

# The Floating of Negative Factors and the Recognition of Semantic Patterns of *HUAIYI* Sentences in Mandarin

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## Abstract

Negative factors and their floating are the semantic marks of objective identification of the meaning of *huaiyi* and sub-categorization of sentence patterns of the *huaiyi* sentences. This article discusses negative factors, the floating of negative factors and recognition of different patterns of *huaiyi* sentences. It has also been argued that there is an operational mark of syntactic-semantic generalization which functions to identify the semantic patterns of sentences, and demonstrated the nature and use of this kind of mark. We argue that more reliable connection can be established between human beings and computers. Some related theoretical and methodological issues are also addressed in this article.

## 1 Introduction

**1.1** The usual method of natural language understanding is from form to meaning or meaning to meaning. In some language with developed-forms, different semantic patterns can be distinguished by different forms (inflections). Form is the natural formal mark of semantic understanding of sentences. However, semantic patterns are various, it's impossible for any language to have enough forms to mark all its semantic patterns. Thus it's important to explore the combined-marks of forms and form-meaning synthesis marks in our study.

**1.2** In the viewpoint of philosophy, generality is the abstraction of individual on one hand, individual reflects generality on the other hand. So, from generality to individual or from individual to individual are two feasible ways of exploring combined-marks of forms and form-meaning synthetic- marks. This article adopts the latter. Based on the exploration of form-meaning synthetic- marks and recognition program of semantic patterns of *huaiyi* sentences, this paper tries to build a bridge, which is friendly to people as well as to computer in the process of semantic understanding.

**1.3** Semantic recognition includes sentence meaning recognition and semantic patterns recognition. The semantic understanding of a sentences lies on the accomplishment of these two sides. However, in the our viewpoint, we can only solve one problem. This paper discusses the semantic patterns recognition of *huaiyi*

sentence and the relative theoretical issues.

## 2 *Huaiyi* Sentence and Its Negative Factors

2.1 *Huaiyi* sentence is the sentence whose predicate or object is *huaiyi*. e.g.

- (1) 他一直怀疑小张。      (2) 这次拿三块金牌，我有些怀疑。  
(3) 我怀疑他是小偷。      (4) 他怀疑这个人有问题。  
(5) 我怀疑我没开口，怎么会有声音的？

Based on our study, the signification of *huaiyi* can be described as follows: *huaiyi*<sub>1</sub>=distrust; *huaiyi*<sub>2</sub>=suspect; *huaiyi*<sub>3</sub>=uncertain, puzzle. Different meanings of *huaiyi* reflect different semantic patterns of *huaiyi* sentences. For example, the meaning of *huaiyi* in e.g. (1) and (2) is *huaiyi*<sub>1</sub>, the corresponding sentences meaning are *He distrusts Xiao zhang all the time* and *I don't believe they can win three gold medal this time*. the meaning of *huaiyi* in e.g. (3) and (4) is *huaiyi*<sub>2</sub>, the corresponding sentences meaning are *I suspect that he is a thief* and *I suspect that this guy is unreliable*. the meaning of *huaiyi* in e.g. (5) is *huaiyi*<sub>3</sub>, the corresponding sentence meaning is *I was puzzled that how can I voice without speaking*

2.2 In this paper, *huaiyi*<sub>123</sub> represents the signification of *huaiyi* which is corresponding to the semantic patterns of *huaiyi* sentences, and these semantic patterns can be marked by  $S_{huaiyi1\ 2\ 3}$  accordingly. As the thinking-judging sentence, different semantic patterns of *huaiyi* sentences represent different semantic function. Based on our research, a conclusion can be made: *huaiyi*<sub>1</sub> is judgmental sentence, *huaiyi*<sub>2</sub> is suspicion sentence, *huaiyi*<sub>3</sub> is inquiry sentence.

