



# Study of Emotion Models: A Survey

<sup>1</sup>Sonia Xylina Mashal, <sup>2</sup>Kavita Asnani

<sup>1,2</sup>Department of Computer Engineering, Goa College of Engineering, Goa University Farmagudi, Ponda-Goa  
Email: <sup>1</sup>soniamashal31@gmail.com, <sup>2</sup>kavita@gec.ac.in

**Abstract** — Emotion can be described as the reaction of the brain after encountering a sudden situation. Emotion is the behavioral tendency of the brain. Emotion classification in text is an emerging field with a lot of study being done recently. Emotion classification in text helps to find out the author's state of mind when the text was documented. For having better results, a good dataset which is annotated with proper emotion tag is a must, for this we need to refer to certain dimensional models for having appropriate words for collection of dataset. This paper briefly describes four emotion models and whether they can be used for emotion tagging in emotion classification projects.

**Keywords**— emotion, emotion classification, model.

## I. INTRODUCTION

The rise of social media sites gave birth to the method of communication technique we now know as instant messaging where there is a lot of communication taking place using emoticons and short forms. Text based representations of feelings are used in texts. Having a conversation online or communicating through text messages has led to the loss of importance of human communication. A personal conversation, where the other person is standing right in front of you or sitting across involves verbal communication, whose meaning can be affected by the person's voice tone or facial expressions. Voice modulation, intonation and the body language of a person tend to convey our emotions, which are lost in instant text messaging. Hence there is a need to develop methods to detect and analyze emotions from texts.

In linguistics, the automatic computation and detection of emotions from text is becoming one of the highly researched topics, even in terms of many applications, automatic detection of emotion would be considered as a plus point. Even though, the study of emotion began way back in the 1980s, computation of emotions from text is a very young field. Emotion computation poses more of a challenge with the amount of social media data available because having a standard dataset for lexical analysis is problematic. Annotating the data has issues of its own because if human expert is used he can be biased and collecting annotated data from online resources is difficult. Emotion analysis on Twitter data pose problem of length since the author tries to express all his emotions within that short length and also the

increasing content of slang increases the preprocessing required.

The term 'emotion' has various descriptions according to the different studies conducted by psychologists. Many psychologists have modeled their work based on the previously given theories. Some of the emotional models are discussed in the later sections.

## II. LITERATURE SURVEY

Emotion, in layman language, is any relative conscious experience which can be characterized by high and instant mental activity. The high mental activity can be considered together along with a high degree of pleasure or displeasure. Emotions are a complex state of mind. Some theories state that emotions are a state of feeling that can result in psychological and physical changes that influence a person's behavior. The understanding of emotions is closely related to the level of activity at that particular point of time by the human nervous system with various levels and strength of activity relating, to particular emotions. Emotion is a strong feeling which derives from one's method of forming judgment about circumstances, event or relationships with others.

The extensive research on emotions have led to two fundamental viewpoints for classification of emotions: (i) emotions are discrete and differ from each other; (ii) emotions can be classified into groups based on appropriate dimensions. Dimensional models of emotion make an attempt to characterize human emotions by defining whether they lie in two or three dimensional space. Most emotional models include active (valence) and alertness (arousal or intensity) dimensions. Dimensional models of emotion propose that a common and interconnected neural and physiological system is mainly responsible for all core states of mind.

Some dimensional models contrast theories of basic emotion,. The primary theories of emotion propose that different emotions arise from different behavior of the neural systems. Many dimensional models of emotion have been studied, researched and developed, but only a few amongst them remain as the dominating models. Some of these dimensional models can be used for emotion classification in text, which can be document,

sentence, short message or tweets. The models are used for data collection in emotion classification.

### III. BRIEF DESCRIPTION OF EMOTION MODELS

The following sections provide a brief description of four dimensional models giving precise details about them and a mention on whether they can be used for data collection task for emotion classification in text.

