mapping

#	Structure	Representation	Key
1	Left to Right	→	A
2	Above to Below	↓	S
3	Surround	○	D
4	Others	◇	F
5	All	?	G

Selective inputs may be implemented by digital keys on the keyboard of the desktop computer, and may also be implemented by mouse keys.

The specific mapping approaches are not intended to limit the present invention. Any key mapping is possible to be applied to the present invention, as long as no conflict occurs.

Figs. 8A and 8B show exemplary embodiments of the present invention embodied on a mobile phone.

As shown in Fig. 8A, an input schematic diagram of an input sequence "33181" is displayed on a screen. Accordingly, Fig. 8B shows positions of stroke input keys and structure input keys. As shown in Fig. 8B, stroke inputs and structure inputs may be mapped on the keyboard of the mobile phone respectively. Tables 5 and 6 show specific mapping

relationships.

Table 5 Stroke Mapping

#	Stroke	Representation	Key
1	横	—	1
2	竖		2
3	撇	丿	3
4	折	→	4
5	All	?	5

5

Table 6 Structure Mapping

#	Structure	Representation	Key
1	Left to Right	→	7
2	Above to Below	↓	8
3	Surround	○	9
4	Others	◇	*
5	All	?	0

Selective inputs may be implemented by a four-direction key or a track ball key on a keypad of the mobile phone.

10

The specific mapping approaches are not intended to limit the present invention. Any key mapping is possible to be applied to the present invention, as long as no conflict occurs.

Fig. 9 shows an exemplary embodiment of the present

invention embodied on a touchpad system.

As shown in Fig. 9, an input schematic diagram of an input sequence “→ ◇ | ” is displayed on a screen. Different from the system with keys such as the desktop computer and the mobile phone, the touchpad system may directly display on the touchpad stroke representations and structure representations (area mapping). When input, these representations may be clicked directly (Tables 7 and 8).

Table 7 Stroke Representation

#	Stroke	Representation
1	横	—
2	竖	
3	撇	丿
4	折	↗
5	All	?

Table 8 Structure Representation

#	Structure	Representation
1	Left to Right	→
2	Above to Below	↓
3	Surround	○
4	Others	◇
5	All	?

In the touchpad system, selective inputs may be implemented by clicking the candidate characters or candidate words, or by separately clicking the area.

5 The specific mapping approaches are not intended to limit the present invention. Any key mapping is possible to be applied to the present invention, as long as no conflict occurs.

10 Figs. 10A-10E show exemplary embodiments of the stroke and structure input method according to the present invention.

As shown in Fig. 10A, a stroke “乚” is input. The input collection unit 110 determines that it is one character, and provides the stroke “乚” to the stroke and structure to character transfer unit 125. The stroke and structure to character transfer unit 125 returns candidate characters, and the candidate characters are presented in a “candidate block” by the candidate selection unit 140. Fig. 10A only shows the candidate characters 1-8: “1 飞 2 了 3 子 4 出 5 也 6 那 7 以 8 对” .

As shown in Fig. 10B, a structure “◇” is input subsequently. The input collection unit 110 determines that it is a character, and provides the stroke and the structure “乚 ◇” to the stroke and structure to character transfer unit 125. The

stroke and structure to character transfer unit 125 returns candidate characters, and the candidate characters are presented in the “candidate block” by the candidate selection unit 140. Fig. 10B only shows the candidate characters 1-8: “1
5 飞 2也 3 又 4 己 5已 6 女 7 力 8 马” .

As shown in Fig. 10C, a stroke “ | ” is input subsequently. The input collection unit 110 determines that it is not a character, and provides the strokes and the structure “一 ◇ | ”
10 to the stroke and structure to word transfer unit 135. The stroke and structure to word transfer unit 135 returns candidate words, and the candidate words are presented in the “candidate block” by the candidate selection unit 140. Fig. 10C only shows the candidate words 1-6: “1 飞快 2也是 3 力量
15 4 马上 5随时 6 刀具” .

As shown in Fig. 10D, a selective number “1” is input. The input collection unit 110 determines that it is neither stroke information nor structure information, but selection
20 information, and provides the input information to the candidate selection unit 140. The candidate selection unit 140 outputs the currently selected candidate word “飞快” in an “output block”. Meanwhile, the candidate selection unit 140 provides “飞快” to the forecast unit 155. The forecast unit 155
25 returns the forecast candidate words, and the forecast

candidate words are presented in the “candidate block” by the candidate selection unit 140. Fig. 10D shows the candidate words 1-4: “1 奔跑 2前进 3 突破 4 变化” .

5 As shown in Fig. 10E, a selective number “1” is input. The input collection unit 110 determines that it is neither stroke information nor structure information, but selection information, and provides the input information to the candidate selection unit 140. The candidate selection unit 140
10 outputs the currently selected candidate word “奔跑” after the previously output word “飞快” in the “output block”. Meanwhile, the candidate selection unit 140 provides “奔跑” to the forecast unit 155. The forecast unit 155 returns the forecast candidate words, and the forecast candidate words are presented in the
15 “candidate block” by the candidate selection unit 140. Fig. 10E shows the candidate words 1 and 2: “1前进 2 传递” .

[Stroke Sequence Free Input]

20 Fig. 11 shows a schematic block diagram of a stroke and structure input system 100A according to a variant of the present invention, which may provide a stroke sequence free input function.

25 A difference from the stroke and structure input system 100 as shown in Fig. 1 mainly consists in that a stroke

sequence free unit 1100 is added in the input collection unit 110A. Because other components are completely identical with those as shown in Fig. 1, repetitive descriptions of the same components are omitted for conciseness.

5

The stroke sequence free input unit 1100 may process the stroke information provided, by the input collection unit 110, to the stroke and structure to character transfer unit 125 and/or the stroke and structure to word transfer unit 135, and change
10 a sequence of a plurality of strokes belonging to one character by taking the structure information as borders, so as to provide all of possible stroke combinations. For example, the input information “→ ∩ ∅ | ∩ ” may be processed by the stroke sequence free input unit 1100 to obtain four outputs (“→ ∩ ∅ |
15 ∩ ” , “∩ → ∅ | ∩ ” , “→ ∩ ∅ ∩ | ” , “∩ → ∅ ∩ | ”), which are then provided to the stroke and structure to character transfer unit 125 and/or the stroke and structure to word transfer unit 135.

Fig. 12 shows a schematic block diagram of a stroke and
20 structure input system 100B according to another variant of the present invention, which may provide the stroke sequence free input function.

The difference from the stroke and structure input system
25 100 as shown in Fig. 1 mainly consists in that a stroke

sequence free input unit 1200 may be firstly used for updating the character stroke structure dictionary 120 and the word stroke structure dictionary 130, so as to obtain the updated character stroke structure dictionary 120B and word stroke structure dictionary 130B.

The stroke sequence free input unit 1200 may be used for performing the stroke sequence free processing on the records in the character stroke structure dictionary 120 and the word stroke structure dictionary 130, so that the same character may correspond to all of possible stroke sequence combinations, and the same word may correspond to all of possible stroke sequence combinations. In particular, the stroke sequence free input unit 1200 may firstly read one piece of record from the character stroke structure dictionary 120 or the word stroke structure dictionary 130; and then take the structure information as borders to change the order of the plurality of strokes belonging to one character; store the changed record as a new piece of record; perform the steps of changing the stroke sequence and storing the new record repeatedly, until storage of records of all of the possible stroke combinations for the one piece of record has been completed.

Figs. 13A-13C show comparisons between examples without a stroke sequence free input function and those with a

stroke sequence free input function.

Fig. 13A shows a correct stroke sequence of the Chinese character “力”. Correct results may be output, regardless of whether the stroke sequence free input function is enabled or not. When the strokes “㇏ ㇏” are input, the candidate selection unit 140 will present in the “candidate block” the candidate characters 1-6: “1 力 2她 3 好 4 发 5如 6 女”.

