International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-3, February 2019

Facial Emotion Recognition Through Hand Gesture and Its Position Surrounding The Face

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Abstract: ***For effective interaction with computers as human being, need to recognize and understand human emotions through the analyzing of the human 'effective state, physiology and behavior. This paper is designed to focus on different types of emotion recognition study based on face and hand gesture. Human Computer Interaction (HCI) systems is designed for the machine to behave as normal as human beings. So, for the same objective, need to develop algorithm, technology which can used to track, detect, understand facula movements, hand gesture, position of hand surrounding the face to ensure about the human emotions in an effective way. Here we will try to design a basic framework for a vision-based multimodal analyzer. This analyzer is used to combines the feature of face and hand gesture to get better results than the existing ones.***

Keywords: Facial Emotion Recognition, Hand Gesture Recognition, Human Computer Interaction, Multimodal Interface,

I. INTRODUCTION

Facial emotion is one amongst the foremost vital characteristics of human feeling. Its scientific study began as late 1872, with the work of Charles Robert Darwin. He has mentioned about the human emotions in his book "The Emotion of the Emotions in Man and Animals". Many researchers noticed after deep analysis that the human emotions through number of changes in response to person's internal spirit, intentions, muscles movements or social environment. Nowadays, due to automatic recognition of human emotions, many fascinating real time applications such as interactive games, data-driven animation, sociable artificial intelligence, online/remote education and lots of others Human-Computer Interaction (HCI) systems [1-3]. Human Emotions Recognition is a task where humans recognize other 'very easily and effortlessly, however that's not nevertheless simply performed by computers. a great deal of analysis work has tried to form computers reach identical accuracy of humans, and a few samples of these works are highlighted here. This drawback continues to be a challenge for computers as a result of it's terribly laborious to separate the emotions feature area. Figure-1shows 3 subjects with a cheerful emotion.

Manuscript published on 28 February 2019.
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As will be seen within the figure, the pictures vary a ton one type one another not solely within the means that the themes show their emotion, however additionally in lighting, brightness, position and background [4].

Figure-1: Three different subjects with a happy emotion.

Gesture is a non-verbal way of effective communication. Gesture recognition is an interface with a system using some particular hand gestures. Hand gestures is one of the major contributed area to recognize more accurately then the other hand gesture during communication. For recognizing more accurate emotions its plays a very vital role in recognition and classification portion. Here, the hand gesture is taken as an input and the output associated with that particular hand gesture is generated [Figure 1]. Recognizing gestures as input enables computer systems to be more accessible or user friendly for the physically-impaired and makes interaction more exciting in a gaming or 3-D virtual reality environment [5].

II. PROBLEM DOMAIN

Facial expression recognition based on hand gesture include analysis of various techniques such as machine learning, computer vision, Artificial intelligence, Artificial Neural Network and so on. These all have some issues during the designing of any recognitionsystems.so we have to take care these issues. The following steps are taking care during human emotion recognition based on hand gesture. –

1. A database for facial emotions and hand gesture should be created.
2. Tracking the facial expression and hand gesture and its position on an image sequence.
3. Withdrawal the information of the face a hand gesture from features selection.
4. Recognition and classification of a human 'emotions

III. EMOTION AND INDIVIDUAL

Human 'Emotion is tough to recognize also there is no universally accepted single definition for the human 'emotions. because it's just a feeling which appear on the face after getting or face many circumstances weather it's a good or bad.

The word 'emotion' is employed with the inner feelings of someone and can be expressed promptly with hand gesture to display human emotions more accurately. Researchers have developed varied taxonomies of feeling connected words to be used in several domains or contexts. a number of these categorize words in line with linguistic anal, some by scaling of similarity judgements [figure-2], or some by analyzing feeling events in varied eventualities [6].

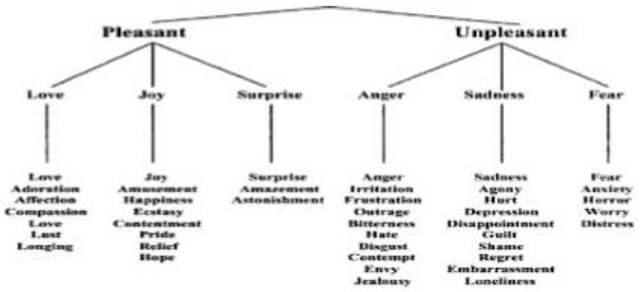

Figure-2: Illustration of Shaver et al's (1987) Hierarchical Structure of Emotions

Emotion word have several refined reminders that means in numerous contexts that don't perpetually without delay lend to easy translation between languages. Baron-Cohen likens his classes to the color spectrum: "We will consider these twenty-four teams as being kind of like the color spectrum, that is comprised of teams of colors (the Red cluster, the Blue cluster, and so on), that have reminder colors among them (e.g. reminder blue comparable to turquoise and aqua-marine are within the Blue Group). Thus, each feeling falls into a selected cluster (e.g. ill-tempered and furious are within the Angry Group). after we use a word like "blue" it might seek advice from an entire cluster of colors, or it might seek advice from the clearest, most common example of a shade of blue, among that cluster. Therefore, it's with emotions after we use the word "angry" it might seek advice from a bunch of emotions, or it might seek advice from the clearest, most common example of a shade of anger, among that feeling cluster [7].

