

# Review of The Facial Emotional Recognition With Various Approaches And Phases

Manpreet Kaur<sup>1</sup>, Maninder Kaur<sup>2</sup>

*M.Tech(Scholar), Assistant Professor*

*Doaba Institute of Engineering and Technology, Kharar*

**Abstract** - The feeling of someone plays necessary role in life as a result of we have a tendency to cannot specific our feelings or emotions in words, countenance or gesture to precise emotions. Somebody's face doesn't solely establish a private however additionally communicates helpful info a few person's spirits. Countenance provides the necessary info regarding the feeling of someone. Face feeling recognition is one in every of the most applications of machine vision that wide attended in recent years. It will be utilized in areas of security, recreation and human machine interface (HMI). Feeling recognition sometimes uses of science image process, speech process, gesture signal process and physiological signal process.

**Keyword**- Feeling recognition, techniques of feeling recognition, Multi-linear Image Analysis, Fisher's Linear Discriminant

## I. INTRODUCTION

The feeling of someone is considerably necessary for effective communication. There is a unit several factors that contribute to know the emotions of the individual cherish face, speech, body posture, behaviors, etc.[1]Paul Ekman has mentioned in his analysis findings that bound emotions will be universally recognized, albeit there are a unified cultural variation through the facial expressions like worry, happiness, anger, disgust, unhappiness and surprise.

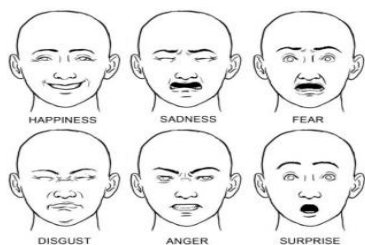


Fig 1: Six basic Facial Expressions

Facial expressions offer an important behavioral approach to revive the feeling and social interaction. Identification of the person through his/her face and recognition of their emotions became a promising analytic space in recent times. Its application includes Human-Computer Interfaces, Human feeling Analysis, and medical aid and Cure. Recent advancement during this space

has created, the researchers optimistic to widen the appliance of facial feeling recognition to varied areas like chat space avatars, video conferencing avatars. What is more, the applications of face and facial feeling recognition will be utilized in several areas starting from signing through Medical Rehabilitation to computer games, Education purpose, Clinical and Psychological Departments, etc. ton of stress is given in Human laptop Interaction (HCI) in order that there might be some chance for the Human and also the laptop to move in the additional natural manner. For this to happen, it's necessary for the information processing system to know the emotions of the human whereas interacting. An effort to spot the facial feeling will contribute to the Human and laptop Interaction in additional effective manner. As mentioned earlier, there has been loads of analysis work happening to acknowledge the countenance to deduce the emotions with higher accuracy rate, still it remains tough to attain the bigger accuracy thanks to the elaborateness, complexes and a variety of facial expressions. Hence, the researcher area unit limiting their approaches so as to get higher results..

## II. RELATED WORK

Manisha et al., 2015 [2] bestowed the employment of Artificial Neural Network and machine learning. face expression Recognition System is developed to research four sort of human expressions- happy, sad, angry and shocked. Jaffe and Paul Ekman information is employed for coaching the information. This face expression recognition system is found to be seventy six correct in analyzing the human feeling.

Anchal Garg et al., 2015 [3] delineate the facial feeling recognition are going to be done mistreatment the hybridizing of neural network with ICA still as genetic algorithmic program. first the feature extraction are going to be done mistreatment ICA then the feature reduction are going to be done mistreatment genetic algorithmic program during which options square measure reduced to tiny dataset. Then classification of 5 emotions are going to be done like unhappy, HAPPY, SURPRISE ANGRY and NEUTRAL mistreatment neural network classifiers.

Shruti Bansal et al., [4] bestowed a system that mechanically acknowledges the feeling delineated on a face. Thus, a Bezier curve primarily based resolution along with image process is employed in classifying the emotions. colored face pictures

square measure given as input to the system. Then, Image process primarily based feature purpose extraction methodology is applied to extract a group of designated feature points. Finally, extracted options like eyes and mouth, obtained once process is given as input to the curve algorithmic program to acknowledge the feeling contained.

