Revista de Psicología del Deporte/Journal of Sport Psychology Vol. 30. n.°3. 2021. pp. 276-284
Universidad de Almería / Universitat Autónoma de Barcelona. ISSN 1132–239X ISSNe 1988–5636

Research on extracting mental lexicon from legal cases of players based on text features

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Abstract
Mental lexicon extraction has important theoretical and practical significance in legal case judgment; however, mental lexicon cannot be extracted in time and effectively. Therefore, this paper puts forward the research on the extraction method of mental lexicon in legal cases of players based on text features. In terms of extraction factors of mental lexicon in legal cases of players, quantity and quality are the two most important factors, and form an important reference for mental lexicon recognition. Therefore, it should be combined with text features to identify and extract mental lexicon frequency, and the extraction process is described in detail in this paper by using pattern recognition theory. The psychological test is applied to test the biological reaction of the suspect to determine and judge the relationship between the suspect and the case to ensure the accuracy of the case.
Keywords: player's psychology, text features; legal cases; mental lexicon, criminal psychology, players

Introduction

Usually, legal cases of players often leave behind a lasting impression on the parties. This impression is the result of specific psychological activities, which can be called criminal psychological traces. It is an objective existence based on criminal psychological traces(Párraga-Valle, García-Bermúdez, Rojas, Torres-Morán, & Simón-Cuevas, 2020). The extraction of mental lexicon in legal cases can effectively identify abnormal psychology in players, and provide reference for the judgment of legal cases of players. In legal cases, mental lexicon extraction technology mainly rejuvenates the specific psychological activities of the criminal subject through relevant language stimulation, images and sounds, and by extracting relevant psychological activity information through the mental lexicon extraction recognition. This is done to determine whether the criminal subject is related to the case or not (Raza et al., 2018). The most basic function of mental lexicon extraction technology in legal cases is to make mental lexicon in legal cases have specific meaning through a reference to situations, norms and other methods, and connect it with individual criminal cases (that is, specific events). This is done to examine subjects' psychological and physiological responses to psychological lexical stimuli in legal cases and infer the relationship between subjects and a specific event. The subject's response to verbal stimuli is a complex physiological and psychological process (Medikonda & Madasu, 2018). The psychological reaction of the researcher to the language stimulus is the process of the development of the researcher's understanding of the language. It is an important part of criminal investigation in China (Bollegala, Atanasov, Maehara, & Kawarabayashi, 2018). In the process of interpreting, the surface psychological structure is seen as the deepest psychological structure. Understanding these factors can help criminal psychological tester master the basic principles of problem speech, pretest dialogue and posttest inquiry effect, with a view to improving the reliability and validity of legal case judgment (Khurana, Kumar, Saini, & Roy, 2018).

Mental lexicon extraction in legal cases of players

Recognition of psychological lexical features in legal cases of players

In the research of mental lexicon extraction in legal cases, subjects are affected by non-verbal factors, such as pronunciation, vocabulary, grammar, rhetoric, and crime-related or unrelated psychological factors, which will produce a certain reaction (Zhang, Yan, Wang, & Zhao, 2019). The cognitive process of mental lexicon in legal cases is the process of the brain recognizing the words input by auditory organs, as well as the characteristics of mental lexicon in legal cases. The corresponding reaction is activated in the dictionary (Wu, Li, Wu, & Chang, 2020). The content of mental lexicon is not fixed as different words have different meanings, and even different pronunciation can affect the effect of feature recognition. Different individuals have different mental lexicon, and the same individual is different in different periods (Alonso Martin, Malfaz, Castro-González, Castillo, & Salichs, 2020). The recognition of psychological lexical features in legal cases should be targeted so that examinees can naturally and quickly receive information, stimulate the suspects in the case, and ensure the consistency of legal case identification (Raza et al., 2018). In order to

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ensure the research effect, the recognition method of mental lexicon in legal cases is optimized as follows (Sahoo, Ari, & Ghosh, 2018):