Fig. 13B shows a wrong stroke sequence of the Chinese character “力”, wherein the stroke sequence free input function is disabled, a correct result cannot be output. When the strokes “㇏ ㇏” are input, the input collection unit 110 determines that it is one character, and provides the strokes “㇏ ㇏” to the stroke and structure to character transfer unit 125. The stroke and structure to character transfer unit 125 returns the candidate characters, and the candidate characters are presented in the “candidate block”. Fig. 13B only shows the candidate characters 1-6: “1么 2多 3 然 4 用 5外 6 月”. The desired Chinese character “力” cannot be found.

Fig. 13C still shows a wrong stroke sequence of the Chinese character “力”, wherein the stroke sequence free input function is enabled, the correct result may be output.

According to the variant of the present invention as illustrated in Fig. 11, when the strokes “丿 一” are input, the input collection unit 110A determines that it is one character. The stroke sequence free unit 1100 processes the strokes “丿 一” as the strokes “丿 一” and the strokes “一 丿”, and provides the strokes “丿 一” and the strokes “一 丿” to the stroke and structure to character transfer unit 125. The stroke and structure to character transfer unit 125 returns candidate characters matched with the strokes “丿 一” and candidate characters matched with the strokes “一 丿”, which are then presented by the candidate selection unit 140 in the “candidate block”. Fig. 13C only shows the candidate characters 1-6: “1 力 2 么 3 多 4 她 5 好 6 用”. The desired Chinese character “力” may still be found.

According to the another variant of the present invention as illustrated in Fig. 12, when the strokes “丿 一” are input, the input collection unit 110 determines that it is one character, and provides the strokes “丿 一” to the stroke and structure to character transfer unit 125. The stroke and structure to character transfer unit 125 inquires the character stroke structure dictionary 120B. The candidate characters returned by the character stroke structure dictionary 120B which are matched with the strokes “丿 一” contain the Chinese character “力”. The stroke and structure to character transfer unit 125

returns the candidate characters matched with the strokes “丿
→” which also contain the Chinese character “力”, and the
candidate characters are presented by the candidate selection
unit 140 in the “candidate block”. Fig. 13C only shows the
5 candidate characters 1-6: “1 力 2 么 3 多 4 她 5 好 6 用”.
The desired Chinese character “力” may still be found.

Further configurations of the disclosed invention
embodiment comprise software programs for the steps and
10 operations which are first described briefly and then elaborated
in the method embodiments. More particularly, the computer
program product is an embodiment having computer-readable
medium encoded thereon computer program logic, which
provides relevant operations when running on a computing
15 device. While being executed on at least one processor of a
computing system, the computer program logic causes the
processor to perform the operations (steps) of the embodiments.
Such configuration of the present invention is typically
provided as software, code and/or other data structure
20 provided or encoded on a computer-readable medium, such as
optical medium (e.g., CD-ROM), flexible or hard disk, or other
types of mediums, such as firmware or microcode on one or
more ROM, RAM or PROM chips, or application specific
integrated chip (ASIC), or downloadable software images,
25 shared database in one or more modules. Such configuration as

software or firmware can be installed on the computing device so as to cause one or more processors in the computing device to implement the embodiments of the present invention. Software processes operated with, for example, a group of data communication devices or computing devices in other entities can provide the system of the present invention. The system of the present invention can also be several software processes distributed over a number of data communication devices, or all software processes running on a group of a miniature dedicated computers, or all software processes running on a single computer.

It is noted that, strictly speaking, the embodiments of the present invention can be implemented in software program, software and hardware on a data communication device, or separate software and/or separate circuit.

The present invention has been described above with reference to the preferred embodiments thereof. It should be understood that various modifications, alternations and additions can be made by those who skilled in the art without departing from the spirits and scope of the present invention. Therefore, the scope of the present invention is not limited to the above particular embodiments but only defined by the claims as attached.

CLAIMS

Claim 1

A stroke and structure input system comprising:

5 a character stroke structure dictionary, adapted to store records formed by encoding characters according to strokes and structures of the characters;

10 a word stroke structure dictionary, adapted to store records formed by encoding words according to strokes and structures of characters which constitute the words;

an input collection unit, adapted

to process input information from an input device for distinguishing stroke information, structure information and selection information;

15 to provide the stroke information and/or the structure information in the input information to a stroke and structure to character transfer unit, when it is determined based on the input stroke information and/or the structure information that
20 one character is to be input;

to provide the stroke information and/or the structure information in the input information to a stroke and structure to word transfer unit, when it is determined based on the input stroke information
25 and/or the structure information that a word is to be

input; and

to provide the selection information in the input
information to a candidate selection unit, when it is
determined based on the input selection information
5 that one candidate character or candidate word is to
be selected;

the stroke and structure to character transfer unit,
adapted to search the character stroke structure dictionary for
a candidate character matched with the input stroke
10 information and/or structure information;

the stroke and structure to word transfer unit, adapted to
search the word stroke structure dictionary for a candidate
word matched with the input stroke information and/or
structure information;

15 the candidate selection unit, adapted to present the
candidate character provided by the stroke and structure to
character transfer unit and/or the candidate word provided by
the stroke and structure to word transfer unit, and to output
the selected candidate character or candidate word according to
20 the input selection information,

wherein the structure information is used as separators
between multiple characters.

Claim 2

25 The stroke and structure input system according to claim

1, further comprises:

a forecast dictionary, adapted to store at least one of relationships between characters, relationships between characters and words, relationships between words, and relationships between words and characters;

a forecast unit, adapted to search the forecast dictionary for a candidate character and/or a candidate word matched with the selected candidate character or candidate word,

wherein the candidate selection unit is further adapted to present the candidate character and/or candidate word provided by the forecast unit, and to output the selected candidate character or candidate word according to the input selection information.

Claim 3

The stroke and structure input system according to claim 1, further comprises:

a stroke sequence free unit, adapted to perform a stroke sequence free processing on the records stored in the character stroke structure dictionary and the word stroke structure dictionary, so that a same character corresponds to all of possible stroke sequence combinations, and a same word corresponds to all of possible stroke sequence combinations.

Claim 4

The stroke and structure input system according to claim 1, wherein the input collection unit comprises:

a stroke sequence free unit, adapted to perform a stroke sequence free processing on the stroke information to be provided to the stroke and structure to character transfer unit and/or the stroke and structure to word transfer unit; to change a sequence of a plurality of strokes belonging to one character by taking the structure information as borders to provide all of possible stroke combinations, so as to form all of possible stroke information and/or structure information corresponding to the input stroke information and/or structure information,

wherein the stroke and structure to character transfer unit or the stroke and structure to word transfer unit searches the character stroke structure dictionary or the word stroke structure dictionary for a candidate character or a candidate word matched with the all of possible stroke information and/or structure information.

Claim 5

The stroke and structure input system according to any of claims 1-4, wherein

the strokes of the characters are defined according to the following table:

Stroke	Remarks
一	Including 横(一), 提(一)
丨	Including 竖(丨), 竖勾(乚)
丿	Including 撇(丿), 点(丶), 捺(㇏)
㇏	Including 折(乚), 竖折(乚), 横折(㇟), 横勾(乚)
All	All strokes

the structures of the characters are defined according to the following table:

Structure	Remarks
Left to Right	Including <i>Left to Right, Left to Middle to Right</i>
Above to Below	Including <i>Above to Below, Above to Middle to Below</i>
Surround	Including <i>Surround, Surround from above, Surround from below, Surround from left, Surround from right.</i>
Others	Other structures except above
All	All structures

according to the above definitions, the characters or words are encoded, and the strokes and the structures of the characters are mapped on the input device.

