

## **A SURVEY ON VARIOUS TYPES OF EMOTION MODELS AND ITS IMPORTANCE IN EMOTION RECOGNITION THROUGH SPEECH**

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### **Abstract**

In Last couple of year's artificial intelligence has crop up as an important research area. Emotion recognition as subfield of artificial intelligence can be considered as a highly developed field and researchers has contributed significantly in this area. Hence it is very important to know fundamental of emotions, basic emotions and different model to categories them. This paper will provide enough information on researcher's contribution on defining basic emotions. Emotion recognition majorly performed through speech or voice and facial expressions. This paper contains survey on considering basic emotions in Indian language and future aspects.

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### **Keywords:**

Emotion,  
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## 1.Introduction

Artificial intelligence is an interdisciplinary research area which is composed of various subfields like Natural language processing, emotion recognition, Robotics, neural networks, machine learning etc. Several applications like Assign priority to customers in various call centres, Artificial Intelligence and Robotics, Lie Detection system, Language Conversion and many more has proved Emotion recognition as considerably highly developed area since several decades [1, 2]. Hence to know about History of emotion, various basic emotions and related issues with it is important.

People communicate to each other by using various language, for effective communication people uses different facial expression, head movement, body movement, posture and emotions naturally but majority of the Emotion recognition has been done from speech or image [3]. This paper have contains reviewed from speech only. As the researcher provide a significant contribution in emotion recognition from speech in several languages but this paper intentionally focused for Indian language only.

Emotion recognition and its effectiveness is highly depends on considering and types of emotions, and how they are shaped.

This paper has been arranged as follow: 1) Introduction 2) what is emotion 3) Theories of emotion 3) Types of emotions 4) Basic emotions: Emotion recognition in Indian language 5) Conclusion

## 2.What is Emotion

Emotion is uncertain and subjective in nature so it is hard to define, but still many researchers has defined it like following manner. According to Oxford English Dictionary, 1987 emotion has been defined as a "mental feeling or affection as distinct from cognitions or volitions". As per Oatley 1994," emotion is a mental state". According to Cannon and Philips bard stated that "feelings are the result of physical reactions to a stimulating event" in 1927. Schachter and Singer 1962 define emotion as "emotion is a cognitive tounderstanding how emotional states are

determine by cognitive factors. The term emotion has been utilized with different meaning for various purpose [4, 5, 6].

In general Human emotions can be defined emotions as it is complex psychological states that consist of psychological arousal, expressive behaviors, conscious thoughts and feelings [7].

## **2.1 Theories of Emotion**

Based on research by various neuroscientists and psychologists emotion plays important role in for taking decision. Emotion aided events remember for longer duration than natural events. Normally emotions are highly influence by culture, evolution and subjective experiences. It is very important to know that emotions are highly subjective matter, so their classification is challenging task. Researchers and psychologists are keen to identify that emotions can be categories or recognize in universal manner or not. Culture and society have a considerable weight on the expression of emotions. Researchers and scientists have define the emotions types/ states based on nature of it. The following represented. As the fundamentals and context of psychology emotions are subjective in nature, so it is hard to find ecumenical rules to categories them. After examining the history, emotion can be categories from different approaches. One of them is emotions can be divided in to two parts one is discrete and other is continuous.

There several ways by which researchers have define the emotions and various types of approach. The first way to define is discrete approach for emotions and continuous approach for emotions. Few model also combine the discrete approach and continuous approach both to gather for define a type of emotion.

Aristotle has defined the positive and negative emotions. In 1872, Charles Darwin and his theory of evolution has noticed emotions revolved with evolution researched the expression of emotions in comparison with animals and human being. Then after several physiologist have contributed.

## **2.2 Types of emotion**

Emotions can be categorised in following way. 1) Primary and secondary emotions 2) Discrete emotions and continuous emotions.