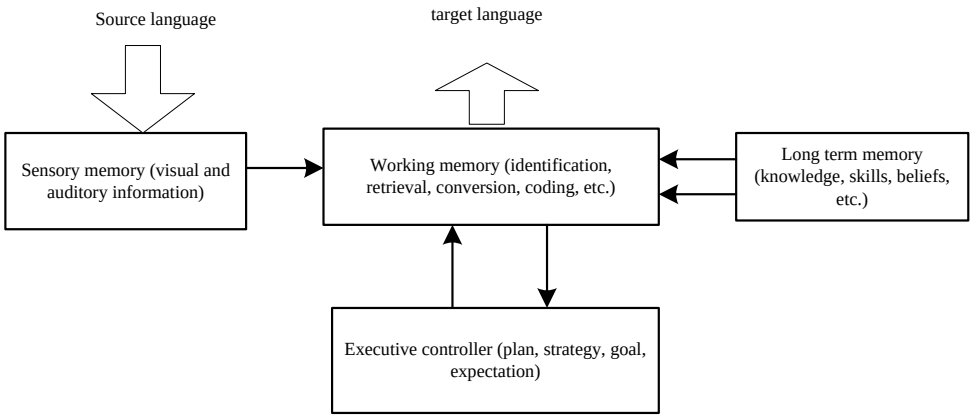

Figure 1. Recognition of mental lexicon in legal cases

Based on the context environment, mental lexicon can be better identified, and fuzzy words can be judged, to ensure that the vocabulary phoneme is clear and the knowledge of word meaning is reliable. In the case of the mind, the words usually have complex meanings (Guo, Zhang, Ye, Li, & Zhang, 2020). If you only understand one meaning of a word, but you cannot choose the meaning it wants to express, or have the option choose more than one meaning, the recognition and understanding of psychological words in legal cases will encounter great obstacles (Parimbelli et al., 2018). Therefore, in the process of criminal mental lexicon extraction and recognition, the higher a person's education level is, the stronger his understanding ability is, and therefore, the easier the criminal psychological and physiological reaction is to be stimulated, and the more effective the mental lexicon stimulation is (Zhu, Y., & Talha, M. 2021). At present, only a small part of the word meaning is grasped in the process of identifying the characteristics of mental words in legal cases, while the understanding of the variation and change of word meaning depends on the knowledge of context (N. A. Khan, Shafi, & Ahangar, 2018). This is because vocabulary understanding is not only to understand meaning, but also a positive process. This process is often different in different stages of cognitive development (U. A. Khan et al., 2020). Sign language and pictures should be chosen as the purpose stimulus in the criminal psychological test of deaf patients (Li, Zhang, Ye, Guo, & Fang, 2019). This type emphasizes the generation of source language information in semantic representation, that is, the generation of a "nonlinguistic" state of semantic concept. Based on this, the semantic representation extraction and recognition model of mental lexicon is constructed (Chen, J., & Talha, M.2021).

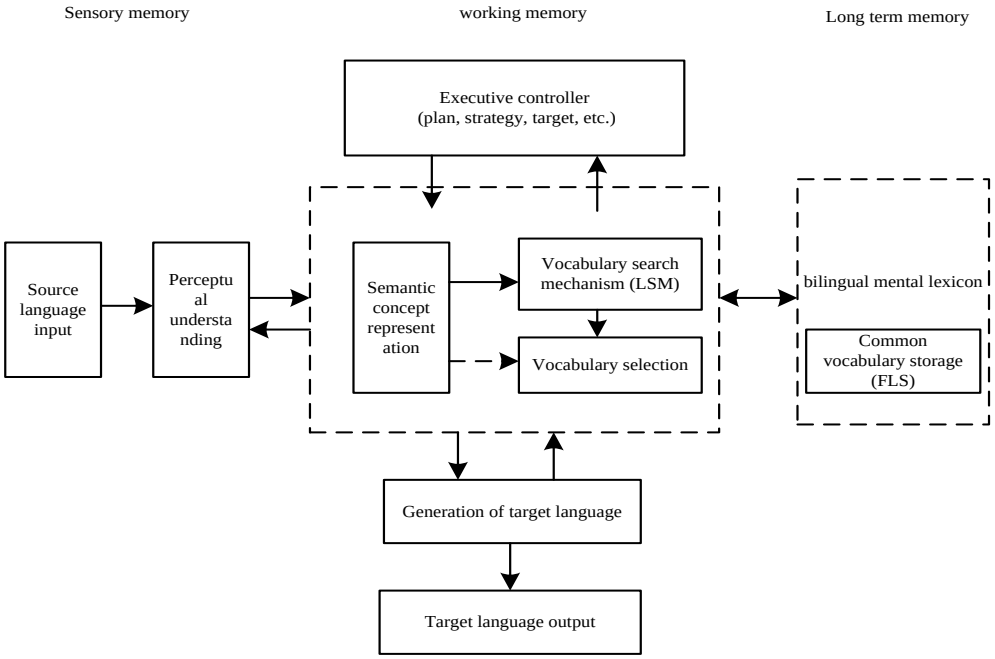

Figure 2. mental lexicon semantic representation extraction and recognition model

