A Survey: Techniques of Facial emotion recognition

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ABSTRACT

Human faces provide various information about emotions. As per psychological researcher, a person expresses his emotions less by verbal talk and more by non verbal body posture and gestures. Emotion recognition or Affective Computing (AC) being the AI related area imparts intelligence to computers in recognizing human emotions. Emotion recognition is proved to be a popular research area topic in few decades and as an interesting area of interest for the researchers. There are study performed mainly on six basic emotions that include happy, sad, anger, fear, disgust, surprise. In this paper we present a literature survey on facial emotion recognition.

Keyword : - *emotion recognition, techniques of emotion recognition, image.*

1. INTRODUCTION

Emotion recognition has been an increasingly popular research area topic in recent year. According to James-Lange Theory, actions precede emotions and the brain to interpret said actions as emotions. A situation occurs and then the brain interprets the situation, and causes a characteristic physiological response. This may include any or all of the following: heart rate elevation, perspiration, facial and gestural expression. These reflexive responses occur only before the person is aware that he or she is experiencing an emotion or only when the brain cognitively assesses the physiology that is it labeled as an "emotion". Whereas, Cannon and Bard opposed the James-Lange theory by stating that the emotion is felt first, and only then the actions follow from cognitive appraisal. In their view, the Thalamus And Amygdala play a central role; that interprets an emotion-provoking situation. It simultaneously send signals to the ANS (autonomic nervous system) and to the cerebral cortex which interprets the situation cognitively. Also Schachter and Singer agreed with James and Lange stating that the experience of emotions arises from the cognitive labeling of physiological sensation. However, they also believed that it is not enough to explain the more subtle differences in emotion self-perception, that is between anger and fear [1].

In 1994, Ekman found the evidence supporting the claim about universality of facial expressions or mimics which was speculated since Charles Darwin's "The expression of the emotions in man and animals". These universal facial expressions represent emotions such as happy, sad, anger, fear, surprise and disgust. Along with neutral emotion, facial expression sums up to seven universal emotional classes. Since then, interest in this type of interaction is been increasing [2].

There are various emotion recognition applications being implemented through various approaches. Facial expression presents key mechanism that describe human emotions. From starting to end of the day human changes plenty of emotions, it may be either because of their mental or physical circumstances. Facial Action Coding System (FACS), is the earliest method of characterizing the physical expression of emotions. It was developed in 1978, by Paul Ekman, along with Wallace Friesen and is still widely used today. The system is used to measure all visually distinguishable facial movements and for encoding movements of facial muscles that result in changes in the appearance of the face. Ekman and Friesen studied anatomy and found the associations between the action of muscles, and the changes in facial appearance. Some appearance changes are the outcome of movements of multiple muscles and some muscles can have more than one action. Because of this, they named the measurements of FACS as action units (AUs). AUs are the actions that are performed by an individual muscle or muscles in

combination. FACS consists of 46 AUs of which 12 are for upper face, 18 are for lower face, and AUs 1 through 7 refers to brows, forehead or eyelids. The six basic emotions are: anger, disgust, fear, happiness, sadness, and surprise [4].
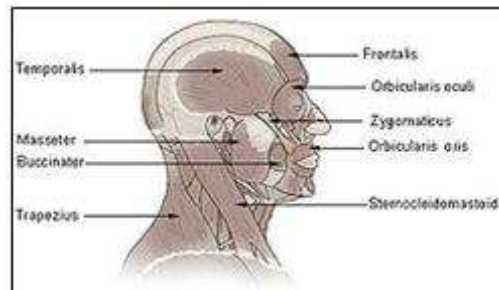

Fig -1: Muscles of the head and neck

2. LITERATURE SURVEY

Emotion recognition is defined as the process of identifying human emotion, most typically from facial expressions. This is both something that humans do automatically but computational methodologies have also been developed. The automatic emotion recognition provides techniques from multiple areas, such as signal processing, machine learning, and computer vision. Human face is said to be most expressive that express various expression such as fear, sad, happy, disgust, anger, neutral. There are various techniques that help to automatically recognize emotion that are illustrated in this paper.