### 2.2.1 Primary emotions and Secondary emotions

One way to categories the emotions can be a primary emotions or secondary emotions. Primary emotions are the first sense experience or response about an event. Primary emotions are correlated with our thoughts for example: anger. Secondary emotions those which are reactions of others so naturally they are in time and sequence [8, 9].

### 2.2.2 Discrete and Continuous emotions

Another way to categories the emotion is either it can be discrete approach or continuous approach.

#### The Discrete approach of emotions

In discrete approach, fixed number of emotions are considered as a universal emotions for example Ekman, Friesen has considered to define seven basic emotions as follows: Joy, fear, sadness, anger, contempt, disgust, and surprise and other emotions have been considered or generated by a combination or mixtures of basic emotions [10].

Table-1. Few basic emotions considered by various Researchers

Sr. No	Theorist	Basic emotions	Total basic emotions
1	Plutchik	Acceptance, Anger, disgust, sadness, Surprise, fear, trust, joy	8
2	Silvan Tomkins	Surprise, interest, joy, rage, fear, disgust, shame, and anguish.	8
3	Paul Ekman	Joy, fear, sadness, anger, contempt, disgust, and surprise.	7
4	McDougall	Anger, disgust, elation, fear, subjection, tender-emotion, wonder	7
5	Izard	Anger, contempt, disgust, distress, fear, guilt, interest, joy, shame, surprise	10
6	Mowrer	Pain, pleasure	2

Additionally these basic emotions were valid universally and it can be easily separable by the people in the universe. Hence deciding a basic emotion is a critical task and it has major impact in further distributions. As per the references and literature survey Table 1 provides the information about the considering basic emotions by researchers. It might be possible that work of all the researchers have not been mention in table-I [11, 12, 13, 14, 15].

### The Continuous approach for emotions

On the other hand in the continuous approach all the emotions have been defined in an N-dimensional emotional space, Where each dimensional is emotion primordial, which are purely subjective in nature. The 2D valence-arousal emotion space is defined as per Figure-1 [16]. Thayer has come up with circumplex model for emotions. The model abides of a two-dimensional one is vertical dimension is arousal and horizontal axis is valence in additionally circular structure. Within this structure, emotions that are inversely correlated are placed across the circle from one another.

A well-known three-dimensional model developed by Schlosberg [17]. He has proposed to consider each emotion can be deliberated as a linear combination of potency (or power), valence (or evaluation), arousal (or activation). All these three primordial are three dimensions of space.



Figure 1. Thayer's arousal-valence emotion plane

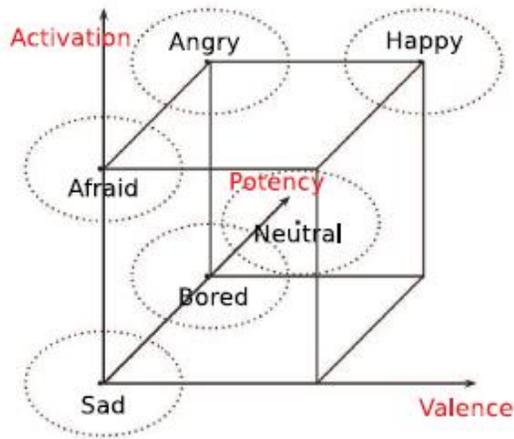


Figure-2. Basic emotions (total-6) in three dimensional emotions space

Valence elucidates whether emotion is positive or negative. Arousal delineates the degree of excitement or involvement of the individual in the emotional state; potency accounts for the strength of the emotion.

Both previous approaches can be amalgamated by placing discrete emotions in a continuous space. Figure 2 shows the location of six common basic emotions in the Schlosberg space. Other examples are Thayer's valence-arousal representation or Plutchik's emotional wheel as shown in figure-3.

### 2.2.3 Plutchik's Wheel of Emotions:

To illustrate different emotions Robert Plutchik formulated a wheel of emotions. In 1980 to know how emotions are correlated, Plutchik proposed his wheel model (2D) or Cone-shaped model (3D).