IV. FACIAL EXPRESSION

Facial expression contains many emotions for many feelings. It shows pain, love, anger through many types of emotions. Facial expression recognition system indicates various human emotions activities which are used in many real time applications such as in education, medical science to understand the internal situation of patient who is unable to express through his or her face, also in phycology. The six universal emotions which are given by Paul in 1986 Are-Happy, Sad, Anger, Surprise, Fear and disgust.

V. HAND GESTURE

Hand gestures are one of the most commonly used gestures in day- to- day communication in human 'life. In Human Machine Interaction(HMI) applications, adding hand gesture recognition for getting better result of human emotion detection change the research scenario. Such developed systems enhance the quality of HCI based applications. This is mostly help those buddy who are unable to express themselves through face so hand gesture recognition enhances the quality of such systems. For the implementation of such hand gesture recognition system various methods have been used. These methods use camera for the capturing image specially shape, location of the object in the input image to get the required interpretation of the gesture. These kid of System known as Vision Based system. These systems are mostly se in recognition because its deals with less cost than the others. A Gaussian Mixture Model(GMM) skin model is used to detect the skin areas on the color input image and then the hand region is determined through the detail information of the hand with respect to the camera. A unified set of hand gestures are framed and aligned. The system interprets the user's hand gesture and then converts into the predefined format for the hand gesture recognition system. Figure 3 describes various hand modeling methods to represent hand gestures [8-10].

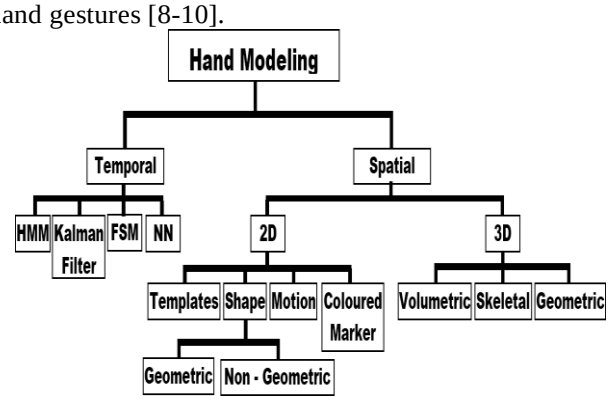

Figure-3: Hand Gesture Classification

VI. BASIC STEPS OF RECOGNITION PROCESS

A. Database for the Facial Emotions and hand Gesture Recognition

Developing strong methods of facial expression analysis, needs to have database that have sufficient samples taken them from problem domain from the problem space of analysis of facial expression. Some investigators have used less data sets that are limited, hence the common place of various analysis of facial expression methods that are remained unknown. Images of facial expression database there is not one single facial expression that is used frequently by all research communities. Each research community has created their own database official expression.

It is a big representative database of facial expression that can be used as a parameter for effort in the area of research, which is used in both testing and training of algorithms for analysis of facial expression.

A database of large, big, explained, proved and correct images of faces (both still motion) is still needed as a test bed which is assessed and different approaches in an objective member.

Published By:
Blue Eyes Intelligence Engineering
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B. Face and hand gesture Detection from an input image

Now a day's facial expression recognition system is a very challenging task due to wide verity of human emotions. These emotions frequently change time to time during communication. Here hand gesture also plays a very important role to get better output to understand human intensions. So, for the same, in input image, face and hand position of an input image should be detected first and then preprocess such image for noise removal and other activities [11-13].

C. Feature Extraction

Feature extraction phase for human emotion recognition is mainly dependent on the representation of human face and hand gesture in the input. Because face and hand gestures are mainly represented through holistic, analytically and in hybrid form. But these all all largely depend on face. Feature extraction methods that are localizes the features of human face analytically. In Hybrid way of feature extraction combines the analytic and holistic approach to get better features of input image. The extracted features can either physical based or an appearance based. Still many of the features extracted approaches do not extracted features automatically.