2.1 Real Time Facial Emotion Recognition using Kinect V2 Sensor

The paper presented by Hesham A. Alabbasi et. al. Real Time Facial Emotion Recognition using Kinect V2 Sensor. It also includes the Facial Action Coding System (FACS), that is the method of characterizing the physical expression of emotions.
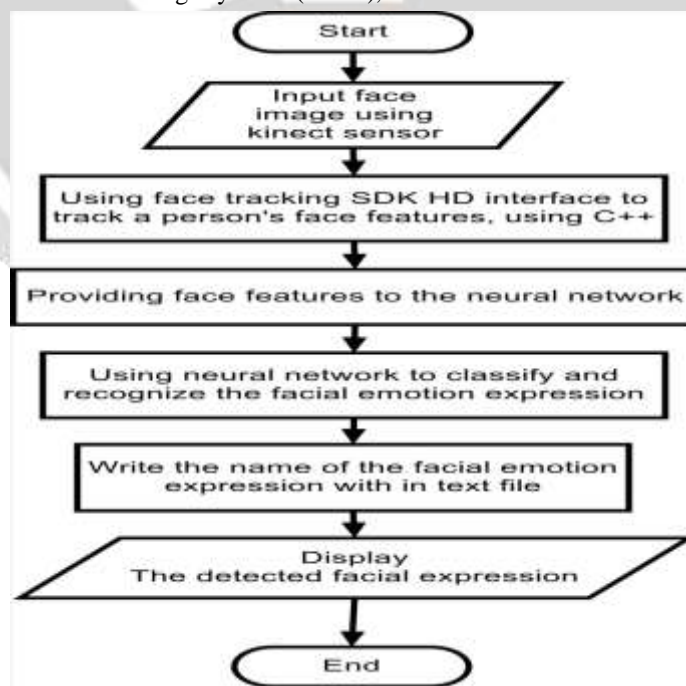

Fig -2: Flowchart Of Methedology

The Kinect for Windows v2 sensor is a device that has depth sensing technology, a built-in color camera, an infrared (IR) emitter, and a microphone array, which enables to sense the location and movements of people. The Kinect sensor camera gives 30 frames in one second and a set of 23 face animation unit values for each frame. The Microsoft Face Tracking Software Development Kit for Kinect for Windows, enables to create applications that can track human faces in real time. Face Tracking SDK includes a face tracking engine, that analyzes the input from the Kinect camera and detect the head pose and face features depending on the points that can be tracked, and also generate information for the application in real time. The system include: A multilayer feedforward neural network that is implemented using the simple NN tool present in Matlab. In application, NN is used for classifying and recognizing the expression in each frame. The system is tested on many persons stored in the database, and gives a very good result and the identification rate of about 96% [4].

2.2 Exploring Principles-of-Art Features For Image Emotion Recognition

In this paper, the author investigated the concept of principles-of-art and its influence on image emotions. Principles-of-art-based emotion features (PAEF) are extracted to classify and score image emotions for the purpose of understanding the relationship between artistic principles and emotions. PAEF are said to be the unified combination of representation features that are derived from different principles, including balance, emphasis, harmony, variety, gradation, and movement. There are various experiments on the International Affective Picture System (IAPS), a set of artistic photography and a set of peer rated abstract paintings, that demonstrate the superiority of PAEF for affective image classification and regression (with about 5% improvement on classification accuracy and 0.2 decrease in mean squared error), as compared to the state of-the-art approaches. The PAEF is also used to analyze the emotions of master paintings, with promising results [5].

