

Emotional Metaphors for Emotion Recognition in Chinese Text

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Abstract. The affections of a person can be expressed by non-verbal methods such as facial expressions, gestures, postures and expressions from eyes. While implicit language like emotional metaphor is also an important way to express one's affections. Different kinds of emotional metaphors in Chinese and their characteristics are proposed, including happiness, sadness, anger, fear and surprise. Experiment result shows the characteristics of Chinese emotional metaphors are reasonable. The importance of emotional metaphors in emotion recognition is also discussed.

1 Introduction

The latest scientific findings have indicated that emotions lead an important role in human intelligence, such as decision-making, inter-communication and more. As Marvin Minsky said in his "the society of mind"[1], "The question is not whether intelligent machines can have any emotions, but whether machines can be intelligent without any emotions", if we want computers to be vividly intelligent and to interact with us more naturally and socially, we should let the computers have the abilities to recognize, understand, and even to express emotions[2].

To date, much of the work studying affective computing has concentrated on facial expressions, gestures, postures, and properties of speech. Although much emotional expression is conveyed in physiological features or speech's acoustic realizations, it is equally important to trace into how it is conveyed in the linguistic content[3]. In written language, the interpretation of emotional states is more complex. It can be referred to directly, for instance, "I am angry", but usually it is not explicit and the reader or hearer must infer it. The cues for inferring it can come from grammatical structures, vocabulary forms and verbal inflections, etc. Metaphor is useful for abstract concepts, and the function of a metaphor is to express, clarify or explain some concept through a better understood, and generally concrete, concept. For example, in metaphor "Time is money", the concept "time" is an abstract concept, while "money" is a concrete concept. Since emotions are abstract concepts, it is natural that metaphor is an effective method for expressing emotion. In fact, one of the major functions of metaphor is to express emotion[4, 5]. Through metaphor, an emotion can be related to some other concept, which tends to make it more concrete.

In this paper, the different emotional metaphors and the characteristics of Chinese emotional metaphor are discussed. We think that emotional metaphor plays an important role in emotion recognition for text. Taking emotional metaphor into account will make up the insufficiency of merely focusing on emotion keywords.

The rest of the paper is organized as follows: Section 2 describes some backgrounds about metaphors and emotional metaphor. Section 3 discusses the different kinds of emotional metaphor according to the source domain. And then, the characteristics of five primary emotions of happiness, sadness, anger, fear and surprise are proposed in section 4. Related works are introduced in section 5. At last, the conclusions and future work are given in section 6.

2 Metaphors and Emotional Metaphor

The study for metaphor can trace back to the era of Aristotle. Since then, the traditional view to metaphor is that metaphorical language is decorative and secondary, while literal language is the primary. However, along with the development of metaphor research, researchers have realized that metaphor is prevalent in natural language, and is the center of language and human thinking[6]. Lakoff and Johnson proposed that metaphor is a means of understanding one domain of experience, called the source domain, in terms of the conceptual structure of another domain, called the target domain. Their study indicates that the cognitive system of human itself is a metaphorical system. Metaphor is not merely decoration of language, but also an important method of human thinking and cognition[6].

Many linguists have researched about emotional metaphor in English. The results indicate that the emotions of human are generally expressed through metaphors about body perceptions in a way[6-8]. Some researchers have compared the emotional metaphors between Chinese and English[7, 8]. Yu Ning[8] discussed the metaphorical expressions about Chinese emotional concept “愤怒”(anger) and “喜悦”(happy). He demonstrates that the metaphorical schemas of emotions in Chinese is the same to those in English, which are “ANGER IS HEAT” and “HAPPY IS UP”. There are two derived conceptual metaphor for this schema, namely, “anger is fire” and “anger is a hot fluid/gas in a container”. Here, based on the research result on emotional metaphors from linguists, through analyzing different kind of emotional metaphors, we divide emotional metaphors into following kinds in section 3.

3 Kinds of Emotional Metaphor

In this section, we will discuss 3 types of emotional metaphors, namely, orientational metaphors, body metaphors and nature metaphors. The main standard is the source domain of emotional metaphors.

3.1 Orientational Metaphors

In Lakoff's conceptual metaphor theory, emotions are generally understood in terms of orientational metaphors, such as "HAPPY IS UP", "SAD IS DOWN". From these root metaphors, we can derive many emotional metaphors as follows.

