A Literature review on Emotion Recognition System Using Various Facial Expression

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ABSTRACT

Recognition and extracting various emotions and then validating those emotions from the facial expressions has become important for improving the overall human computer interaction. So this paper also describe about Emotion Recognition Techniques. Emotion Recognition has become a progressive research area and it plays a major role in Human-Computer-Interaction. For any Facial Expression Recognition, it is necessary to extract the features of face that can be possibly used to detect the expression. For Feature Extraction the Principal Component Analysis will be used. A survey of various techniques used in emotion recognition like PCA, LBP etc. is done in this paper and listing their performance. The goal of this paper is to show the comparison with Other Recognition Techniques with different approaches. And also describe the general step of the how to recognize emotion from various facial expression

Keyword: -. *Emotion Recognition, Facial Expression*

I. INTRODUCTION

The human face plays an important role in communication. The face can express their feelings through emotions. Face Expression approach [2] can be divided into three major steps so that the face in an image is known for further processing, facial feature extraction which is the method used to represent the facial expressions and finally classification which is the step that classifies the features extracted in the appropriate expressions. The facial expression are for identifying the basic human emotion like anger, fear, happiness, sadness, and surprise.
Figure1 below showing the general step of emotion recognition. From the figure, there are three important phases of overall system. First is face detection task in which first prominent features are extracted and then face is identified. The second step is where the facial feature extraction and recognition of facial expressions to the overall features are removed at the end of the last step in classification. Facial expressions of input image are then recognized.

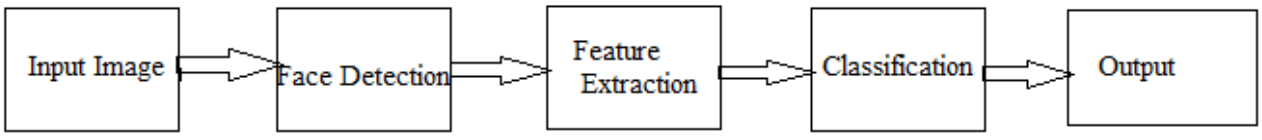

Fig. 1 General step of emotion recognition

In this paper section II is provide the system overview of emotion recognition system. Section III describes the techniques used for emotion recognition. Finally the paper concludes with the conclusion in section IV.

II. SYSTEM OVERVIEW

The process of emotion recognition involves the processing images and detecting the face then extracting the facial feature. Facial Expression Recognition consists of three main steps. In first step face image is acquired and detect the face region from the images and pre-processed the input image to obtain image that have a normalized size or intensity. Next is expression features are extracted from the observed facial image or image sequence. Then extracted features are given to the classifier and classifier provides the recognized expression as output as shown in fig 1.

A. Face Detection and Pre-processing

The face detection is the process of extracting the face region from the background. It means to determine the position of the face in the image. This step is require because images having a different scales. Input image having a complex backgrounds and variety of lightning conditions can be also quite confusing in tracking. Face expression recognition tends to fail if the test image has a different lighting condition than that of the training images. For that facial point can be detected inaccurately for that pre-processing step is required.

B. Feature Extraction And Classification

Selecting a set of feature points which represent the important characteristics of the human face. After the face has been located in the image, it can be analysed in terms of facial features. The features measure the certain parts of the face such as eyebrows or mouth corners. Various methods exist which can extract feature for expression based on motion of the feature such Active Appearance Model [6] which is statistical model of shape and gray scale information. The Features describe the change in face texture when particular action is performed such as wrinkles, bulges, forefront, regions surrounding the mouth and eyes. Image filters are used, applied to either the whole-face or specific regions in a face image to extract a feature vector. Principal Component Analysis [3], Local Binary Pattern (LBP)[4],Fisher's Linear Discriminator[5] based approaches are the main categories of the approaches available.

After the set of features are extracted from the face region are used in classification stage. The set of features are used to describe the facial expression. Classification requires supervised training, so the training set should consist of labelled data. Once the classifier is trained, it can recognize input images by assigning them a particular class label. The most commonly used facial expressions classification is done both in terms of Action Units, proposed in Facial Action Coding System (FACS) [8] and in terms of six universal emotions: happy, sad, anger, surprise, disgust and fear.

III. Techniques used for emotion recognition

A. Principal Component Analysis

Principal Components Analysis (PCA) ia a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences. The facial expression recognition using eigen faces in which PCA is used to extract features from input image. First of all they create training dataset to compare result. Once inputted face image is pre-processed and compare with training dataset which are already computed but based on the idea, they divided the training set into six basic classes according to universal expression(Happy, Surprise, Disgust, sad, Angry, Fear)[3].

B. Local Binary Pattern

LBP based feature extraction method is used owing to its excellent light invariance property and low computational complexity [4]. The neighbourhood values are threshold by the centre value and the result is treated as a binary number. If the canter pixels value is greater than the neighbour's value write 1, otherwise 0. In this way, it encodes the neighbourhood information very efficiently.

C. Active Appearance Model

Active Appearance Model (AAM) is a statistical approach for shape and texture modelling and feature extraction. It has been extensively used in computer vision applications. AAM generates statistical appearance models by combining a model of shape variation with a texture variation. So the AAM creates the shape, texture combination model of training facial image sequence "Textures" are pixel intensities of the target image [6].

D. Facial Action Coding System (FACS)

Facial Action Coding System (FACS) was developed by Paul Ekman and Wallace Friesen in 1976 is a system for measuring facial expression. FACS is based on the analysis of the relations between muscle contraction and changes in the face appearance. The Face can be divided into Upper Face and Lower Face Action units[8].Action Units are changes in the face caused by one muscle or a combination of muscles. There are 46 AUs that represent changes in facial expression and 12 AUs connected with eye gaze direction and head orientation.

E. Haar Classifier

Haar classifier based method is chosen for face detection owing to its high detection accuracy and real time performance [4]. Consists of black and white connected rectangles in which the value of the feature is the difference of sum of pixel values in black and white regions. The computational speed of the feature calculation is increased with the use of Integral image.

TABLE I
A SUMMARY OF EMOTION RECOGNITION SYSTEM TECHNIQUES

Reference	**Method**	**Performance**
Sukanya and Pallavi 2014IEEE[3]	PCA	This method provide better face recognition with reasonably low error rates
S L Happy;Anjith George;Aurobinda Routray[4]	LBP(Local Binary Pattern)	Higher recognition accuracy,Low computational complexity
Kwang –Eun Ko and Kwee-Bo Sim[6]	Active Appearance Model	The computational time and complexity was also very low
S L Happy;Anjith George;Aurobinda Routray[4]	Haar Classifier	High detection accuracy
Ms.Aswathy [9]	Fisher's Linear Discriminant	Recognition rate is low
Ms.Aswathy [9]	Multilinear Image Analysis	Recognition rate higher.but only in grayscale image

IV. CONCLUSIONS

In this paper, the review of framework of facial expression recognition has been highlighted. and presents a literature survey on the various techniques involved in facial expression recognition. These methods are measured on the basis of recognition rate. PCA has the highest recognition rate and has highest performance.

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