$S_{huaiyi\ 1}$  (judgmental sentence) represents that a subject X of thinking forms a judgment on a object Y. Verb *huaiyi* is a judging word or opinion. E.g. (1) reports that *he* distrusts *Xiao zhang*, e.g. (2) reports that *I* don't believe that *they can win three gold medals this time*. *Huaiyi* is the viewpoint of the subject X. Other examples read as follows:

- (6) 打过几次交道以后，我就很怀疑他了。  
(7) “一汽-大众特许销售商” 赫然醒目，玻璃幕墙的销售大厅、230 个工位、温馨的休闲厅等，无法让人怀疑其正规性。  
(8) 诸多的便利让公众不得不对是否能按法律规程办事产生怀疑。

$S_{huaiyi\ 2}$  (suspicion sentence) expresses the conclusion of thinking Y, represents that a subject X of thinking passes a judgment about possibility on a object Y. Verb *huaiyi* has the function of marking the character of conclusion Y, which is a kind of suspicion. In e.g. (3) and (4), Y- *he is a thief* and *this guy is unreliable* are two suspicions of subject marked with *Huaiyi* respectively. Other examples read as follows:

- (9) 我怀疑明天会下雨。  
(10) 五角大楼一直怀疑，包括拉登在内的众多“基地”组织高官，很可能就藏身在上述“无法无天”的部落地区 and 阿富汗境内山区。  
(11) 毫无互联网运营经验的公司，这种高额加盟费用的制定不免让人怀疑有套现的可能。

$S_{huaiyi_3}$ (inquiry sentence) reports question-Y in the form of question, which is inquired by subject X.  
e.g.:

(12) 这么大的暴风雪，我真怀疑你是怎么把车开回来的？

(13) 这两年又买房子又买车，她老爸也怀疑她是哪来的那么多钱呢？

**2.3** No matter what kind of semantic patterns and function the sentence is, the meaning of *huaiyi* sentence involves negative factors or negative semantic elements. The forms and floating of negative factors are influenced by the sentences with different semantic patterns and functions.

Negative factors of judgmental sentence drift into the meaning of verb, which contains negative semantic element *bu*. the sentence meaning indicates negativity of judgment. Such as, e.g. (1),(2),(6),(7),(8) and their verb *huaiyi*.

In typical suspicion sentences, negative factors drift into the conclusion Y whose content is generally derogatory, such as *thief* in e.g. (3), *unreliable* in e.g. (4), *cheat* in e.g. (9), the Y of non-typical suspicion sentences indicates that the result of thinking is opposite to the beginning. For example, the conclusion Y of e.g. (9) *it will rain tomorrow* is the conclusion of thinking, this conclusion is generally contrary to the opposite beginning of thinking, such as *it will be a sunny day tomorrow* or *it will not rain tomorrow*. The beginning of thinking sometimes can be found in the context. E.g. (9) can be analogized by this way.

Negative factors of inquiry sentence drift into the morpheme *yi* of verb, *huaiyi* means uncertainty, Y is the concrete content of question. The question of e.g. (5) is that *how can I voice without speaking?* The question of e.g. (12) is that *how can you drive the car back?* Y of inquiry sentence and the morpheme *yi* have the relationship of mutual explanation: Y is the question of subject of thinking and vice versa.

**2.4** The research findings of semantic patterns, word meaning of verb and negative factors of *huaiyi* can be summarized as follows.

sentences		verb “ <i>huaiyi</i> ”	negative factors	
patterns	function	word meaning	patterns	landing sites of floating
$Shuaiyi_1$	judgment	1. distrust	negativity of viewpoint	holistic word meaning of <i>huaiyi</i>
$Shuaiyi_2$	suspicion	2. suspect	opposition between conclusion and beginning of thinking	Conclusion of thinking (Y)
$Shuaiyi_3$	inquiry	3. uncertain	Uncertainty of conclusion	Meaning of a morpheme <i>yi</i> of verb <i>huaiyi</i>

### 3 Semantic Recognition of *Huaiyi* Sentences

**3.1** There are three semantic patterns of *huaiyi* sentence. Theoretically, the distinctive feature is the sufficient condition of semantic patterns' recognition. Each item of function (a), word meaning (b), patterns of negative factors(c), and position of negative factors (d), as indicated above, can act as the sufficient condition and distinctive feature of semantic patterns recognition of *huaiyi* sentences. In other words, so long as we can find each one of four items, the semantic patterns of *huaiyi* sentences can be recognized. There are

different levels of semantic recognition of sentence. The recognition capacity and sequence of distinctive feature (a, b, c, d) is different at different levels, however, the distinctive feature of recognition should be examined by speech and demonstrated by theory.

**3.2** In the field of sentence pattern analysis of linguistic theory study, the capacity of four features (a, b, c, d) are equal, disordered and optional for recognizing the sentence pattern of *huaiyi* sentence, however, that does not mean that the function of each feature for explaining system is different.

