# Application Scenarios of Emotional Metaphor Computing and Emotional Intelligence Recognition in Group Mentality Management

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**Abstract.** Emotional metaphor computing is a quantitative (from qualitative) analysis and calculation of emotional metaphors, which is theoretical guided by cognitive linguistics, based on the ontology of emotional vocabulary, emotional commonsense knowledge base and emotional metaphor knowledge base, and supported by machine learning, natural language processing and text mining. This paper mainly discusses the application of emotional metaphor computing in the four phases of group mentality development (possibility phase, gathering phase, development phase and forming phase), to improve the efficiency and effect of group mentality management.

**Keywords:** Emotional metaphor calculation · Group mentality management · Public management · Development path

## 1 Introduction

Metaphor, as a common phenomenon in human natural language, will become a bottleneck problem in natural language processing if not be solved well. While Emotion, as the most common but also the most difficult content to be described and grasped in human group life, may become the Achilles heel of artificial intelligence and modern intelligent management.

The conceptual metaphor theory and cognitive linguistics proposed by scholars represented by Lakoff [5] have brought light to the solution of those difficult problems. Kövecses, a linguist, has made outstanding contributions to the in-depth study of emotional metaphors. Based on Lakoff's conceptual metaphor theory, he has developed and improved the theories and research methods related to emotional metaphors [4], opening the way for the calculation of emotional metaphors.

The goal is for computers to understand human language, have conversations with people, and ultimately understand people's feelings and lives. Emotional metaphor computing has made great progress in resource construction and computing methods. It has also been applied in many scenarios, such as machine translation, chatbot, comment analysis and so on [7]. And when it plays a greater role in comment analysis, it opens the door of group mentality management.

## 2   Emotional Metaphor Computing

Artificial intelligence is a discipline dedicated to endowing computers with human intelligence. It aims to make computers not only have the perceptual computing ability beyond human beings, but also have good emotional communication ability. In order to let computers understand human emotions, it is necessary to deeply understand and dig out the emotional characteristics of human beings. While emotional metaphor is an important way to express human emotions [10]. In this context, emotional metaphor computing comes into being.

Emotional metaphor computing is a quantitative (from qualitative) analysis and calculation of emotional metaphors, which is theoretical guided by cognitive linguistics, based on the ontology of emotional vocabulary, emotional commonsense knowledge base and emotional metaphor knowledge base, and supported by machine learning, natural language processing and text mining. Its original purpose is to assist relevant metaphor researchers to carry out corresponding work and improve the efficiency and accuracy of metaphor recognition and understanding.

However, metaphor is not only a way of language, but also a way of thinking and living. So, by knowing and mastering metaphors well enough, the computer is able to trace a person's mental model. Since human metaphorical thinking is rooted in the interaction between human and the environment, relying on the record of human network behavior in the era of big data, the same behavior patterns of human in different environments can be concluded through machine learning, and these same behavior patterns can be regarded as the implicit bridge from the source domain to the target domain in metaphor. Through the reverse operation, we can know the metaphorical meaning of the environment to the individual when he symbolizes his environment into his own cognitive system. In other words, the interaction between people and the environment
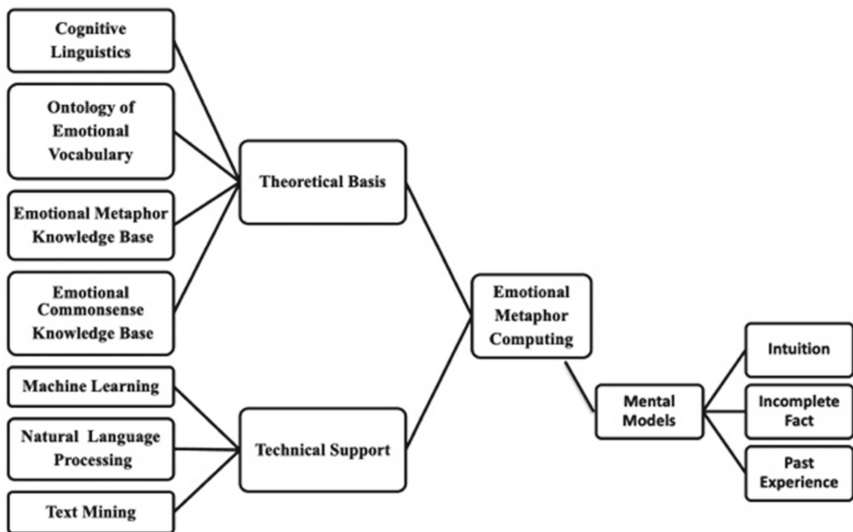


**Fig. 1.** Mapping of mental model by emotional metaphor computing

is regarded as a dialogue. The material of emotional metaphor calculation is changed from vocabulary material to symbolic representation of the environment, and people's emotions can also be recognized (as shown in Fig. 1). This is the larger goal of emotional metaphor computing.