Claim 6

The stroke and structure input system according to claim 5, wherein

the input device is a computer keyboard, which maps the strokes “一, 丨, 丿, ㇏, All” on keys “Q, W, E, R, T” respectively, and maps the structures “Left to Right, Above to Below,

Surround, Others, All” on keys “A, S, D, F, G”; or

the input device is a digital keypad, which maps the strokes “一, |, J, 丿, All” on keys “1, 2, 3, 4, 5” respectively, and maps the structures “Left to Right, Above to Below, Surround, Others, All” on keys “7, 8, 9, *, 0” respectively; or

the input device is a touchpad, which maps the strokes “一, |, J, 丿, All” on different areas on the touchpad respectively, and maps the structures “Left to Right, Above to Below, Surround, Others, All” on different areas on the touchpad respectively.

Claim 7

A stroke and structure input method, comprising:

encoding characters according to strokes and structures of the characters, storing the encoded characters in a character stroke structure dictionary; and encoding words according to strokes and structures of characters which constitute the words, storing the encoded words in a word stroke structure dictionary;

processing input information from an input device for distinguishing stroke information, structure information and selection information;

searching the character stroke structure dictionary for a candidate character matched with the stroke information and/or structure information in the input information and

presenting the candidate character, when it is determined based on the input stroke information and/or the structure information that one character is to be input;

searching the word stroke structure dictionary for a candidate word matched with the stroke information and/or structure information in the input information and presenting the candidate word, when it is determined based on the input stroke information and/or the structure information that a word is to be input;

when it is determined based on the input selection information that one candidate character or candidate word is to be selected, outputting the selected candidate character or candidate word,

wherein the structure information is used as separators between multiple characters.

Claim 8

The stroke and structure input method according to claim 7, further comprises:

forecasting a candidate character and/or a candidate word matched with the selected candidate character or candidate word, and presenting the candidate character and/or candidate word; and

when it is determined based on the input selection information that one candidate character or candidate word is

to be selected, outputting the selected candidate character or candidate word.

Claim 9

5 The stroke and structure input method according to claim 7, wherein

 performing a stroke sequence free processing on records stored in the character stroke structure dictionary and the word stroke structure dictionary, so that a same character
10 corresponds to all of possible stroke sequence combinations, and a same word corresponds to all of possible stroke sequence combinations.

Claim 10

15 The stroke and structure input method according to claim 7, further comprises:

 performing the stroke sequence free processing on the stroke information firstly, when it is determined based on the stroke information and/or structure information that one
20 character or word is to be input; changing a sequence of a plurality of strokes belonging to one character by taking the structure information as borders to provide all of possible stroke combinations, so as to form all of possible stroke information and/or structure information corresponding to the
25 input stroke information and/or structure information,

wherein the character stroke structure dictionary or the word stroke structure dictionary is searched for a candidate character or a candidate word matched with the all of possible stroke information and/or structure information, and the candidate character or the candidate word is presented.

Claim 11

The stroke and structure input method according to any of claims 7-10, wherein

the strokes of the characters are defined according to the following table:

Stroke	Remarks
—	Including 横(一), 提(㇏)
丨	Including 竖(丨), 竖勾(㇚)
丿	Including 撇(丿), 点(丶), 捺(㇏)
㇚	Including 折(乚), 竖折(㇟), 横折(㇗), 横勾(㇚)
All	All strokes

the structures of the characters are defined according to the following table:

Structure	Remarks
Left to Right	Including <i>Left to Right, Left to Middle to Right</i>
Above to Below	Including <i>Above to Below, Above to Middle to Below</i>
Surround	Including <i>Surround, Surround from above, Surround from below, Surround from left, Surround from right.</i>
Others	Other structures except above

All	All structures
-----	----------------

according to the above definitions, the characters or words are encoded, and the strokes and the structures of the characters are mapped on the input device.

5 Claim 12

The stroke and structure input method according to claim 11, wherein

the input device is a computer keyboard, which maps the strokes “一, |, J, ㄣ, All” on keys “Q, W, E, R, T” respectively,
10 and maps the structures “Left to Right, Above to Below, Surround, Others, All” on keys “A, S, D, F, G”; or

the input device is a digital keypad, which maps the strokes “一, |, J, ㄣ, All” on keys “1, 2, 3, 4, 5” respectively,
and maps the structures “Left to Right, Above to Below, Surround, Others, All” on keys “7, 8, 9, *, 0” respectively; or
15

the input device is a touchpad, which maps the strokes “一, |, J, ㄣ, All” on different areas on the touchpad respectively,
and maps the structures “Left to Right, Above to Below, Surround, Others, All” on different areas on the touchpad
20 respectively.

Claim 13

A control program which causes a computer to perform a stroke and structure input method, the method comprising:

encoding characters according to strokes and structures of the characters, storing the encoded characters in a character stroke structure dictionary; and encoding words according to strokes and structures of characters which constitute the words, storing the encoded words in a word stroke structure dictionary;

processing input information from an input device for distinguishing stroke information, structure information and selection information;

searching the character stroke structure dictionary for a candidate character matched with the stroke information and/or structure information in the input information and presenting the candidate character, when it is determined based on the input stroke information and/or the structure information that one character is to be input;

searching the word stroke structure dictionary for a candidate word matched with the stroke information and/or structure information in the input information and presenting the candidate word, when it is determined based on the input stroke information and/or the structure information that a word is to be input;

when it is determined based on the input selection information that one candidate character or candidate word is to be selected, outputting the selected candidate character or candidate word,

wherein the structure information is used as separators between multiple characters.

Claim 14

5 A computer-readable storage medium storing a control program which causes a computer to perform a stroke and structure input method, the method comprising:

 encoding characters according to strokes and structures of the characters, storing the encoded characters in a character stroke structure dictionary; and encoding words according to
10 strokes and structures of characters which constitute the words, storing the encoded words in a word stroke structure dictionary;

 processing input information from an input device for
15 distinguishing stroke information, structure information and selection information;

 searching the character stroke structure dictionary for a candidate character matched with the stroke information and/or structure information in the input information and
20 presenting the candidate character, when it is determined based on the input stroke information and/or the structure information that one character is to be input;

 searching the word stroke structure dictionary for a candidate word matched with the stroke information and/or
25 structure information in the input information and presenting