2.3 Emotion Recognition From Facial Expression Based On Bezier Curve

This paper includes the feature based approach, that is automatic detection of eye and mouth from a still image. The technique here include two noteworthy steps: the initial step is the location and examination of the elements of the data, and the second step is the acknowledgment of the facial feeling of the trademark highlights. The initial step include the locale of eye and mouth from a still picture utilizing Canny Edge Detection calculation produced by John F. Watchful in 1986. The Color space changes and lighting pay is performed next. For this situation a skin shading based methodology utilizing YCbCr model, with shading model, Y, a solitary part that speaks to luminance data and shading data is put as two shading contrast segment, Cb and Cr. Part Cb is the contrast between the blue segment and a reference quality, and segment Cr is the distinction between the red segment and a reference esteem. Then big connect interfaces operation is applied to skin separated eye lead to the disposal of minor part and the outcome is the significant segment of the eye. The bend calculation on the resultant picture that is on eye is applied. For applying Bezier bend, the beginning and completion pixel of the eye in flat is located. Finally, extracted features like eyes and mouth, obtained after processing is given as input to the curve algorithm to recognize the emotion contained. Experimental results show average 60% of success to analyse and recognize emotion detection [6].

2.4 Human Emotion Recognition System

This paper discusses the application of feature extraction of facial expressions with a combination of neural network. The purpose of the paper is the recognition of different facial emotions that include happy, sad, angry, fear, surprised, neutral. Humans are capable of producing thousands of facial actions during communication that vary in complexity, intensity, and meaning. This paper analyses the limitations with system that is Emotion recognition using brain activity. In this paper by using an existing simulator I, 97 percent accurate results are acquired. This system depends upon human face as known that face also reflects the human brain activities or emotions. In this paper neural network has been used for better results [7].
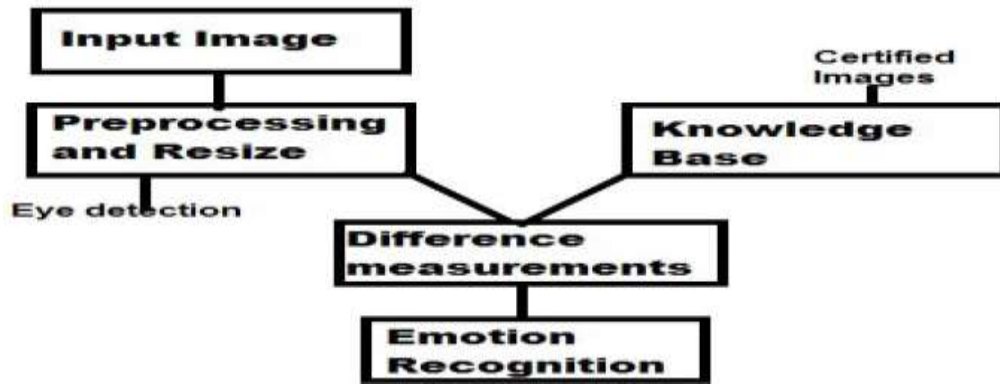
Fig -3: How Emotion recognition system work