## 3   Group Mentality Management

The so-called group mentality refers to a psychological state and tendency produced by a certain person after obtaining a psychological group. It mainly includes two meanings: one is that people gathered together have the same psychological tendency and trend, which is a group mentality after the formation of a group behavior, which is completely different from the psychological state of people in individual solitude. The other is that people with the same psychological tendency gather together and form behaviors, which is a group mentality before the formation of group behaviors [2].

The group mentality management focuses on maintaining a good psychological state at the first level, and preventing extreme situations at the second level. With the deepening of the Internet of human society, and the increase of population mobility, the composition forms of groups become more and more diverse. On the Internet, the emergence and development of a group are very fast, and even the disappearance of most of them is also very fast, which is very consistent with the law of human emotions. In order to maintain the orderly development of society, the second level of group mentality management is becoming more and more important. For this, emotional metaphor computing can just find the emotional background of a group well, and predict the change of group mentality before a certain information enters a group.

## 4   New Application Scenarios

With the rapid development of the Internet, especially the rapid rise of micro-blogs, forums, social networking sites and other network media, the public has been widely involved in the comments on social events and political activities, resulting in a large number of metaphorical information with rich emotional tendency, which however brings challenges to the efficiency and effectiveness of public administration. While emotional metaphor computing can be used to analyze and process the emotions conveyed by these text comments, which is expected to be used in public opinion monitoring and information prediction. Nevertheless, to a greater extent to help group mentality management is not expected. The reason is not only that the calculation of emotional metaphor is not mature, but also that the analysis of needs is not sophisticated enough.

Group mentality has a law of development. At different phases of the development of group mentality, its demand for reading the information circulating in the group is different. A group will go through four phases: potential, gathering, development and formation. The change characteristics of group mentality corresponding to each phase are as follows: potential same psychological tendency; the extreme development of group emotion; the phenomenon of exclusivity appeared, and the group began to force the disappearance of individual personality; form an emotional background within a certain range. In these four phases, the attention to information and the way of production are
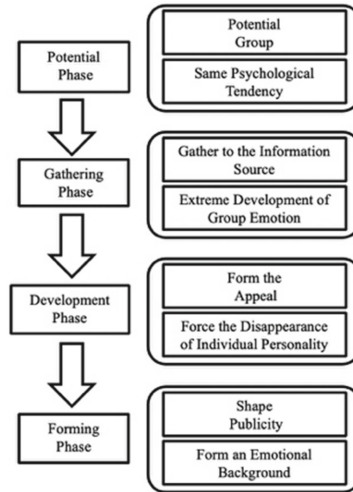
**Fig. 2.** The development path of the group and group mentality

also different, respectively: discrete hidden in the ocean of information; the emergence of information focus and explosive dissemination; information capacity began to reduce, with the formation of appealing information, and began to spread; appealing information was further clear, and formed the possibility of reshaping publicity. Figure 2 summarizes the development path of the group and group mentality:

Though any group can naturally disintegrate during the four phases, the group that eventually formed and its general path of mental development are always the same. So emotional metaphor calculation can be used in all four phases.

First, individuals will be attracted by different information due to their different psychological tendencies. And individuals with the same psychological tendency become a potential group. It is almost just a matter of time before they meet on the Internet's information tide. Therefore, some people with special psychological tendencies can be discovered in advance through emotional metaphor calculation, so as to intervene in advance. For example, comments with suicidal ideation are identified through real-time analysis of Sina Weibo content, and the user's suicidal ideation is further confirmed through analysis of the user's past behaviors and contents [15]. Zhu Tingshao team established a suicide ideation recognition model, of which the accuracy rate, recall rate, F value and accuracy were respectively 0.88, 0.85, 0.85 and 0.86. They provide psychological assistance to identified users through private messages on Micro blogs, to some extent preventing such potential groups from gathering.