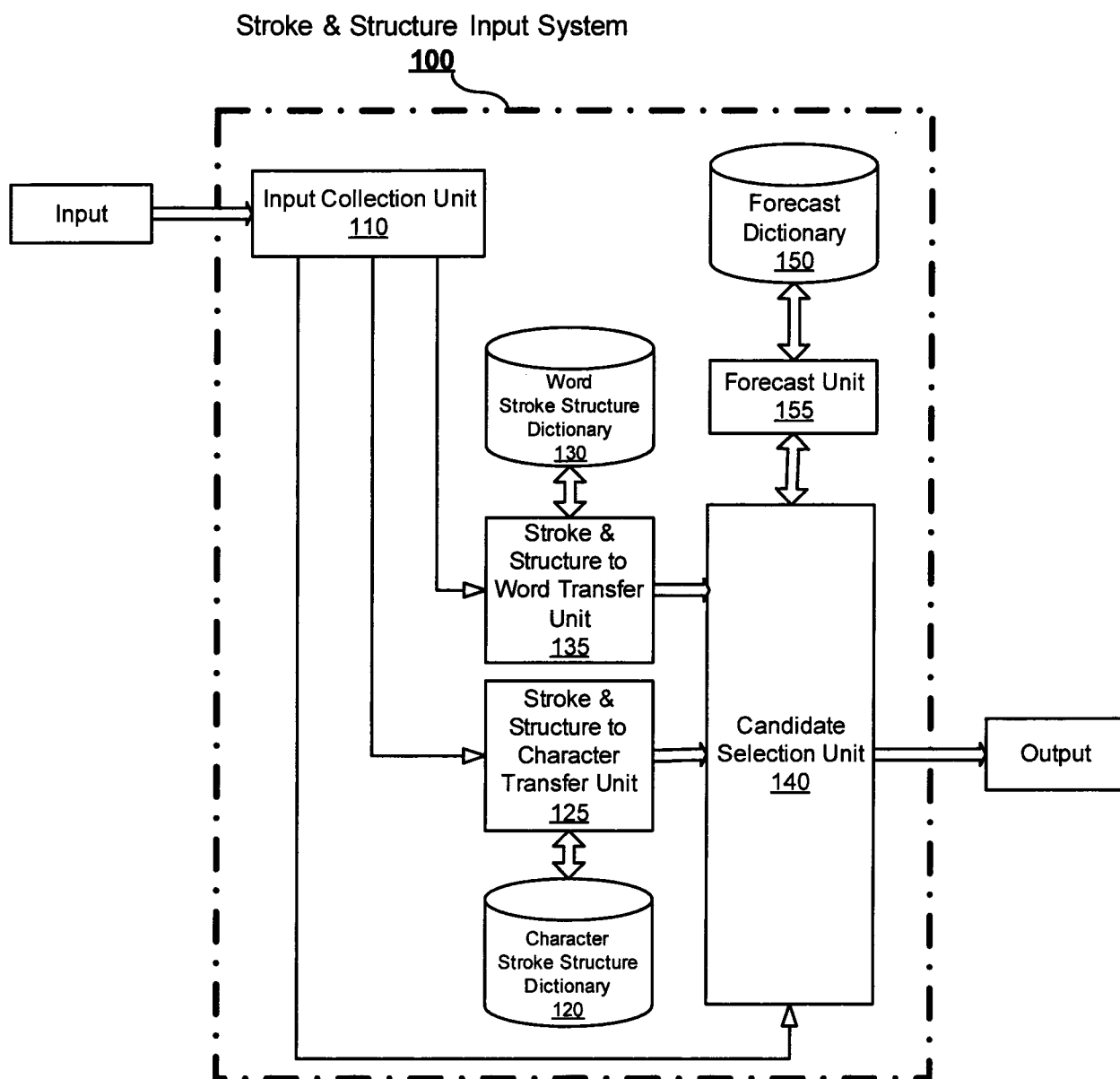
the candidate word, when it is determined based on the input stroke information and/or the structure information that a word is to be input;

when it is determined based on the input selection
5 information that one candidate character or candidate word is to be selected, outputting the selected candidate character or candidate word,

wherein the structure information is used as separators between multiple characters.