- (1) 他 今天 情绪 看起来 很高/低落.
He seems in high/low spirits today.
- (2) 老师 高度 评价 了 他的 成果.
The teacher remarked highly of his achievements.
- (3) 战士们 士气 高昂/低落.
The soldiers were elated/downcast.
- (4) 别 看低 他 的 本领.
Don't look down upon him.

Example (1)-(3) uses the orientational concept "high" ("low") to express one's emotion about happiness (sadness). In (4), the orientational concept "down" is used to express the agent's scorn emotion.

3.2 Body Metaphors

Emotions are generally expressed through the physiological state of human body[6, 9]. Researchers have investigated different languages such as Chinese and English, and have found that many emotional metaphors are in forms of mapping the physiological changes into the emotion domain[6, 7, 10]. In section 1, we have introduced that most of existing emotion recognition methods are through facial expressions, gestures, postures and physiological features. When it comes to written language, it is also a good approach to recognize emotions through the words which describing the physiological features of the agent. In body metaphors, the states of eyebrows, facial colors, hairs and hearts are usually used to express different emotions.

3.2.1 Eyes and Brows

In Chinese, there are many methods to express emotions through eyes and brows. We can find these phenomena from many Chinese idioms. For instance, "眉飞色舞"(brows flying and eyes dancing), "喜上眉梢"(joys on the brows), "舒眉展眼"(be all smiles) and "眉开眼笑"(brows expanding and eyes smiling) all express the happy feelings; both "愁眉苦脸" and "眉头紧锁" mean sadness; "横眉" and "皱眉" mean anger and worry respectively.

3.2.2 Facial Colors

Facial color is an effective source feature reflecting agent's emotion. In written language, using facial colors to describe emotion is ubiquitous. For examples, "脸色苍白"(pale or white) in Chinese is generally used to express "fear" or "fright"; "红晕"(flush) is used for "shame" or "embarrassment"; "急红了脸"(red with anger) and "面红耳赤"(be flushed) mean "anger". Sometimes, red is also used to express "happy", such as "红光满面"(in ruddy health).

3.2.3 Heart

Heart also plays an important role in expressing human emotion, especially in written text, when characterizing people's mental activities. We may use “心碎”(heart broken) and “心如刀割”(to feel as if a knife were piercing one's heart) to express the extremity of sadness or depression, heartbroken ;“心花怒放”(a flower blossoms in the heart) and “心旷神怡”(relaxed and happy, cool) are generally used to convey the happiness, While “心惊肉跳” and “心惊胆战” are used to express fear, which means that the heart is shaking with fear.

3.2.4 Behaviors

Ordinarily, emotions can also be expressed through behaviors. If someone is dancing and skipping with joy, then he may be happy. If someone is grinding one's teeth, he may be angry. “hair stands on end” means fear, and that “weeping” means sadness.

(5) 孩子们拿到礼物后,都欢蹦乱跳起来。

The children were dancing and skipping with joy, after they got their presents.

(6) 听了这个故事,大家都觉得毛骨悚然。

When having heard the story, we all felt hair stands on end.

(7) 得知这个消息后,她低下了头默默流泪。

When heard of the message, she crouched and wept.

(8) 遇到不人道的事情,大家都咬牙切齿。

We all gnash for inhumanity.

3.3 Nature Metaphors

The nature is the closest thing human can feel directly. In traditional culture of China, “red” is one of the symbols for happy events such as weddings, festivals etc., and “black” is used to express sadness such as bereavements. In English, “blue” represents sadness, but “gray” is used in Chinese for sadness, such as (9).

(9) 今天的心情就像这天空一样,是灰色的。

The feeling is gray, like the color of today's sky.

Goatly[4] has pointed out that most of the language for emotion or emotional states come from the words for weather or weather changes.

(10) 她脸上带着灿烂的笑容。

There are sunny smiles on her face.

(11) 刚才还是晴空万里,现在就变为乌云密布,女人的心真难琢磨。

Sun shining a moment ago has turned heavily cloudy, it's so hard to tell women's mood.

(12) 老板突然来了一个晴天霹雳,大家都沉默了。

Suddenly, the boss got thunderstorm and we all kept silent.

(13) 她对我大发雷霆。

She blew up at me.

In (10), the term “sunny” which comes from weather domain is used as a modifier for smile, to express the happiness of the subject. In (11) to (13), “乌云密布”(cloudy), “晴天霹雳”(a lightning bolt) and “雷霆”(thunder) all represent anger.

In Lakoff’s conceptual metaphor theory, “ANGER IS FIRE” is a famous conceptual metaphor. In Chinese, anger is usually described as gas[8]. For examples,

- (14) 他在发脾气
He is losing control of himself.
- (15) 别惹他发火
Don’t make him get angry.