Secondly, driven by emotion, individuals tend to gather towards a certain type or information source. While algorithmic recommendation is widely applied to all kinds of news and message push, echo chambers and information cocoons filter out diverse and heterogeneous information from outside and form closed and homogeneous self-space or small group space [13]. On the one hand, this accelerates the extreme development of individual emotions and the aggregation of individuals towards a certain information source. The application of emotional metaphor computing in this phase is

to predict the emotional polarity of the information entering the algorithm recommendation in advance. For example, *SentiWordNet* [1], an open source vocabulary resource for sentiment categorization and opinion mining applications. More than 300 research organizations around the world have been licensed to use it in a variety of emotional research topics. SentiWordNet is built on automatic tagging of SentiWordNet's synonym set. Each synonym set contains three grades of pos(s), neg (s) and obj (s) and scores below each grade. Each score is at [0, 1.0]. Words with multiple meanings may have different levels and scores, which add up to 1. For example, in the synonym set of the adjective "*estimable*" with the meaning of "*may be computed or estimated*", emotions were labeled as neutral score 1.0, negative score 0, and positive score 0. While in the synonym set with the meaning of "*deserving of respect or high regard*", emotions were labeled as positive score 0.75, negative score 0, and neutral score 0.25. This resource can be used to exclude some information that intensifies negative emotions from algorithm recommendation through emotional metaphor calculation in advance, or to judge the emotional polarity of the information cocoon formed so as to interrupt algorithm recommendation timely.

Thirdly, once a group is formed, in order to maintain its form, the group will spontaneously start to express appeals, and the members of the group unconsciously start to suppress their own personality, which becomes a significant feature of this phase. With the emergence of a group's appeals, the group enters a period of rapid development, and "*people without direct conflicts of interest*" [14] flood into the group. These participants often have no direct interest relation with group's appeals, and their core goal is just to vent their emotions. At this phase, the emotional metaphor calculation needs to take the group's emergent appeals as the source domain and emotion as the target domain to calculate, and find out the emotions that may be used to exert problems, and then make intervention. Here the *Master Metaphor List* [5] is a Metaphor database with emotion and psychology as its main aspects, including 203 Metaphor mappings and corresponding Metaphor instances. The mapping in the database is organized in the way of ontology, including four metaphorical categories: mental events, emotions, event structure and others. Each category is divided into 69 terms and 203 metaphor categories and mappings according to the target domain of metaphor. In the metaphorical category of "*emotions*", there are six entries, such as *anger* and *love*. The metaphorical categories under the entry include source domain, target domain, example sentences and annotations, as well as special sub-cases in individual categories (as shown in Fig. 3).

Fourthly, if a group is long or large enough, then the group mentality will develop into the emotional background of a certain period or region, by which the group mentality has the possibility of shaping the publicity. While publicity has always been the value support and logical starting point of public management. From the most abstract point of view, publicity can be summarized as "a social attribute or value attribute of object existence generated on the basis of the relationship between subject and object", which can be grasped through public interest, public spirit, public goods, public welfare, public choice and other carriers [12]. In other words, these carriers can be used as the source domain, and the emotional background of the group can be seen more clearly through emotional metaphor calculation, so as to avoid further intensification of group emotions
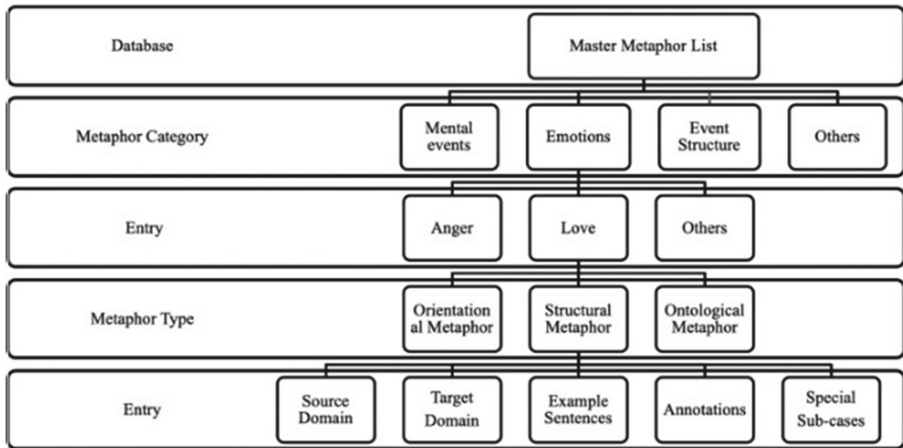
**Fig. 3.** Establishment path of emotional metaphor database

and gradually restore the rationality and sense of responsibility of individuals in the group.