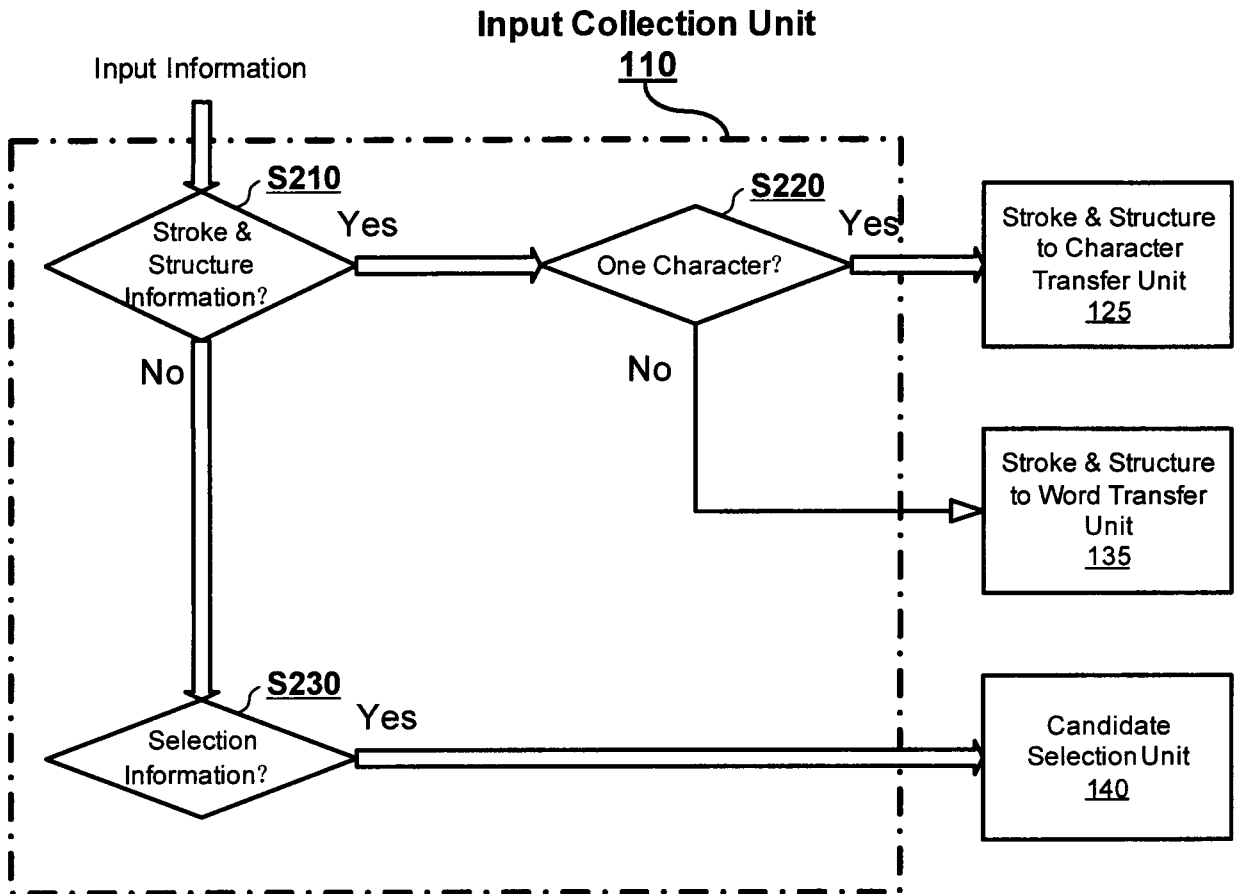
1/15

FIG. 1



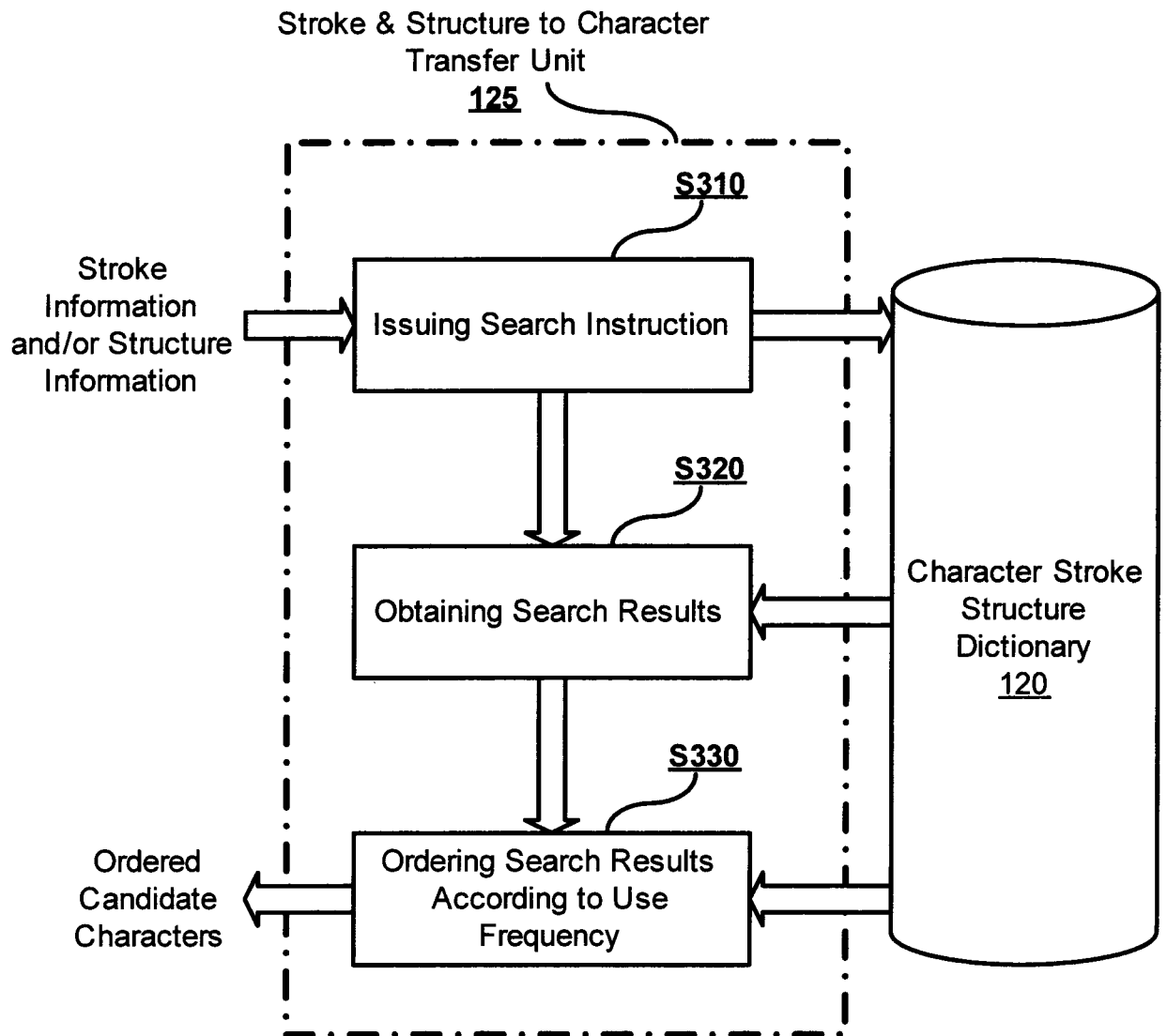
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FIG. 2



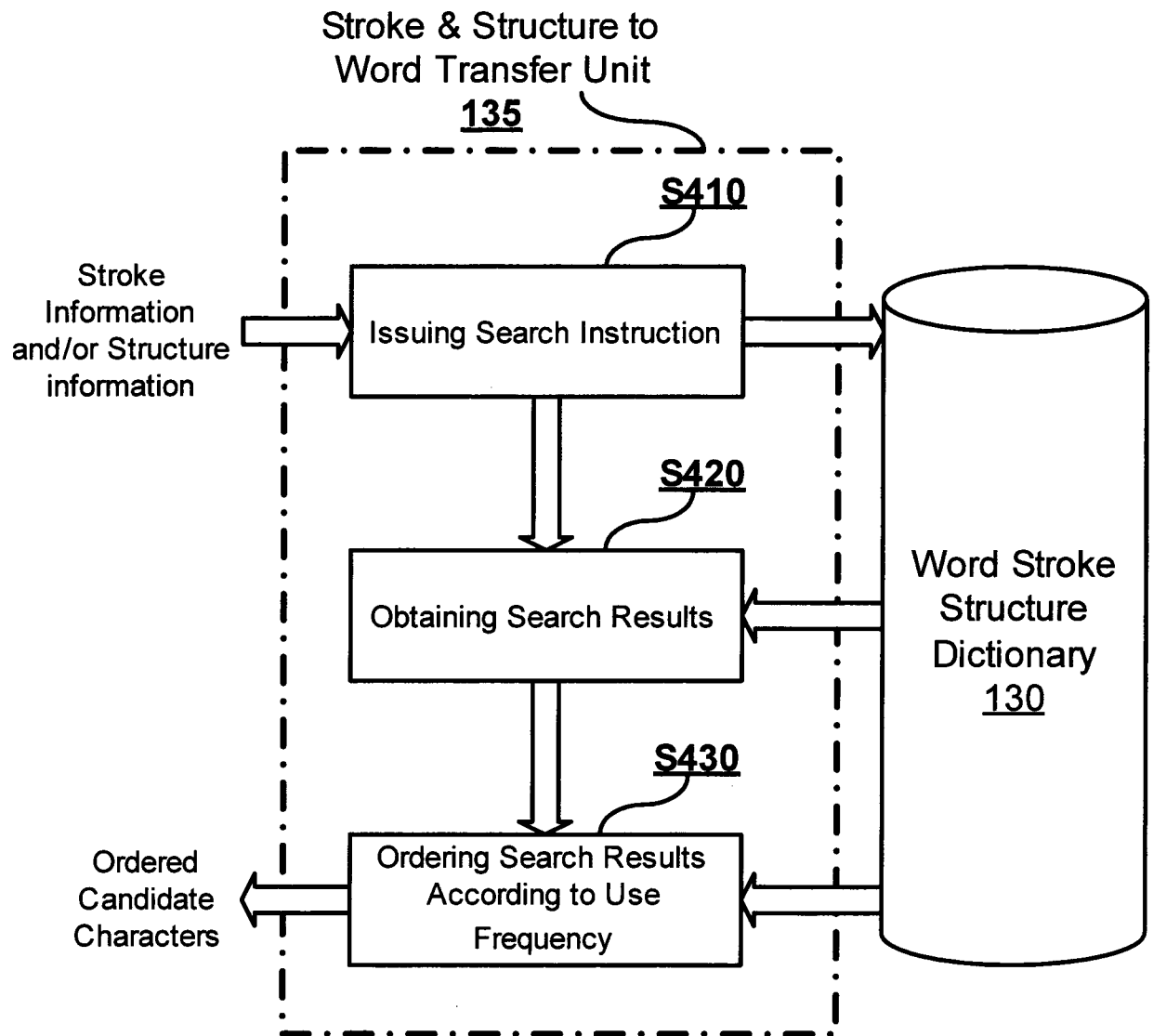
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FIG. 3