2.5 Facial expression (mood) recognition from facial images using committee neural networks

The author states that facial image based mood detection techniques may provide a fast and practical approach for non-invasive mood detection. The purpose of the paper was to develop an intelligent system for facial image based expression classification using committee neural networks. the methods includes, where several facial parameters were extracted from a facial image and were used to train generalized and specialized neural networks. Based on initial testing, the best performing generalized and specialized neural networks are included into decision making committees that forms an integrated committee neural network system. The integrated committee neural network system is evaluated using data obtained from subjects not used in training or in initial testing. The system correctly identifies the correct facial expression in 255 of the 282 images, from 62 subjects that are not used in training or in initial testing.
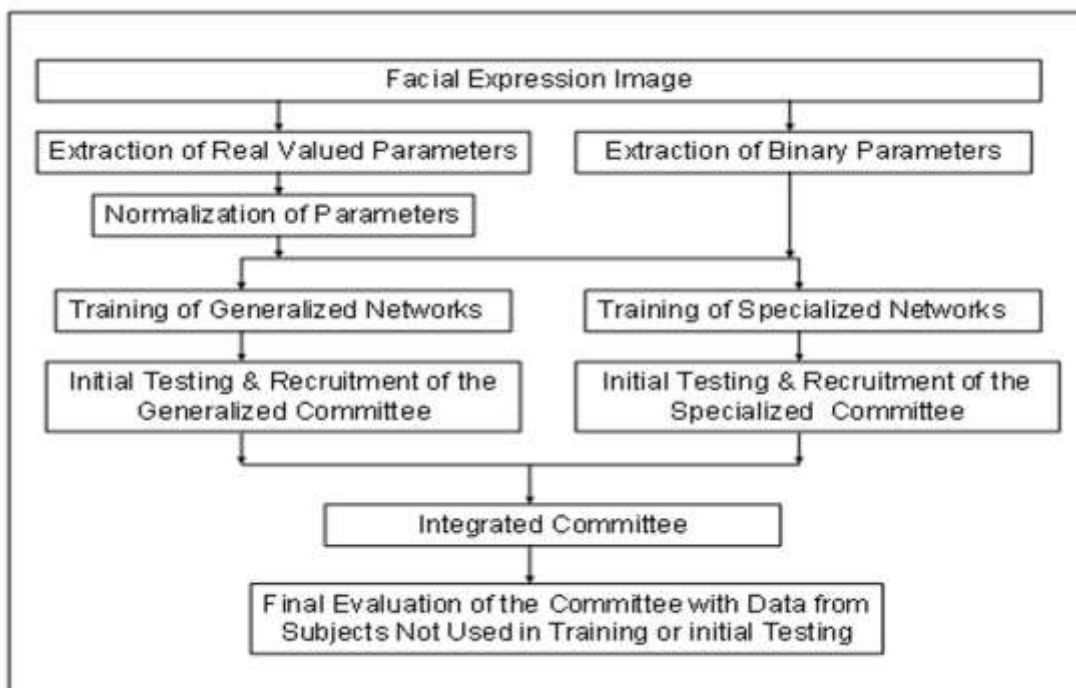

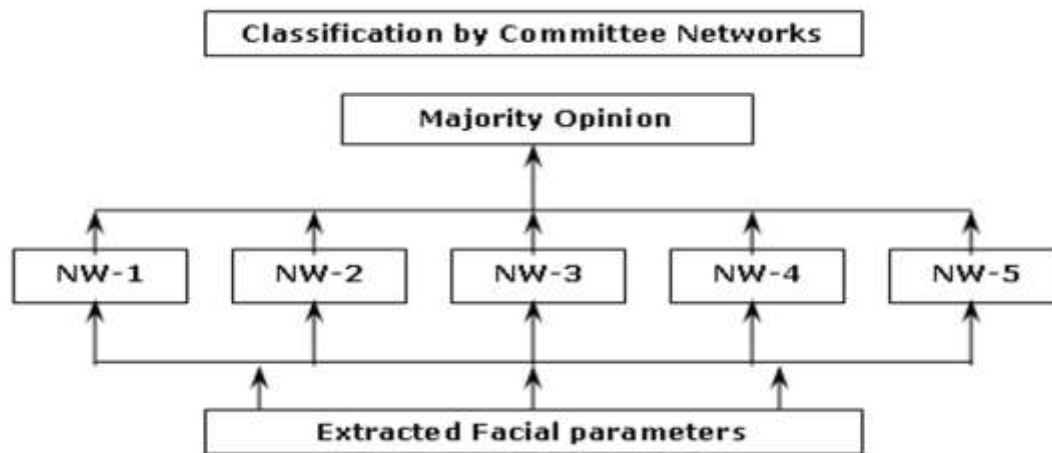**Fig -4: An overall block diagram of the methodology.**

Fig -5: Five-network committee neural network architecture

The present study demonstrated the development and the application of committee neural networks to classify seven basic emotion types from facial images. The integrated committee neural network system consisting of generalized and specialized networks, can classify the emotion depicted in the facial image into one of the following emotions: neutral, angry, disgust, fear, sad, surprised or happy. The integrated committee decision provided 90.43% accurate and reliable classification [8].

3. CONCLUSIONS

In this paper we have presented various approach for facial emotion recognition in the images. There are various techniques that are implemented for emotion recognition through image, whether it be a real time image or still image. There are various databases available for the purpose of emotion recognition. Through this paper it is well understood that emotion recognition is done through different method such as ensemble of feature, principal Principles-of-art-based emotion features (PAEF) and various classification algorithm that help in classifying the emotions.

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