#### A. Circumplex Model

The Circumplex model was proposed in 1980 by James Russell. It is also known as the Russell's model. The Circumplex model said that the affective states are represented as a circle in a two-dimensional bipolar space. Affective state is the raw form of feeling for a certain mood or emotion[1]. For conceptualizing this model two types of theories were considered:(i) theories on how laymen conceptualize affective states and (ii) theories from multivariate analyses of self-reported affective states. The eight basic emotion variables considered are arranged in a circular two-dimensional space in a manner which can be considered similar to points on a compass. The horizontal (east-west) dimension in this model is the pleasure-displeasure dimension, and the vertical (north-south) dimension is arousal-sleep dimension. The remaining four variables do not form any emotion independently, but help to define the quadrants of the space.[2]

The Circumplex model does emotion tagging by placing 28 words in eight different categories over a two-dimensional circular space. The model was developed to cater to the needs of psychology domain with applications such as identifying emotions in pictures. This model can also be used by laymen as a memory map for emotions. The challenges faced during the conceptualization process of this model was that each word used for emotion tagging appeared to lack sharp boundaries in the sense that it was possible to place it in a number of categories, with the probability associated with placement in each category varying systematically with the position of the category in the circular order[2,3]. This model can be used for emotion tagging in text because there are 8 discrete emotion categories along with 28 words classified into them. These 28 words can be used for dataset collection and training classifiers.

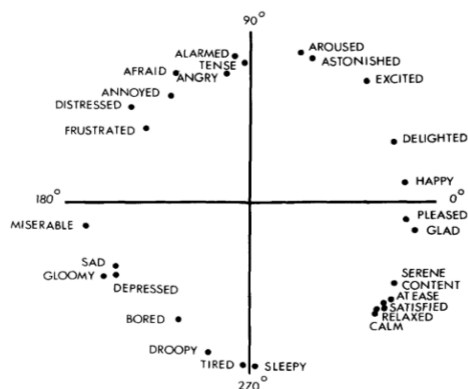


Figure 1: Circumplex model[2]

#### B. Lövheims Cube of Emotion

Lövheims cube of emotion is a three-dimensional model for monoamine neurotransmitters and emotions. In this model the monoamine systems are represented along the orthogonal axes and the eight basic emotions as defined by Tomkins are placed at each of the eight extreme corners of the cube. The most important monoamine neurotransmitters are serotonin, noradrenaline and dopamine. They are essential in the control of behavior and emotions. The serotonin axis represents self-confidence, inner strength& satisfaction. The dopamine axis is involved with reward, negotiation and reinforcement. Noradrenaline axis represents activation, vigilance and attention.[4]

Emotion tagging is done on the varying levels of monoamine neurotransmitters and the eight basic emotions as labeled by Tomkins. The model finds application in the neurobiological domain with a focus on understanding of psychiatric illness and effect of psychotropic drugs. Even though Lövheims cube is well modeled, it needs to be empirically tested to establish its validity[4]. The model cannot be used for emotion tagging in text because it's a three-dimensional cubic model and detecting the effect of monoamine systems in text is difficult.

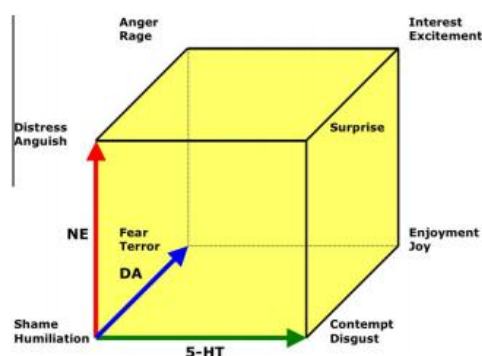


Figure 2: Lövheims cube of emotion[4]

#### C. Vector Model

The vector model was built along the dimensions of pleasantness and arousal. The model was constructed based on experiments conducted for incidental memory performance for pictures. A collection of pictures was

given as input to test the memory of the subjects over short and long time periods. After the experiment, the authors concluded that the long-term memory performance of human beings is mainly affected by arousal. [5]

The vector model defines emotion across pleasantness and arousal considering the intensity of the emotion. The domain this model addresses is checking memory performance for pictures with an application in testing of word and picture stimuli[5]. It cannot be used for emotion tagging in text because the emotion words are not discretized. Hence it is not a good option to consider this model to be used for data collection for emotion classification in text.