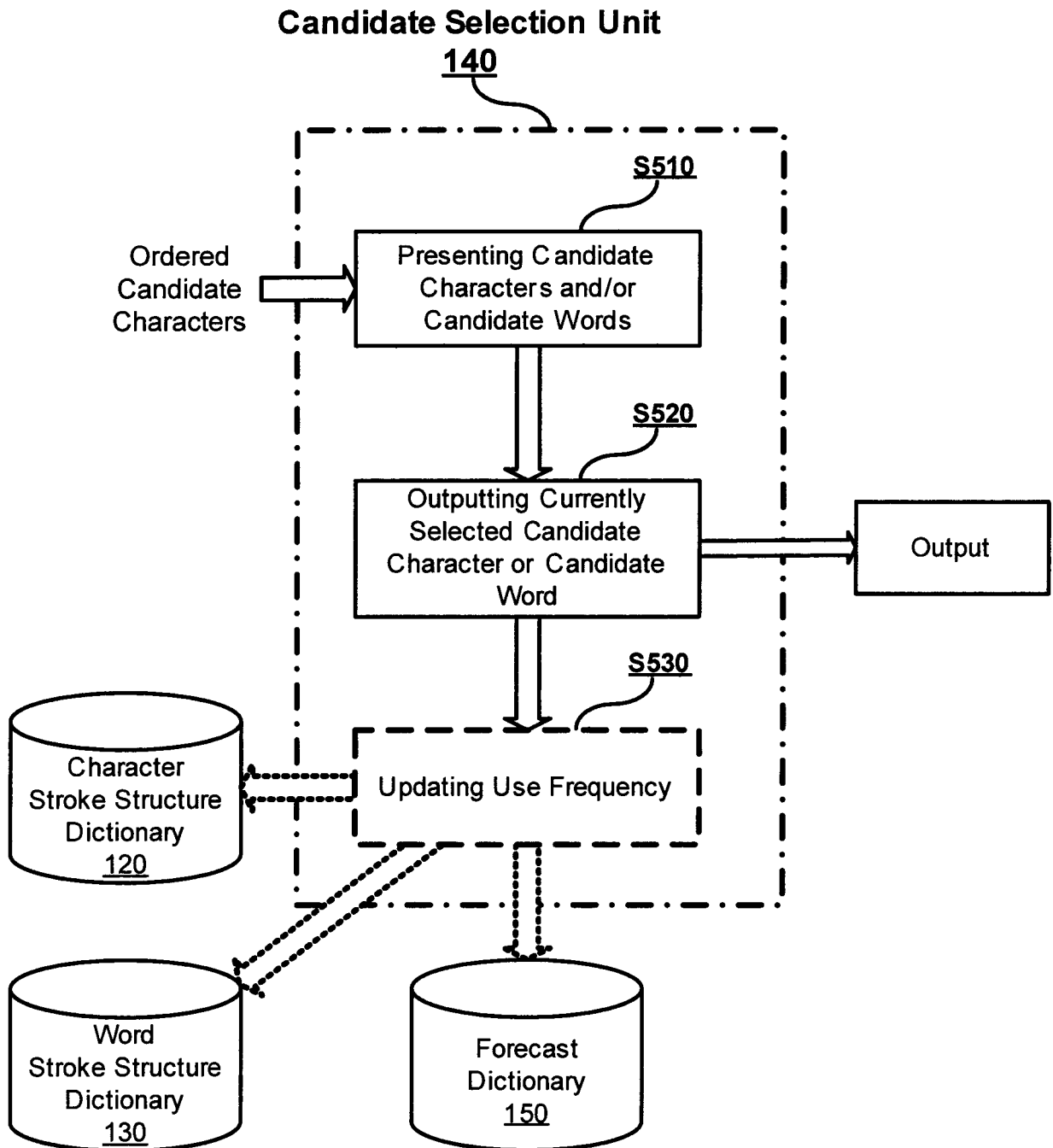
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FIG. 4



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FIG. 5



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FIG. 6

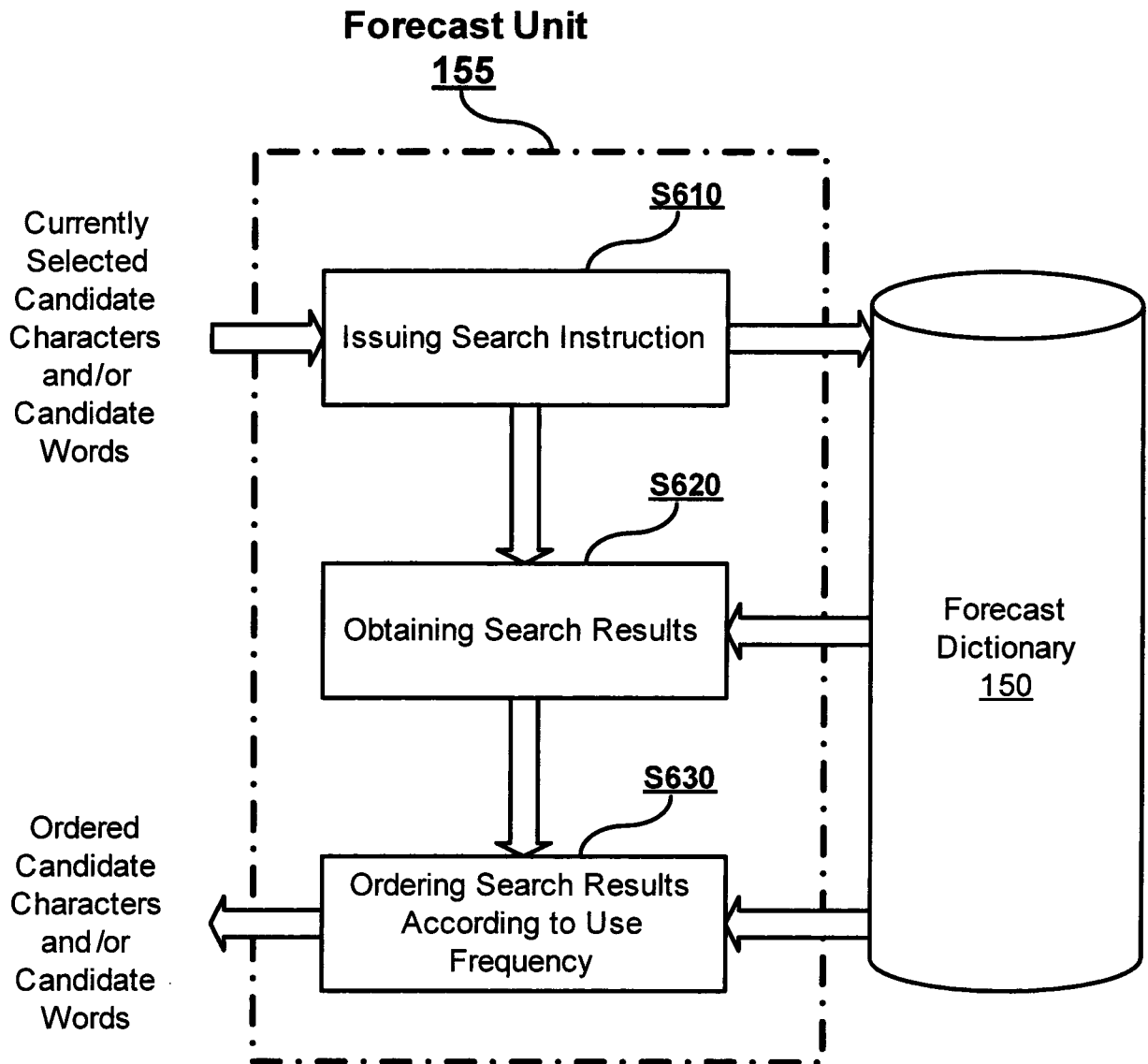


FIG. 7A

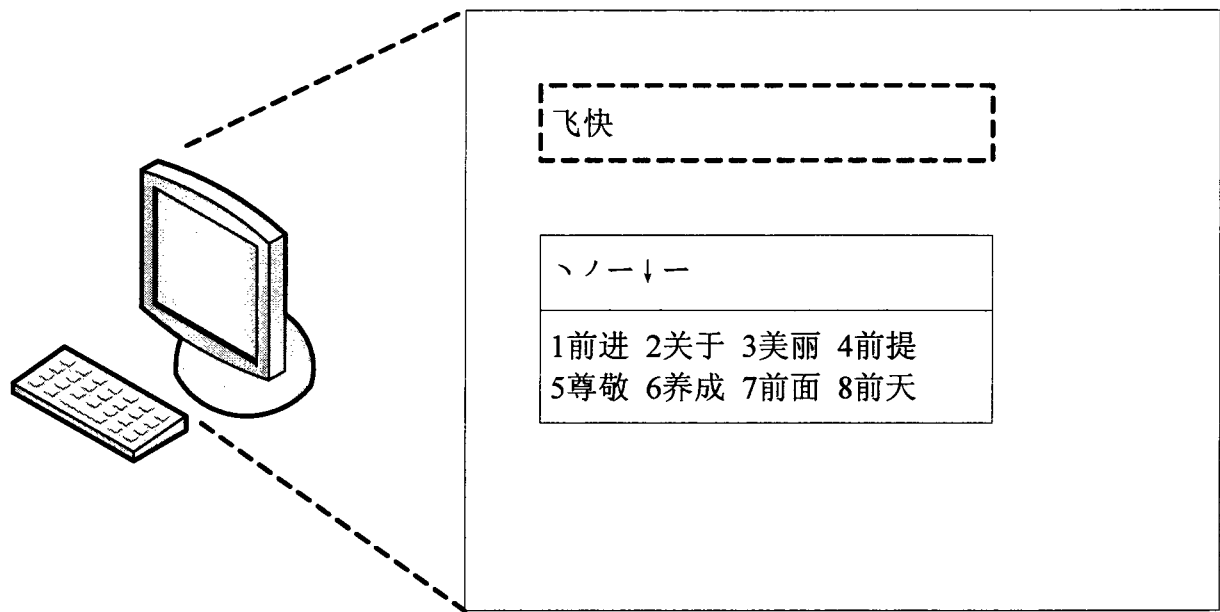


FIG. 7B

Stroke Inputs	Q _—	W	E _]	R _→	T _?	Y	U	I	O
Structure Inputs	A _→	S _↓	D _○	F _◇	G _?	H	J	K	L
	Shift	Z	X	C	V	B	N	M	,
	Ctrl	Alt	Enter					Alt	Ctrl