For instance, *huaiyi* is a thinking verb, which belongs to the same word family as the words *renwei*, *guji*, *caice*, *juede*.<sup>i</sup> In the family of thinking verbs, “*huaiyi*” which has negative factors is opposite to other thinking verbs without negative factors at meaning. Thus as the distinctive feature of *huaiyi* sentence pattern, an important function of negative factors (c, d) is to distinguish *huaiyi* sentences from non-*huaiyi* sentences. In comparison with negative factors, other features (a, b) don't possess the function of distinguish upper-patterns.

In this paper, the classification and explanation of meaning of *huaiyi* is differ from any dictionary in hand. By demonstrating the correspondence of negative factors patterns (c) and its drift (d), and examining the fact of language, we divide the meanings of *huaiyi* into three items and describe it so. From the research of recognizing wording meaning, we conclude that don't take it for granted that the word meaning of a authoritative dictionary can be used directly for natural language processing. In fact, lexical items in most of these dictionaries are neither exhaustive nor objective. They are provided quite randomly.

**3.3** In speech communication, function (a) is the fundamental basis for recognizing the semantic category of sentences. In oral speaking, people's understanding of sentences is generally from the language's function, and this is subconscious. When we use sentence *huaiyi*, we will not understand the word meaning of *huaiyi* first, but recognize the semantic patterns through the contradiction and difference between the three functions of *huaiyi* sentence, and then we could understand the meaning of whole sentence, although the recognition of semantic pattern is greatly assisted by context. For instance, hearing the sentence 他虽然对小王委以重任, 但又一直怀疑他的可靠性, firstly the listener senses that *he* has the negative viewpoint or attitude on *Xiao wang*, so the sentence can be determined as judgment sentence. Secondly, by concretizing the negative viewpoint into *distrust* or *disbelieve*, the listener enters the stage of determining the verb meaning. Another instance, hearing the sentence 我怀疑明天会下雨, the listener senses that the speaker expresses a judgment firstly, which is a suspicion marked by *huaiyi*, then enters the stage of determining the verb meaning *huaiyi*=suspicion. In the same way, the listener senses that the object of *huaiyi* is the content of inquiry when hearing the sentence 我真怀疑当时是怎么撑下来的. The word meaning of *huaiyi* can be recognized subsequently. In a word, speech understanding and semantic recognition in people's language communication is from the determination of sentence function to the recognition of meaning of verb. In other words, we recognize the semantic pattern of *huaiyi* sentences by its function, not by the meaning of *huaiyi*, which is not the fundamental basis of semantic recognition in speech communication.<sup>ii</sup>

**3.4** In the automatic recognition, the meaning of *huaiyi* (b distinctive feature) is the foundation and has the central function. But the use of this feature can work with help of linguistic forms.

The recognition of sentence's semantic pattern is generally called artificial intelligence. But now the machine does not have the ability like people to recognize sentence directly by function (a), machine must be transitioned to function (a) recognition by form, and then realize the recognition of sentence's semantic pattern. Artificial intelligence can not totally imitate the human beings' process and ways. The most

important principle of artificial intelligence should get the same result as human work by the most feasible methods. According to this, as to the semantic recognition of sentence *huaiyi*, the most realistic and feasible method is not the transition from form to the recognition of sentence pattern of a, or c, d, but the transition from form to the recognition of b. In another word, through language form as the media to the recognition of b: the recognition of words' meaning, then we can reach this recognition way of "language form as media first, then word meaning feature orientation", which is the most convenient and feasible way. And this way is friendly both for machine and people ( the second language learners and the language researchers) (Please see Section 4) .

#### 4 Mark Categories for Automatic Recognition and Procedure Manifestation of *Huaiyi* Sentence

4.1 Logically speaking, some sufficient conditions or distinguishing features are provided in a single form. For instance, "words that can be adverbial are adverbs" in English; and some sufficient conditions or distinguishing features are complex, such as, the sufficient condition of judging the Chinese adverb is formed by two conditions: (I) can be adverbial, (II) can only be adverbial. It is not optional of whether it is to use a single or complex condition for the judgment of an object, and it is decided by the feature and nature of the object. Besides adverb, adjective and noun in Chinese can also be adverbial, so its sufficient condition must be the synthesis of several conditions. <sup>iii</sup>The conditions used by machine to recognize the pattern of sentence *huaiyi* in this article is complex conditions.