D. Classification

Many classification approaches are used to classify human emotions abased on predefined classes of human emotions. These all are based on either takes full face or work on particular human emotion. In effective approach it takes both parameters to get better results than the existing. In the current scenario of the study try to point out the automatic recognition of facial expressions through testing and training phase. There are many classification approaches which are further classified into majorly in Template Based Classification approaches where the human emotions are extracted is first compared to the predefined emotions which are already set to get best match. Whereas Rule based classification techniques classify the human emotions based on the predefined set of rules on facial actions and then find which is best-fit for the output. And at last another category of classification techniques is Statistical Pattern Recognition where ANN plays a very important role. this network put on static images and den classify the calculated human emotion based on hand gesture into the multiple classes where other specified category of classification is applying through HMM. This technique uses Static images as well as image sequences [14,15].

VII. RESULTS AND DISCUSSION

Multimodal systems provide the possibility to combine different types of modalities that occurs together in more efficient and reliable way for the Human Computer Interaction applications. Moreover, with multi-modal systems, the ambiguities during the interactions can be resolved in a very smooth and simple manner so that system can work more effectively. Most of the existing system provides automatic and single modal analysis through the analysis of various communication cues separately. Presently, very few multimodal systems are used to attempt for analyzing the various combinations of human communications through face and hand and other parameters of body. These types of system are used to recognize human emotions automatically based on some predefined classes of human emotions such as Happy, Anger, Disgust, surprise, Neutral and fear. These existing algorithm combines different types of approaches for the facial emotion's recognition based on hand gesture and its positions surrounding the face. Based on some modality analysis and experiment we got following result through the help pf Figure-4(a),4(b) and produced Analysis of an output through Pie -Graph Figure-4(c).

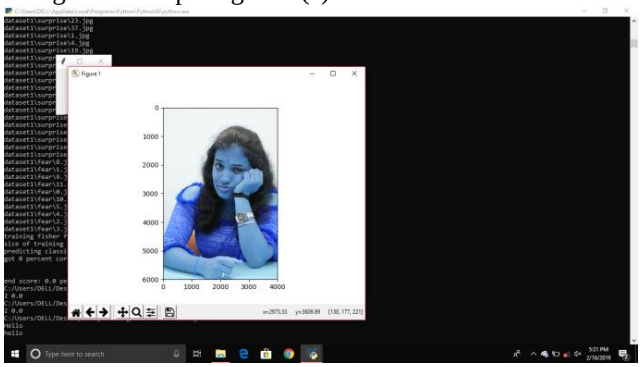

Figure 4(a)-Input Image

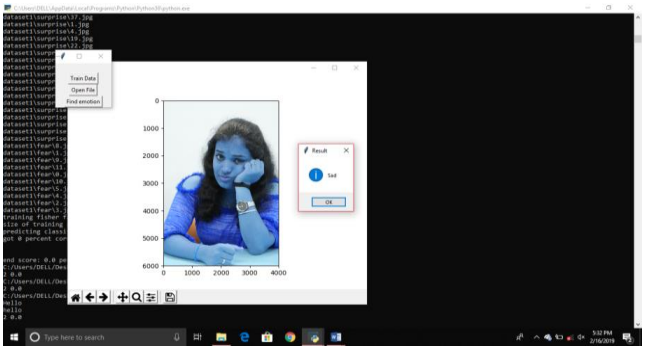

Figure 4(b)-Output Image

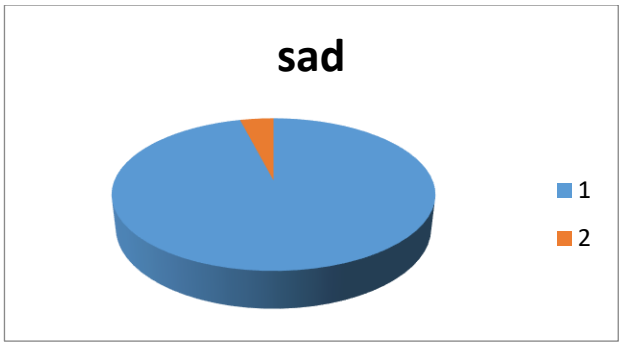

Figure-4(c)-Analysis of an output through Pie -Graph

VIII. CONCLUSION

This paper encompasses the emotion of face and hand gestures and also give information about the multimodal analyzer from facial emotion recognition based on hand gesture.

The multi model analyzer finds the applications which are used in video surveillance, virtual environments, monitoring the human activity, these kind of systems are used to increase the interaction accuracy in HCI – applications. Still there are many challenges and issues occurring during the design of a multimodal, adaptive and context sensitive analyzer which is used to develop such system for the human emotion recognition based on hand gesture and its position through the computer vision and machine learning techniques.

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