FIG. 8A

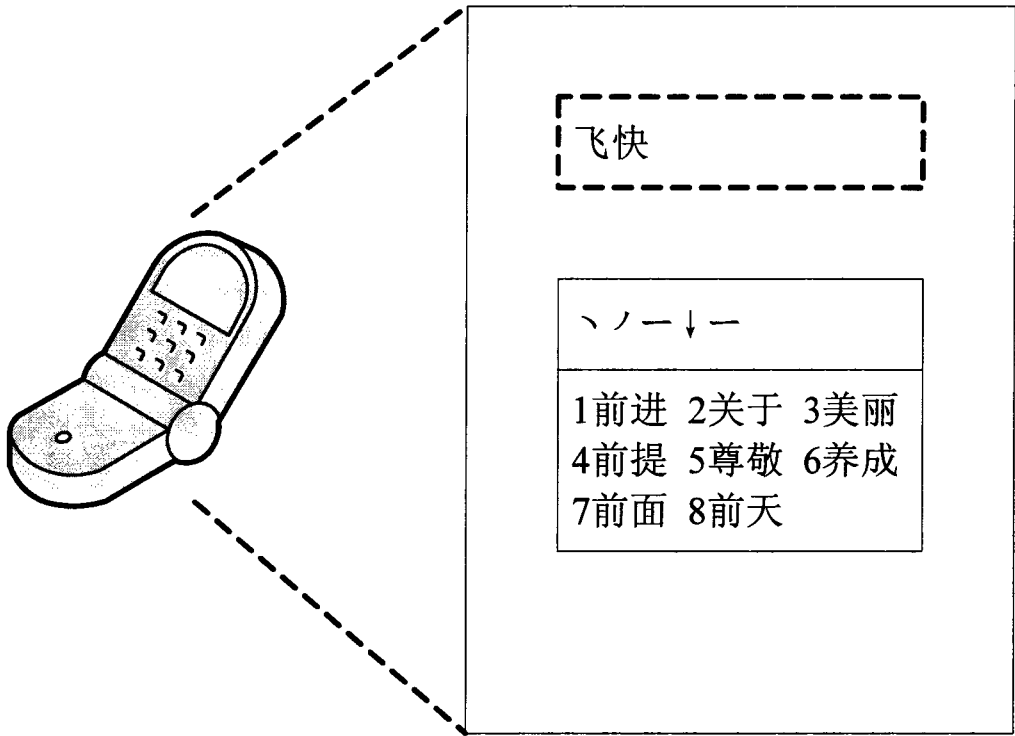
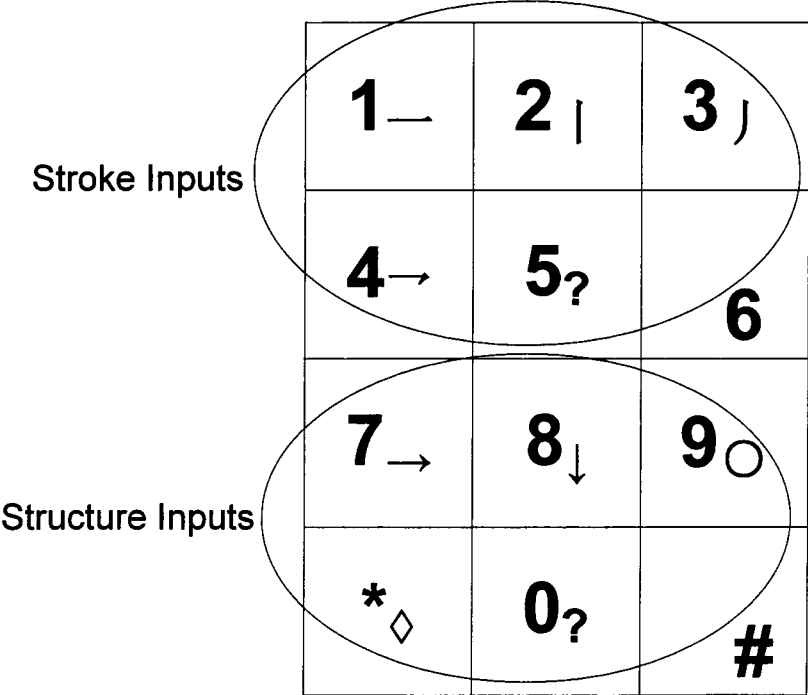