Single sufficient condition is more economical and terse than the complex conditions. And it may be the human nature to like and pursue the economy. In the long river of the human recognition, the recognition of single sufficient condition is far earlier than the recognition of the complex condition, and it is also to the study of a specific single sufficient pattern condition and distinguishing feature. For example, Li Xingya in his *The meanings of huaiyi and object pattern* (1987) argues that when there is nominal object or not object after *huaiyi*, the meaning of word *huaiyi* is distrust, for example, 我怀疑他 | 我对他的可靠性表示怀疑; when there is predicative object, the meaning of *huaiyi* is suspect, for example, 我怀疑他就是小偷. It is not difficult to find from it that f Mr. Li's foundation of the judgment and recognition of the word meaning of *huaiyi* is a kind of single sufficient condition. However, this kind of single sufficient condition can not explain all the meanings of *huaiyi* in the sentence *huaiyi*, so in his paper *remark on meanings of huaiyi* (1988) , Li Yunxi makes some addition to Li Xingya and points out: when there is predicative object and there is no negative word before *huaiyi*, the meaning of *huaiyi* is suspect; when there is negative words before *huaiyi* , that is to say it has predicative object, the meaning of *huaiyi* is distrust. For example, 我不怀疑这篇文章是他写的. From the judgmental condition or distinguishing feature, the addition of Li Yunxi is putting the single sufficient condition of the recognition and judgment of *huaiyi* to the complex sufficient condition. The promotion from single condition to complex condition is the process by using synchronous elements '(object or other parts) the grammar form or nature to recognize the meaning of *huaiyi*. It makes another step toward the full understanding of language facts. The complex condition for recognition of *huaiyi* 's meaning used in this article makes a further step based on them (Please see Section 4.2 for more details).

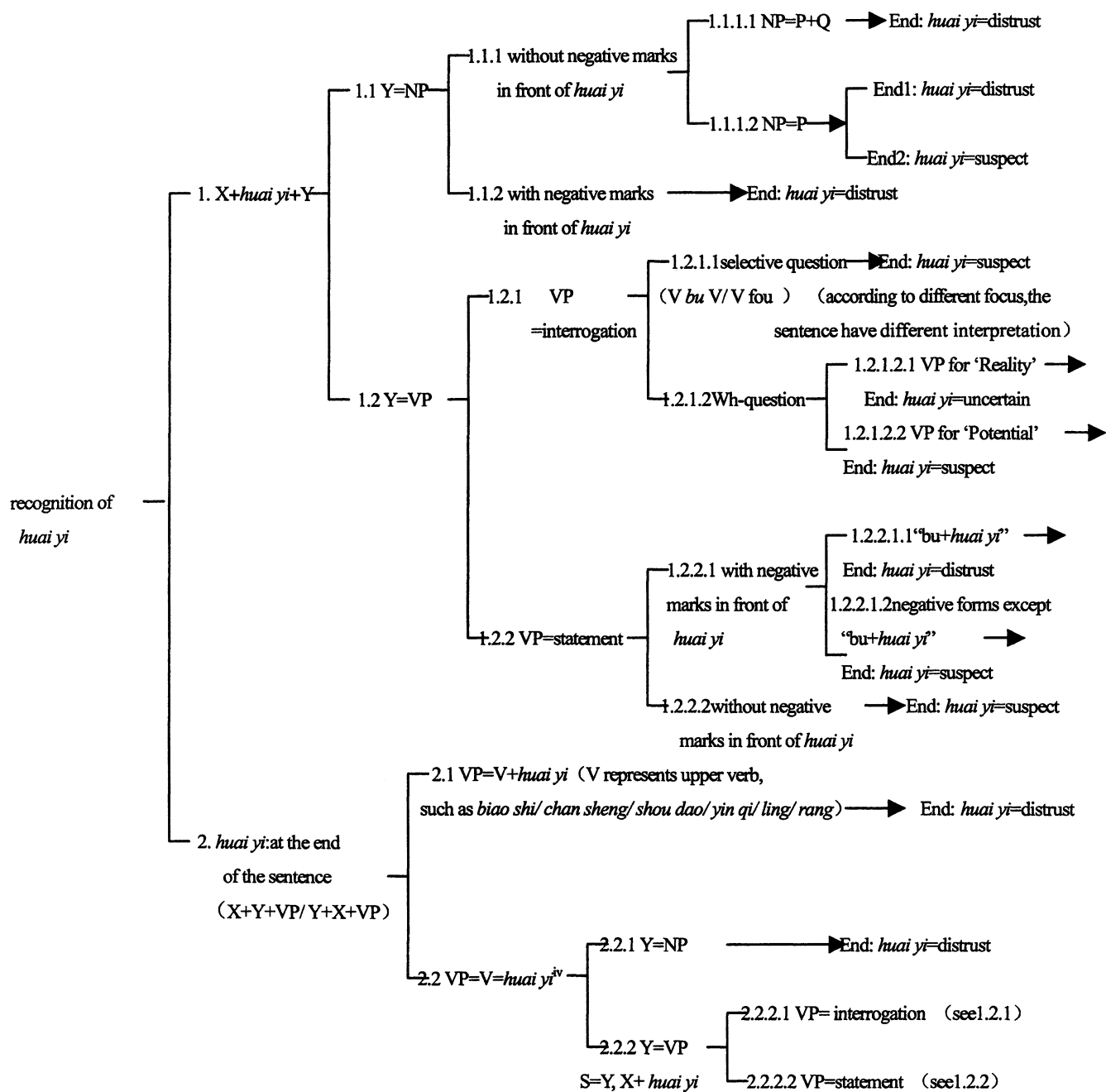
The using of complex condition or distinguishing feature should have extensive future. In order for indication and appellation , we name the condition formed by form and form "language form combination condition", and name the condition formed by semantics (including function) "semantic combination condition", and name the condition formed by and semantics "synthesis condition" or "form-semantic