Once a group is formed, a new metaphorical system will emerge, and the generation of new metaphors is a challenge to metaphorical computing. From the perspective of public management yet, it is particularly important to identify a special kind of emotional metaphor, which refers to the special attributes or partial attributes of people with inanimate objects. For example, hands are *tools*, emotional loss is a *system virus*, etc. Such metaphors often herald the collapse of the group's sense of human integrity. When people are in a formed group, affected by the emotional background, their attention and rationality will be suppressed, and people will forget the integrity of people, but only pay attention to the partial or one-sided attributes of people. In order to quickly identify such metaphors from mass information, we can refer to MIDAS, a metaphor recognition system proposed by Martint [9]. Its biggest characteristic is that it is a method based on reasoning, which can explain the metaphor of the new system [3].

MIDAS uses KL20NE's extended semantic system KODIAK as the knowledge representation language. KODIAK connects knowledge elements through inheritance mechanism and concept hierarchy. Referring to the hierarchical relationship of metaphor mapping in MIDAS, a special hierarchical relationship of emotional metaphor calculation is designed (as shown in Fig. 4). The small arrow in the box in the figure indicates that the former concept is regarded as the latter one, and the line between the boxes indicates the inheritance relationship between mappings.

The interpretation system of MIDAS [11] is divided into two steps: Step 1 is to analyze the syntax of the input sentence and form a preliminary semantic representation. The primal content obtained in this step can be considered as an intermediate phase in the interpretation process and is mainly derived from the grammar and thesaurus of the analyzer. Step 2 replaces this preliminary content with a concrete interpretation that explains the input, the real content, which may be literal or some conventional metaphorical interpretation. Step 2 involves two modes of reasoning: one, called the
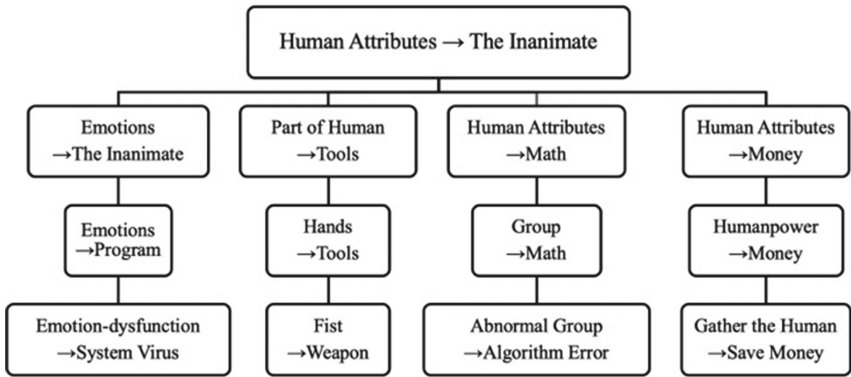
**Fig. 4.** Hierarchical relationship of affective metaphor calculation

reification mode, replaces abstract concepts with concrete ones; another is to replace the source concept with the corresponding target concept. When new metaphors emerge, MIDAS extends existing metaphors through metaphor extension system (MES), which involves three extended reasoning methods [8]: similarity extension, which is mainly based on analogical reasoning principle, and the same metaphor source concept can be applied to similar target concepts; core extension, the premise of which is that the relationship between metaphor concepts can be transferred to the target domain according to the principle of core retention. Composite extensions, which combine the first two. The metaphor expansion algorithm first searches for the metaphors related to the new metaphor, and then selects the closest related metaphor by calculating the conceptual distance between the new metaphor and related metaphors, and applies the metaphor to explain the new metaphor, and finally stores the new metaphor. When new metaphors are identified, they are grouped into specific categories that can judge the growth of negative emotions within a group.

## 5   Conclusion

The rapid development of emotional metaphor computing has been demonstrated in machine translation and robot dialogue. Since groups are more emotional than individuals, this technology should be paid attention to by researchers and practitioners of group mentality management. This paper divides the development process of group mentality into four reasonable phases, and then discusses the needs of emotional metaphor calculation in four phases of group mentality from the needs of public management. Based on the special needs of group mentality management, this paper discusses the selection and application of existing emotional metaphor computing system, and puts forward some improvement schemes and special application schemes for some systems. It is not hard to see that emotional metaphor computing is not only limited to the scope of public opinion monitoring, but also can play a deeper and broader role in the management of group mentality. At the same time, based on the needs of special scenes, it is also helpful to improve the emotional metaphor computing system.

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