4 Characteristics of Chinese Emotional Metaphor

In this section, we summarize the characteristics of Chinese emotional metaphor, based on section 3. We only consider the five primary emotions of happiness, sadness, anger, fear and surprise. The result is in table 1. The left column represents emotions, and the top row represents source domains of emotional metaphors. The cell contents are the features of source domains used to describe emotions.

Table 1. Characteristics of Chinese emotional metaphor for 5 primary emotions.

Emotion	Orientation	Body				Nature	
		Eyebrow	Facial color	Heart	Behavior	Color	Weather
Happy	Up High	Open Free	Flush, Red	Open	Dancing Singing Flying Jumping Smiling	Red	Sunny Spring Warm
Sad	Down Low	Tighten Lour	Cyan White	Broken Pain	Crouch, Weeping	Black White Gray	Rainy Cloudy Autumn Dark
Angry	Up	Frown, Glare	Red		Gnash Fist Stomp Long-face	Red	Fire Storm Thunder Summer
Fear		Close	Pale White	Shake Tighten	Shiver Breathe-hurry	White	Thunder Light Cold
Surprise		Stare			Gapemouthed		

To verify the characteristics summarized above, we collect 100 Chinese emotional metaphors from a large corpus. According to the characteristics in table 1, the distribution of emotions in this collection is 25% for happiness, 25% for sadness, 25% for anger, 15% for fear, and 10% for surprise. 30 subjects who are undergraduate students from Xiamen University are given the forms. Every form consists of a sentence of Chinese emotional metaphors; the subjects should select one and only one of the primary emotions or other for the sentence. 24 out of the 30 subjects returned them.

Then we calculate the values of a sentence as a particular emotion with the following formula:

$$v(i, k) = \frac{num(i, k)}{S} \quad (1)$$

Where, $v(i, k)$ means the value of sentence i as emotion k (that is happiness, sadness, anger, fear or surprise), $num(i, k)$ is the total number of subjects that vote sentence i to emotion k . S is the number of subjects, here $S=24$. Obviously, v is range from 0 to 1. According to the characteristics described in table 1, if sentence i expresses emotion k is denoted as $u(i, k)=1$, otherwise, $u(i, k)=0$. The correlation r_k between v and u for emotion k is decided by the Pearson's correlation as follow.

$$r_k = \frac{\sum_i v(i, k)u(i, k) - \frac{\sum_i v(i, k)\sum_i u(i, k)}{N}}{\sqrt{(\sum_i v(i, k)v(i, k) - \frac{(\sum_i v(i, k))^2}{N})(\sum_i u(i, k)u(i, k) - \frac{(\sum_i u(i, k))^2}{N})}} \quad (2)$$

Where, N is the number of emotional metaphor in the collection, here $N=100$. The resulting correlations are showed in table 2.

Table 2. the correlation values for emotions between decided by subjects and that by characteristics in table 1

Emotion	happiness	sadness	anger	fear	surprise
Correlation value	0.984007	0.869635	0.939065	0.951250	0.833278

The correlation values show that the characteristics in table 1 are reasonable for Chinese emotional metaphor.

5 Related work

According to phrasal conventions of Chinese and the conclusions from linguists, Xu & Tao[11] proposed an emotion system of Chinese, including love, disgust, happiness, anger, sadness, fear and desire. Based on semantic annotation on adjective and verb dictionary, they further categorized the emotion system into mental experience based emotions and expressive force based emotions. The dictionary-based method of Xu & Tao gives a good reference for emotion classification, but they haven't thought of the importance and prevalence of metaphors. We think that emotion is context sensitive, and metaphor is related greatly with cultures and background knowledge. Thus, the dictionary-based method combined with metaphorical knowledge may give a more effective support for emotion classification and recognition.

6 Conclusions and Future Work

Emotion recognition from text is an important part of affective computing. In this paper, the prevalence of metaphors and emotional metaphors are discussed, and different kinds of emotional metaphors in Chinese and their characteristics are proposed. Experiment shows that the characteristics described in this paper are reasonable for Chinese emotional metaphor.

Metaphor is pervasive in natural language, and emotional metaphor is an effective method to express emotions. To construct efficient and lifelike affective computing system, especially Text To Speech (TTS) system, it is important to process emotional metaphor. In the future work, we will propose a computational model for metaphorical mechanism. And the further relation between characteristics of emotional metaphors and the emotional keywords also need to be further investigated.

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