The cognitive process of mental lexicon includes two complementary processes, mainly the adaptation and assimilation of mental lexicon (Castro & Stella, 2019). Adaptation refers to the absorption of new experience into the existing knowledge structure, while assimilation refers to the reconstruction of the new knowledge structure. Based on the content of contacting and understanding the mental lexicon, the foreign language signal in the speech comprehension test in the process of mental vocabulary extraction and recognition is a new content, which is the initial experience of the subjects on language and cultural knowledge (Otmani, Si-Mohammed, Comparot, & Charrel, 2018). In order to accurately understand the meaning of psychological words, the subjects must consciously use language knowledge, such as crime scenes, because the subjects' criminal experience has been well-mastered, from the cognitive level to the choice level, and finally be able to ensure rapid identification and judgment of the subjects' criminal psychology (Souza, Pádua, Lima, Lacerda, & Carneiro, 2018).

Frequency similarity feature algorithm of mental lexicon

The content of mental lexicon is not fixed as the key words of psychological impact of different legal cases are different, and the mental lexicon of the same individual in different periods is also different (Asghar et al., 2019). In order to study and determine the internal relationship, it is necessary to further optimize the frequency similarity feature algorithm of mental lexicon. This helps in extracting the criminal mental lexicon, extracting the theme of recognition, and understanding it naturally and quickly. Aiming at some problems in the process of mental lexicon extraction, a keyword extraction algorithm based on semantic extension and synonym tree word chain method is proposed and improved· First, preprocessing the mental lexicon text in legal cases, using computer technology Chinese lexical analysis method to segment and label parts of speech. According to the different parts of speech, nouns and verbs are selected as candidates (Shan, J., & Talha, M.2021).

Then, according to the statistical data and location information, the stop words which cannot be used as key words are screened out, and the frequency of the central words is screened out [19]. Following this, word sense disambiguation is carried out for the candidate keywords after preprocessing. According to the semantic relationship and semantic correlation degree in synonym forest, the semantic correlation degree is calculated, and the semantic expansion degree is comprehensively calculated to establish the word chain (Noura, Gyrard, Heil, & Gaedke, 2019). The synonyms representing the same concept are combined, the word chain is considered comprehensively, and the word chain's strength, frequency, and position are weighted to identify the frequency of words. The specific steps of identifying the frequency of psychological words are shown in the following figure:

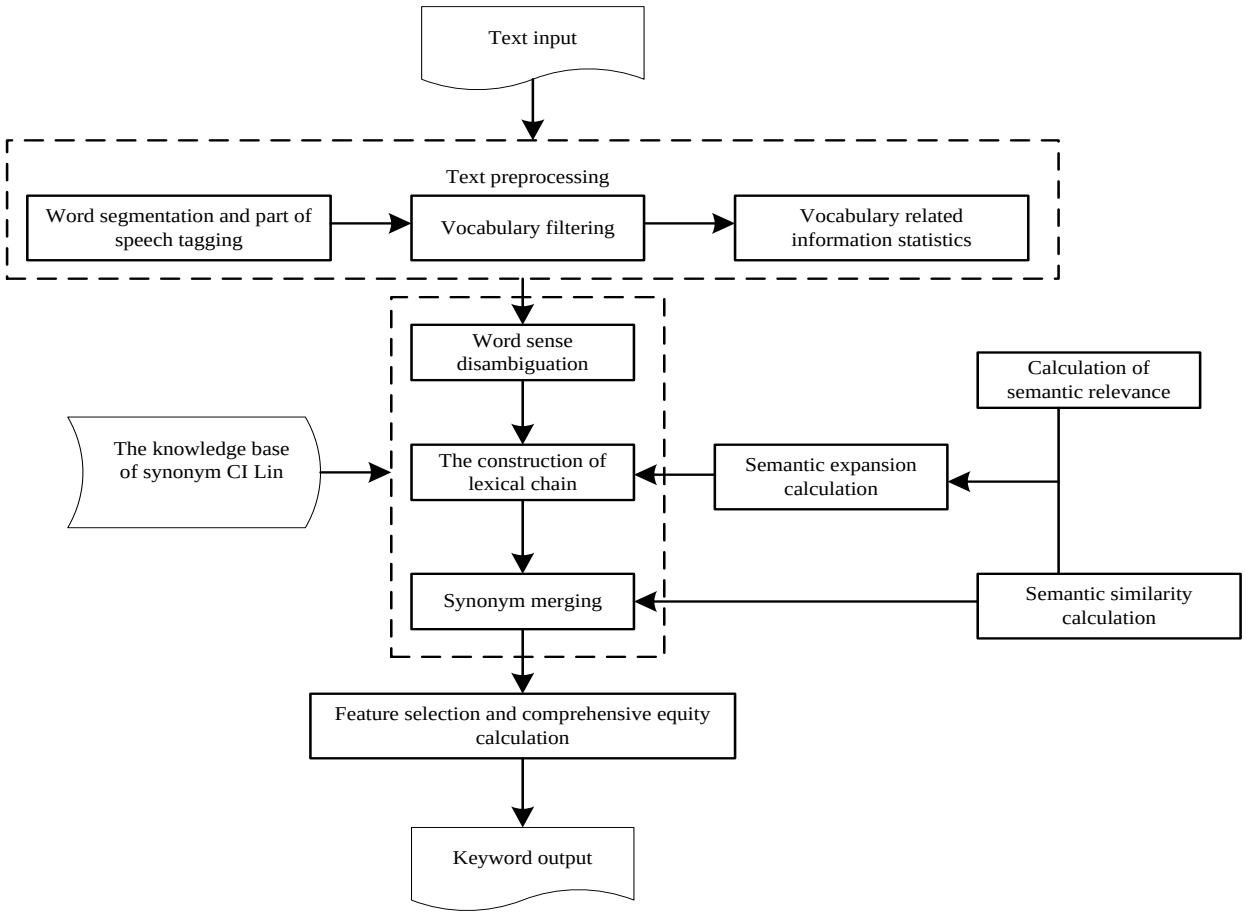

Figure 3. steps of mental lexicon frequency recognition

Vocabulary frequency has an important influence on the judgment of legal cases. The objects that criminals pay close attention to are searching for high-frequency words and counting the words related to crime, such as public security, murder weapon, money, explosives, etc. These words are rare among ordinary people, but become high-frequency words in legal cases. Based on the above contents, the input of mental lexicon is classified into a part of word frequency. However, through the investigation of cases, the similarity between criminal vocabulary and mental lexicon is calculated, and the proximity effect, namely dynamic frequency effect, is obtained. As far as frequency effect is concerned, the meaning of common words is easier to extract than that of common words when other factors remain unchanged. It is found that the results of mental lexicon extraction and recognition have nanosecond differences. This principle is conducive to effective psychological testing of suspects in a better confidentiality. Based on this, a similarity calculation method based on distance coding is proposed. From the perspective of the structure of synonym forest, the basic idea is to identify the two words that need to calculate the similarity, as well as calculate the similarity according to the semantic distance between words.

The similarity increases with distance. The calculation formula of semantic similarity is as follows:

$$sim(w_1, w_2) = d\left(\frac{n-k+1}{n}\right) cos\left(n\frac{\pi}{180}\right) \quad (1)$$

Among them, sim is semantic similarity (0 < sim < 1); d is the lexical feature coefficient determined by code branches, n is the total branch node, and k is the distance between branches. Words in the same code have similar meanings in thesaurus. One word is polysemy and the other can be annotated. The co occurrence ratio of each word is calculated by the following formula:

$$T(w_1, w_2) = log \quad {}_2 S\left\{\frac{\sum P\, sim(w_1, w_2)}{P(w_1)\cdot P(w_2)}\right\} \quad (2)$$