synthesis condition". The language form media in broad sense includes negative words and the grammar nature of words. The pattern media used in the pattern recognition of sentence *huaiyi* in this article is the combination condition formed by language form in broad sense. There are two steps: one is using language form to determine the word meaning; the other one is using word meaning to determine sentence pattern, and if we combine these two steps, that is "form-meaning synthesis condition" used in this article.

In theory, whether the single sufficient condition or complex sufficient condition, only this condition becomes a distinguishing tool, it is a mark. Conversely, mark is a kind of sufficient condition, no matter it is single or complex. So, the "form-meaning synthesis condition" we used to recognize the pattern of sentence *huaiyi* is "form-meaning synthesis mark". we used to recognize the category of sentence *huaiyi* is "form-meaning synthesis mark". And its language form composed by many forms condition is called "language form combination mark". In this meaning, the machine recognition of a natural language, there are two parts before its machine research: (1) the construction of recognition marks, (2) the design and manifestation of recognition marks' programming.

**4.2** The sentence pattern recognition of sentence *huaiyi* by machine is using the "synthesis marks of form-semantic", and its recognition process is formed by two parts: (1) guarantee the work meaning of *huaiyi* by language form mark to recognize the process; (2) determine the sentence pattern by the word meaning of *huaiyi*. By now, this can be the end of the recognition of sentence pattern. But, the scientific and ideal language recognition should be like the mathematical calculation, there should be a verification after the recognition. Based on this, the recognition of sentence pattern of the sentence *huaiyi* should have the third step: (3) the recognition verifying of sentence pattern.

During the three steps we have in the machine recognition of sentence *huaiyi*., the first step is the crux to realize the machine recognition and verify the feasibility of its recognition. In order to show its feasibility, we make the following process structure tree. Every end of the branch of the tree marks the meaning of word *huaiyi*. On the structure tree, the thinking part (the person who suspect) is still marked as X, object is marked as Y, and Y is also can be divided as object P and content Q. Besides, NP represents substantival structure, and VP represents predictive structure (including subject- predicative structure); "/" means "or". The language examples are listed as follows.



The operation of recognizing the word meaning of *huaiyi* is: from the left to the right until the end of the above structure tree. For example: the sentence “我一直怀疑他的可靠性”, the *huaiyi* is in the middle of XY, so up the branch of the structure tree to [1]; because Y is NP, up the branch to [1.1]; because there is no negative word, so up the branch to [1.1.1]; because its Y is formed by the suspect object P(him) and the suspect content Q(reliability), so once more up the branch to [1.1.1.1], and to the end. The word meaning of *huaiyi* is “distrust”. Other examples are like so.

The following is the explanation of every end of branch of the structure tree and its corresponding language example, except [1.1.1.1].