D. PANA Model

The model is known as Positive activation and Negative activation(PANA), it is named so because it proposes two large bipolar dimensions: Positive effect and Negative effect. It is inheritably related to the many factor for emotion which are proposed for discrete-emotions. The first factor Positive effect represents the extent to which a person avows a zest for life. The 2<sup>nd</sup> factor, Negative effect is the extent to which a person reports feeling upset or unpleasantly aroused.[6]

The model can be used for emotion tagging because a lot of words are defined with comparison of various studies. The domain addressed by this model is Mood Research; analysis of facial expression, tones of voice[6]. The challenges faced are optimal rotation in space between the two factors that are considered for conceptualizing the model[6]. This model is robust and stable. It can be used for emotion analysis because it had defined positive & negative emotion words. The model would provide a good background in text classification for classifying whether the polarity of given document , word, sentence or message is positive or negative, which can be further used in fields of opinion mining and Sentiment analysis.

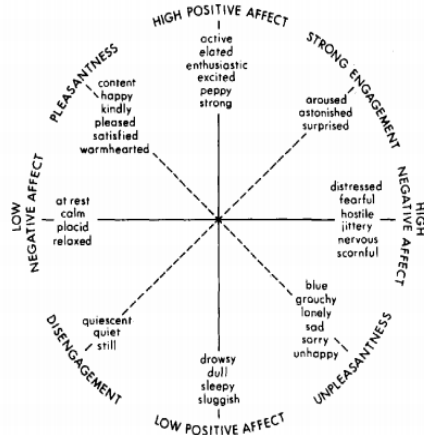


Figure 3: PANA Model[6]

E. Models in Emotion Classification

Most of the research work carried out in the field of emotion classification mainly uses Ekman’s model for

classification of emotions. Paul Ekman carried out a study to identify emotion based on different facial expressions between different cultural people, this study was done to find out whether people from different cultures have same facial expressions to represent certain set of basic emotions[7]. Ekman’s model provides six discrete emotion categories namely happiness, sadness, anger, disgust fear and surprise[7]. These six categories are used for dataset collection for emotion classification tasks in tweets along with other analogous words described by Robbs wheel of feeling[8]. Robbs was an English teacher who summarized a list of words into basic emotion categories. Similarly only the six basic categories from Ekman’s theory can be used for multisource online news tagging[9], or these words along with some seed words related to the basic words can also be used for data collection.[10]

Table 1: Table to specify whether a model can be used for emotion tagging.

MODEL	WHETHER CAN BE USED FOR EMOTION TAGGING IN TEXT?
Circumplex model	Yes
Lövheims cube	No
Vector model	No
PANA model	Yes

IV. CONCLUSION

Emotions are very complex to understand. The dimensional models for emotions provide an insight into the functioning of the human brain and capabilities of human memory. This paper briefly described the four models with respect to emotion tagging for categorizing text into certain emotion category.

REFERENCES

- [1] James A. Russell, “Emotion in Human Consciousness Is Built in Core Affect”, Journal of Consciousness Studies,12,No.8-10,pp 26-42, 2005.
- [2] James A. Russell, A Circumplex Model of Affect,Journal of Personality and Social Psychology , Vol. 39, No. 6, 1161-1178,1980.
- [3] Nancy A. Remington, Leandre R. Fabrigar, Penny S. Visser, “Reexamining the Circumplex Model of Affect”, Journal of Personality and Social Psychology , Vol. 79, No, 2, 286-300, 2000.
- [4] Hugo Lövheim, A new three-dimensional model for emotions and monoamine neurotransmitters, Medical Hypotheses 78 (2012) 341–348.
- [5] Bradley, M. M.; Greenwald, M. K.; Petry, M.C.; Lang, P. J, Remembering Pictures : Pressure & Arousal in Memory, Journal of Experimental Psychology: Learning,Memory, & Cognition

- [6] David Watson; Auke Telleger, "Towards a consensual structure of Mood", Psychological Bulletin, Vol. 98, No. 2. 219-235, 1985.
- [7] Paul Ekman, "Universals and Cultural Differences in Facial Expressions of Emotion", Nebraska Symposium on Motivation, Vol 19, 1971.
- [8] Liza Wikarsa, Sherly Novianti Thahir, "A text mining application of Emotion Classifications of Twitters Users using Nave Bayes Method", IEEE 2015.
- [9] Li Yu, Zhifan Yang, Peng Nie, Xue Zhao, Ying Zhang, "Multi-Source Emotion Tagging for Online News", 12th Web Information System and Application Conference 2015.
- [10] Saima Aman and Stan Szpakowicz, "Identifying Expressions of Emotion in Text", Springer-Verlag Berlin Heidelberg 2007.