W_1 is a polysemous word, W_2 is an annotation word, and S is a semantic range. That is to say, the influence range of polysemous words is similar to that of preceding and following words, and the influence range of psychological words is far from meeting the requirements of the text. Therefore, a concept of semantic scope which is more in line with the characteristics of Chinese discourse is proposed. Where p is the probability of text occurrence, and the formula is as follows:

$$P(w) = \frac{f(w)}{FT(w_1, w_2)} \quad (3)$$

Among these words, f (w) represents the frequency of the word w and f represents the whole vocabulary. Therefore, you can perform the following transformation:

$$T(w_1, w_2) = log\ _2 P(w) \left\{ \frac{\sum_S F * f(w_1, w_2)}{f(w_1) * f(w_2)} \right\} \quad (4)$$

It can be seen from the formula that the frequency of P (w) increases with the increase of frequency of w_1 and w_2, which indicates that F is a polysemy word. We can determine their exact meaning in the current context for the ambiguity of negative polysemous words through the above methods. In synonyms, the meanings of the same code or the fifth level are similar. If one word is polysemous, the other is polysemous. The formula for calculating co-occurrence rate is given.

$$L = log\ _2 \left\{ \frac{\sum_S P(w_1, w_2)}{P(w_1) \cdot P(w_2)} \right\} - T(w_1, w_2) \quad (5)$$

The scope of influence of polysemous words and polysemous words is similar, and a more appropriate concept of semantic domain in Chinese text is put forward. The number of candidate words depends on the feature information of words. Therefore, whether feature selection is effective or not directly affects the quality of keyword extraction. Compared with previous methods, which only use location statistical features, the word frequency, important region, word distance, first occurrence position, and word chain strength are considered. This information is integrated to calculate word weight. The specific feature information and description are given, as shown in Table 1.

Table 1

Characteristics of psychological words in legal cases

Category	Features	Brief Description
Word frequency	TFODF	Represents the frequency of a word appearing in a document, and compares it with the number of documents in the document set.
Position	Important area	Words that appear in important areas such as document titles, abstracts, and chapter titles are more likely to be keywords than other words.
	Word span w_ span	The larger the scope of the subject word in the article, the more it can reflect.
	First appearance position W_pos	Represents the ratio of the vocabulary size before the word first appears in the document to the total number of words in the document, with a value of 0-1. Generally, words at the beginning and end of a document are more likely to become keywords.
Lexical chain strength	Word chain length L_ length	The number of words contained in the chain. The larger the value, the better the chain can express the topic of the article.
	Vocabulary chain span L_ span	It refers to the distance between the last position and the earliest position of the words in the chain, which reflects the coverage of the topic in the text. The larger the value is, the more important the topic is.
	Covering sentence density L_ sent	This feature represents the density of chain coverage, and its value is the number of sentences containing any word in the chain.
	Correlation degree L_ Rel	The mean value of the correlation between the word W_i and the rest of the words in the chain indicates the semantic strength of the word. The higher the value, the more the word is related to the surrounding environment.

Based on the information in the table above, we collect and extract the mental lexicon features in legal cases, and analyze the description features, to make a more effective judgment of legal cases.

The realization of mental lexicon extraction in legal cases

The perception of discourse usually includes perception, syntactic processing and semantic understanding. The speaker first searches the dictionary for the grammatical features and meanings of the phonetic symbols, judges their syntactic structures, and finally determines the actual meaning of the sentence or utterance. In the extraction and recognition of mental lexicon in legal cases, subjects should consider linguistic factors and non-linguistic factors such as intonation and speed, especially contextual factors. The relationship between vocabulary and syntax is also a difficult one. In fact, in addition to lexical and syntactic processing, the understanding of the whole sentence should be based on the criminal knowledge learned. In general, ambiguous sentences are easier to understand than unambiguous sentences, therefore, different ways of mental lexical understanding are needed. In order to avoid the increase of brain activity caused by polysemy, the extraction process of vocabulary must be simplified. In criminal cognitive psychology, this reaction can be easily confused with Europhobia. The cognitive learning process of mental lexicon in legal cases can be divided into two stages: adaptation and absorption. In the test of mental lexicon extraction, subject signal is a new content, which is the subject's initial experience of language and culturally acquired knowledge and criminal behavior. To correctly understand the meaning of a sentence, the subject must consciously use linguistic knowledge such as on-the-spot experience. Through on-site observation, it is possible to use cognitive ability to improve the ability to choose, and to quickly understand what is said. By analyzing the strength, frequency and position of word chain, we can make up for the deficiency of simply considering the cognition of word frequency, and therefore, obtain the weight of key words. Furthermore, the semantic relationship between words is analyzed to reflect the subject information of legal cases, which helps to mine the subject information expressed in legal cases as well as avoid repetition in legal cases containing a large

number of synonyms. The steps of mental lexical feature extraction are outlined as follows:

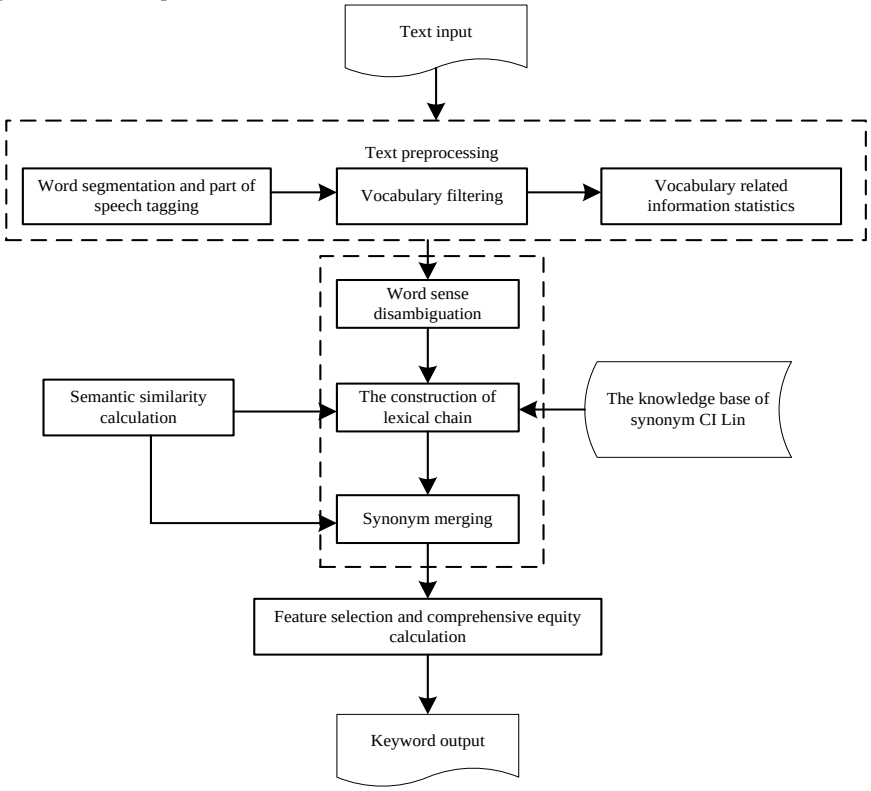

Figure 4. steps of mental lexicon feature extraction

The human brain activates information in long -term memories, narrowing searches and speeding up comprehension. Associating long-term memory with working memory shows the mutual influence of mental lexicon. Mental lexicon is a network of concept nodes, each of which represents a feature. When the goal of the conceptual activator changes, several semantically relevant words are activated and transformed into morphemes simultaneously. This behavior extends from target words to adjacent words, and the target word extraction must be accomplished by the diffusion of multiple semantically related words. Based on this, the semantic features of mental lexicon in legal cases are further identified for case judgment as follows:

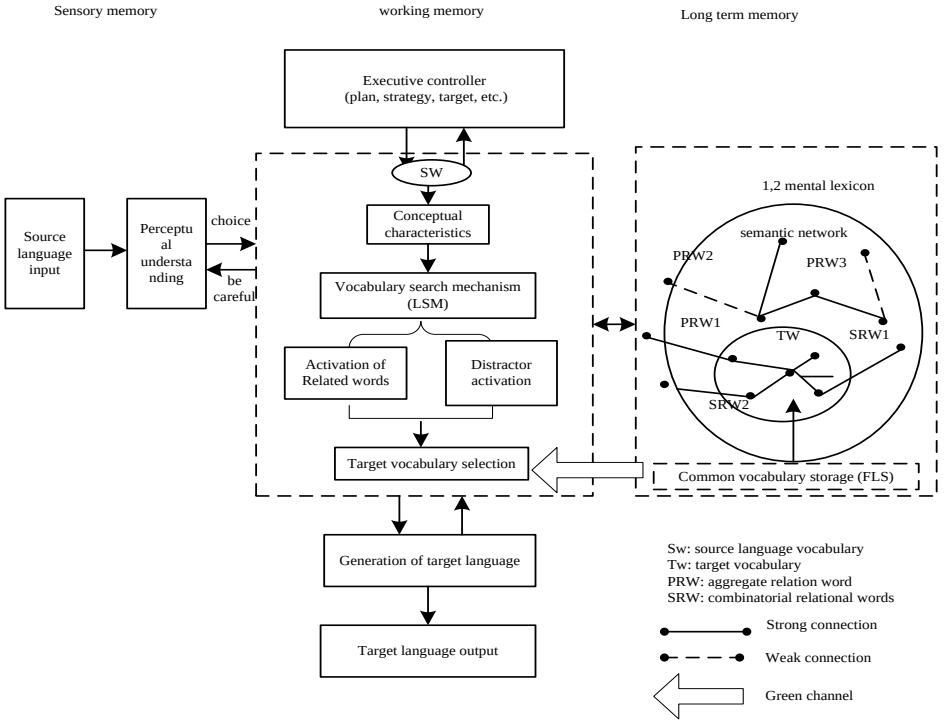

Figure 5. mental lexicon semantic recognition in legal cases

Semantic features activate multiple candidate words in clustering relationships, and word search mechanism requires the suppression of interfering words as well as the screening of target words. Activation and inhibition effects are determined by the distance and intensity of lexical web connection and the degree of inhibition. Multiple edge extraction units are used for the first retrieval. Vocabulary recognition is divided into speech, spelling, syntax and other small modules, and each module is an independent extraction unit, according to storage frequency. In addition to these separate extraction units, there is a main unit with the extraction unit's full functionality. When an input activates one or two extraction units, the entire control unit is activated. Suppose there is an error between the frame and the test item. In such a case, the test taker will correct the error and make the sound message consistent with the original frame, thus fully stimulating the primal psychology of the test taker about the crime experience. In order to achieve the best effect of speech comprehension and psychological arousal, the subjects should arouse the memory related to or irrelevant to crime as much as possible before the criminal psychological test. At this point, the un-activated independent unit is activated. Each input activates a cell for a single entry, and the entire entry is activated, which is how the retrieval pattern works. The image can explain the frequency effect, however, it cannot explain the background effect. Based on the above method, the extraction of mental lexicon in legal cases can improve extraction efficiency and ensure the scientific judgment of cases.

The results of the experiment were analyzed

Four random sampling files were selected, and 50 samples were selected from each region for testing. Application of ICTCLAS system in Institute of Computer science and Technology, Chinese Academy of Sciences. In this paper, the keywords in the manually annotated documents are taken as the standard keywords. The extraction effects of the keyword location recognition method, the method in this paper and the TF × ID method are compared. Furthermore, two estimation algorithms of accuracy and recurrence rate are used as the measurement standard. The specific algorithm is as follows:

$$\text{precision} = \frac{|N\text{auto}\ man|||}{|N_{\text{asio}}|} \quad (7)$$

$$\text{recall} = \frac{|N_{\text{man}} \cap N_{\text{auto}}|}{|N_{man}|||} \quad (8)$$

$$F_{\beta-1} = \frac{2\times\text{precision} \times \text{recall}}{\text{precision} + \text{recall}} = \frac{2\times|N\text{auto}\ man|||}{|N_{man}|||N_{\text{anto}}||} \quad (9)$$

In the algorithm, Nman represents the influence degree of semantic features and Nauto represents the annotation keywords. Simulation results show that if the threshold of lexical similarity is set to 0.95, the head table has the lowest support for frequent 1 item set, and the head table has the lowest support for frequent 1 item set, which is less than 2. Through many experimental studies, α = 0.8, β = 0.2 are obtained as the optimal allocation of candidate eigenweights. Increasing support can effectively reduce frequent itemsets. For text frequent pattern mining, the number of transactions is as small as the number of text. Therefore, low support, tree structure is not deep. Most of the time, 2 settings and 3 settings need to be used frequently. Different feature items are selected, and the comprehensive index of measure is used to evaluate the effect of keyword extraction. This paper analyzes the classification features of key words from the aspects of frequency, position and intensity of choosing words, and obtains the position features and position features of key words as well as the comparison of the extraction results of key words. The specific detection results are shown below:

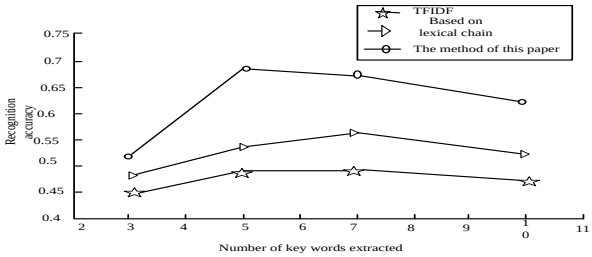

Figure 6. Comparison of keyword recognition results of legal cases

The experimental results show that, compared with traditional methods, the proposed method improves the recognition effect significantly, increases the word chain strength feature information, makes up for the lack of word frequency, location and other information, fully considers the semantic information, and takes into account the semantic similarity and semantic extensibility, which is helpful to mine low frequency words which play an important role in the topic expression. The extraction performance is compared with the three methods, and the specific results are shown in the following figure 6:

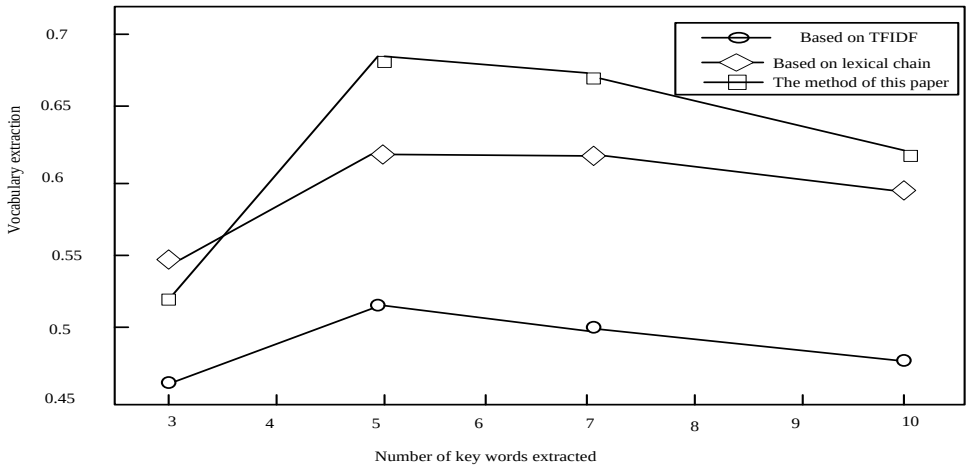

Figure 6. test results of mental lexicon extraction performance

Experimental results show that the proposed method is more effective than traditional methods, and that it is particularly helpful to mine the words which play an important role in topic expression. Results of the aomparison and analysis of extraction performance of the three methods is as follows:

Table 2

test results of vocabulary extraction effect

Extraction method	Number of key words extracted	accuracy	Recall	F-measure
Based on TFIDF	3	0.596	0.378	0.463
	5	0.577	0.465	0.515
	7	0.508	0.490	0.499
	10	0.426	0.547	0.479
Based on lexical chain	3	0.680	0.453	0.544
	5	0.657	0.581	0.617
	7	0.588	0.642	0.614
	10	0.503	0.719	0.592
The method of this paper	3	0.711	0.412	0.522
	5	0.692	0.675	0.683
	7	0.634	0.709	0.669
	10	0.527	0.751	0.619

Psycholinguistic experiments show that in order to understand this phenomenon, we must activate the related memory information. In the process of psychological test of legal cases, the activation of different levels of information can help testees understand information such as phonetics, intonation, vocabulary, etc., . This helps testees identify and judge the meaning of words, and guide subjects to follow the subject's thinking, judgment and semantic induction. Predictions also help the subjects concentrate on understanding the semantics of the test items, while predictable subjects can often estimate what the subjects might say and guess as what is known, unknown, primary, and secondary. By this method, the subjects can pay attention to the expected information selectively in the test process, thus guaranteeing the quality of understanding and reducing the burden of case analysis and investigation.

Conclusion

Psychology is a subject that studies, among other things, the structural patterns of language, which entails a useful exploration for analyzing the actual speech codec process. Psycholinguistics and experimental psychology are the basis of the extraction and recognition of mental lexicon in legal cases. The extraction and understanding of mental lexicon in criminal mental lexicon recognition is a decoding process. Mental lexical extraction can only be realized when both subjects accept the crime meaning, which is a process of understanding crime and can help in judging the legal cases involving players.

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