He suggested 8 primary bipolar emotions: anger versus fear, trust versus disgust, surprise versus anticipation, joy versus sadness. With acquaintance between emotion circle and colour wheel circumflex model was defined. To form different emotions, like colors, primary emotions can be uttered at different intensities and can commix with each other. Plutchik's wheel can be understood by this way. Primary: as mentioned in Figure-3 there are eight primary emotions are employed. Example: anger, anticipation, joy, trust, fear, surprise, sadness and disgust. Intensity: Intensity formalize on the vertical axis of cone. As it goes from outside to

centre, Intensity is increase. Relations: Each circle sector has an opposite emotion like the opposite of joy is sadness. As shown in wheel the emotions with no colour represent an emotion that is a mix of the 2 primary emotions as per wheel of Robert Plutchik.

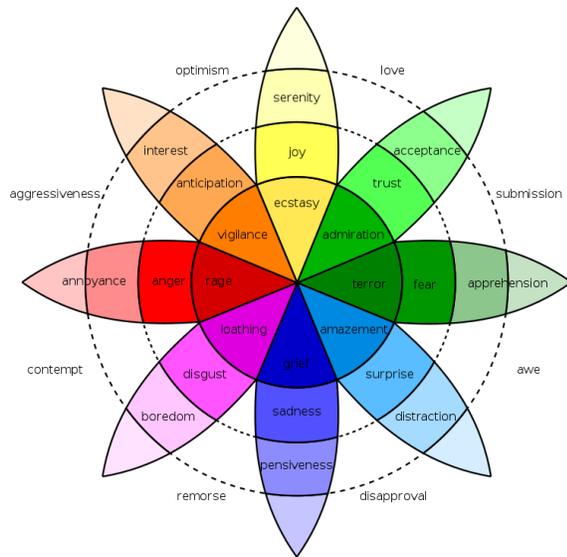


Figure-3.Plutchik's Wheel model for distribution of Emotions

### 3.Emotion Recognition from speech perspective (India)

As mention earlier emotion recognition from speech highly depends on how basic emotion are shaped and consider so, this paper contains several survey on how many basic emotions are considered in Indian language for emotion recognition as per literature [2].

This adequate knowledge about emotions will provide how to determine emotional state and relevant features that are distinct this state from each other. Emotion Recognition and considering various types of emotions are highlighted as per Table-2. Sanskrit can be consider as mother language of almost all Indian languages. According to few literature survey 9(Nine) basic emotions are defined in the history of culture. (Sanskrit- Meaning: Shanta- Peace, Raudra- Anger, Veera- Courage, Karuna-Sadness, Bhayanaka- Fear, Vibhatsya- Disgust., Shringara- Love, Hasya-Joy, Adbhuta- Wonder) [18].

Table-2.Researchers have consider several basic emotions and recognition them properly

S. No.	Name of Indian Language	Types of Emotions recognition through speech	Ref.
1	Hindi	Neutral, Happy, Sad, Anger (04)	Agarwal (2015)
2	Hindi	Happy, Sad, Surprise, Neutral, Anger (05)	Pawar (2015)
3	Marathi	happy, angry, sad, surprised, fear and neutral (06)	Darekar (2016)
4	Malayalam	neutral, happy, sad and anger (04)	Rajisha (2015)
5	Malayalam	Boredom, Fear, Surprise, Calm, Anxiety, Neutral, Happy, Sad and Anger (09)	Firoz (2016)
6	Assamese & Bodo	sadness, surprise, anger, disgust, fear, and happiness (06)	Aditya (2010)
7	Assamese	Neutral, sad, surprise, anger, disgust, fear and happy [07]	Amiya (2015)

#### 4. Conclusion and future work

Emotion is highly subjective matter so it is difficult to define universal. This fundamental impediment is a main hurdle towards research. As far as emotion recognition is concern number of emotions and kind of emotions ultimately control emotion recognition rate. Emotional features are not universal hence making universal emotion recognition system is very important at this point of time. This adequate knowledge will help us to carry out emotion recognition in Indian languages.

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