FIG. 8B



F I G. 9

一	丨	丿	→	?
→	↓	○	◇	?
→◇丨				
飞快 也是 力量 马上 随时				

F I G. 1 0 A

Output:	
Input:	→
Selection:	
Candidates:	1 飞 2 了 3 子 4 出 5 也 6 那 7 以 8 对

FIG. 10B

Output:	
Input:	→◇
Selection:	
Candidates:	1 飞 2 也 3 又 4 己 5 已 6 女 7 力 8 马

FIG. 10C

Output:	
Input:	→◇
Selection:	
Candidates:	1 飞快 2 也是 3 力量 4 马上 5 随时 6 刀具

FIG. 10D

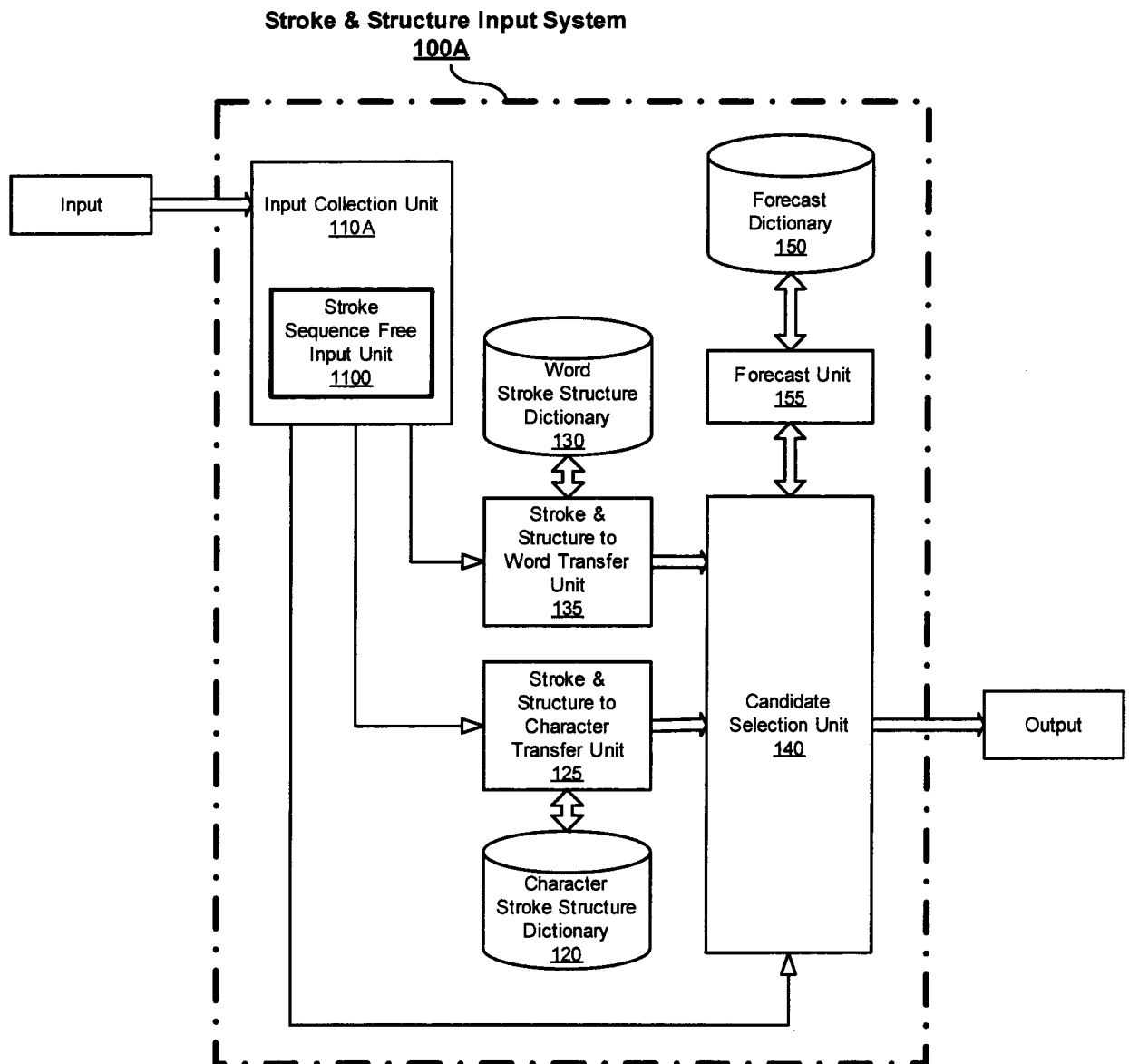
Output:	飞快
Input:	
Selection:	1
Candidates:	1 奔跑 2 前进 3 突破 4 变化

FIG. 10E

Output:	飞快奔跑
Input:	
Selection:	1
Candidates:	1 前进 2 传递

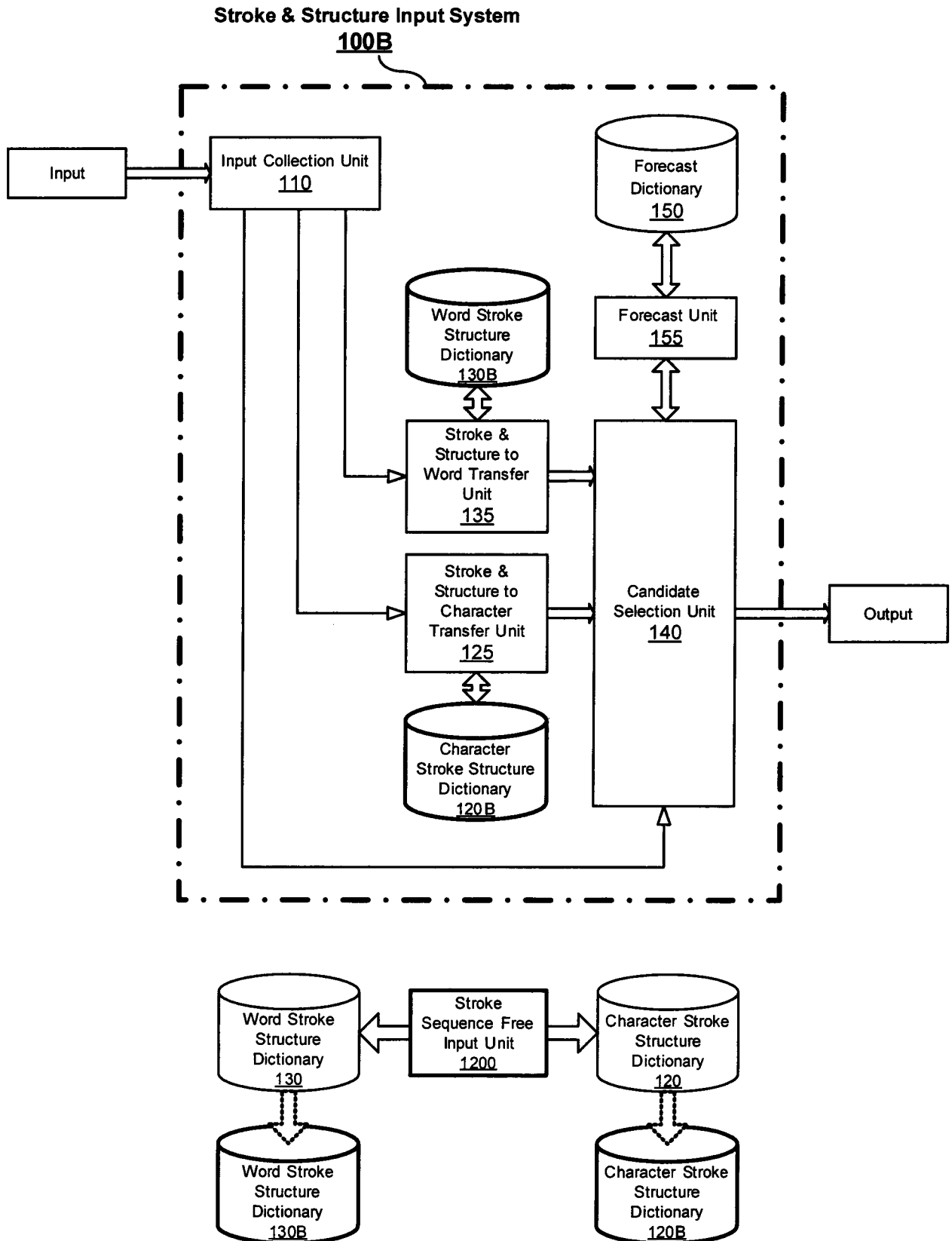
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FIG. 11



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FIG. 12



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FIG. 13A

Output:	力
Input:	ㄣ J
Selection:	1
Candidates:	1 力 2 她 3 好 4 发 5 如 6 女

FIG. 13B

Output:	
Input:	J ㄣ
Selection:	
Candidates:	1 么 2 多 3 然 4 用 5 外 6 月

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FIG. 13C

Output:	力
Input:	丿 一
Selection:	1
Candidates:	1 力 2 么 3 多 4 她 5 好 6 用

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/067383

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. G06F17/22 (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)

Int.Cl. G06F17/22

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

Published examined utility model applications of Japan 1922-1996
 Published unexamined utility model applications of Japan 1971-2011
 Registered utility model specifications of Japan 1996-2011
 Published registered utility model applications of Japan 1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2004-213594 A (TIMESPACE SYSTEM CO LTD) 2004.07.29, paragraph 【0016】 - 【0020】, paragraph	1, 5-7, 11-14
Y	【0027】 - 【0039】 , Fig.1-15 & CN 1515985 A	2-4, 8-10
Y	JP 10-269210 A (SHARP KK) 1998.10.09, paragraph 【0031】 , 【0040】 - 【0043】 (No Family)	2, 8
Y	JP 2005-508031 A (AMERICA ONLINE INC) 2005.03.24, paragraph 【0031】 - 【0034】 & WO 2003021788 A2 & EP 1421696 A2 & US 2004239534 A1 & CN 1550069 A & KR 2004053116 A	3, 4, 9, 10



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

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“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

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“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

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