[1.1.1.2] 他挺怀疑小张。 (*huaiyi* =suspect)

Because Y (xiao zhang) has two understanding, so there can be two understanding of this example. 1. Y = NP(object/ object + content), for example, 别看他对小张用得挺多, 其实他挺怀疑小张; 2. Y = NP + VP, for example, 单位电脑被盗了, 他挺怀疑小张的。

[1.1.2] 我们并不怀疑他的可靠性。/ 我们并没有怀疑他。(huaiyi =distrust)

[1.2.1.1] 我怀疑他是不是生病了? = A.我猜测他是生病了。(huaiyi =suspect)

= B.我猜测他不是生病了。(huaiyi =suspect)

It is just the focus difference of A and B. if the sentence is the oral form, the focus can be manifested by pronunciation, and the different interpretation is generally not existing; in written language, we need the context to understanding the sentence.

[1.2.1.2.1] 这么难的题目, 我怀疑你怎么做出来的? (Y=VP, is existing state, huaiyi =uncertain)

[1.2.1.2.2] 这么难的题目, 我怀疑你怎么做得出来? (Y=VP, is not existing state, huaiyi =suspect, Y is rhetorical sentence =-Y 陈述句)

[1.2.2.1.1] 我们并不怀疑你具有很强的工作能力。(huaiyi =distrust)

[1.2.2.1.2] 我们没怀疑你是小偷。/ 没有人怀疑你是小偷。/ 我们不能不怀疑你是小偷。(huaiyi =suspect)

[1.2.2.2] 我怀疑他不能胜任这项工作。(huaiyi =suspect)

[2.1] 他的工作能力, 我表示怀疑。(huaiyi =distrust)

[2.2.1] 他的工作能力, 我很怀疑。(huaiyi =distrust)

[2.2.2] Its examples are all can be formed by inversion of the examples of 1.2.

4.3 The procedure of language handling is sometimes the procedure of nothing and to solve all the problems from the beginning to the purpose. Some handling procedure is the extensive procedure based by other procedures, and this procedure is just a process of many ones of the whole language handling. The procedure of this article belongs to the latter, and it is the extensive procedure of the existing (supposing it is existing) basic procedure. Therefore, when we recognize the semantic pattern of sentence *huaiyi*, only the meaning of word *huaiyi* is certain, the semantic pattern of this sentence is clear. Because from the word meaning we give, any semantic pattern ( $S_{huaiyi 1}$ ) of a *huaiyi* sentence can be expressed as a function based by the meaning of word *huaiyi*.

$$S_{huaiyi x} = X \quad huaiyi \quad x \quad Y$$

More specifically,

When the meaning of *huaiyi* is “distrust”, the sentence is  $S_{huaiyi 1}$  (judgment)

When the meaning of *huaiyi* is “suspect”, the sentence is  $S_{huaiyi 2}$  (suspicion)

When the meaning of *huaiyi* is “uncertain”, the sentence is  $S_{huaiyi 3}$  (inquiry)

4.4 Recognition verifying is the ideal state we are pursuing. In mathematical calculation, addition is generally verified by subtraction, and multiplication by division. But these two ways are contrary calculation to each other at the same level: addition and subtraction are of the same level, and so are the multiplication and division. But in fact the more reliable calculation may be the calculation of different levels: addition is verified by multiplication, and multiplication is verified by addition. From this perspective, we can verify the



*huaiyi* sentence by using the negative factors. Due to the nature and scope of this article, the technical details are not included here.

The exclusion of the technical details, however, does not affect the important issue that we have brought up and discussed in this article. Our point is that the exploration and use of combination marks and synthesis marks may be a worth-studying approach to recognize the meaning of sentences. The verifying of the semantic factors, which has the function of distinguishing upper-down patterns, is perhaps another important method to ensure that sentence recognition can be done scientifically.

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<sup>i</sup> The word meaning of *huai yi* can be described: “ren wei”+X, X is different, and the word meaning of *huai yi* is different.

<sup>ii</sup> In oral language , the focus of sentence usually has some certain stress marksman . and this marks sometimes have the function of suggestion and extraction for the recognition of sentence pattern . some sentence *huai yi* are ambiguous, but the focus marks can distinguish this ambiguity . (refer to 4.2)。

<sup>iii</sup> sometimes the single condition and comprehensive condition look like a expression problem , for example , the judgment condition of Chinese adverb can be expressed as (II) “can only be adverbial ”. in fact , the expression on (II) is presupposed (I) “can be adverbial ”. we have adopted Mr. Xing Fuyi’s viewpoint: express this feature of Chinese adverb as “pure adverbial”, but it’s just a different expression and can not change the comprehensive feature of condition construction.

<sup>iv</sup> [2.2] is inversion of [1].

<sup>v</sup> In order to make difference with the symbol in the article, the numbers in the structure tree are in the square brackets.

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