Rishabh Bhardwaj et al., 2016 [5] bestowed the introduction of the face recognition associate in nursing facial expression recognition and an investigation on the recent previous researches for extracting the effective and economical technique for facial expression recognition.

### III. TECHNIQUES USED FOR FACIAL EXPRESSION RECOGNITION

#### A. Principal Component Analysis

Principal Component Analysis (PCA), also known as the eigen face approach is one of the popular method for facial expression recognition[6]. The major goal of PCA is to reduce the dimensionality for effective face indexing and retrieval. Also, PCA uses linear projection, which maximize the projected sample scattering [7]. In this, the identity of the person is the only varying factor. PCA faces difficulty if other factors like viewpoint, lighting are varied.

#### B. Fisher's Linear Discriminant

Under severe alteration in facial expression & illumination Fisher's Linear Discriminant (FLD) is extra suitable. FLD reduces the scattering of projected sample since it is a class specific method[7]. Error rate is reduced when compared to PCA.

#### C. Independent Component Analysis

Both PCA & LDA generate spatially overall feature vectors. But for effective facial expression recognition spatially localized feature vectors is needed. Therefore Independent Component Analysis (ICA) produces statistically independent basis vector [8]. The usual recognition rate is improved. But ICA is computationally expensive than PCA.

#### D. 2Dimensional Principal Component Analysis

In PCA, feature extraction is done based on 1D vectors. So the image matrix need to be transmuted into vector. 2dimensional Principal Component Analysis (2DPCA) uses 2D matrix instead of 1D vector [9]. The recognition level of 2DPCA is advanced than PCA. But the storage requirement for 2DPCA is higher than PCA since 2DPCA needs more coefficients for image representation.

#### E. Global Eigen

Method using Color Images Conventional facial expression recognition techniques alike PCA, LDA etc uses only the luminance information in face images. Global Eigen Approach uses the color information in face images [10]. RGB color space does not provide any improvement in recognition rate. In HSV color space, H component is uninvolved since it decreases recognition rate. YUV colorspace provides high recognition rate.

#### F. Sub pattern Extended 2-Dimensional PCA

The recognition rate of PCA is low and has small sample size problem. For gray facial expression appreciation, 2DPCA is comprehensive to Extended 2DPCA. But E2DPCA is not

applicable for color images. Therefore Sub pattern Extended 2-Dimensional PCA (SpE2DPCA) is introduced for color face recognition [11]. The recognition rate is higher than PCA, 2DPCA, E2DPCA and problem of small sample size in PCA is also eliminated.

#### G. Multilinear Image Analysis

Facial expression recognition needs different factors like pose, lighting, expressions to be considered. But the conservative PCA addresses only differences in single factor. Multilinear image analysis use multilinear algebra [12]. In this, the concept of „Tensor faces“ is used, which separates different factors underlying the formation of an image. Recognition rate is superior when compared to PCA method. Color information is not incorporated in multilinear image analysis.

#### H. Color Subspace Linear Discriminant Analysis

The 1DLDA AND 2DLDA are extended in color space to advance the face recognition accurateness. A 3- D color tensor is used to generate color LDA subspace [13]. Horizontal unfolding developments the recognition rate for 2DLDA while vertical unfolding developments recognition rate for 2DPCA. The performance evaluation of various color spaces is not done.

### IV. FACIAL EXPRESSION RECOGNITION SYSTEM CONSISTS OF FOLLOWING STEPS

#### A. Image Acquisition

Static image or image sequences are used for facial expression recognition. 2-D gray scale facial image is most popular for facial image recognition although color images can convey more information about emotion such as blushing. In future color images will prefer for the same because of low cost availability of color image equipments. For image acquisition Camera, Cell Phone or other digital devices are used.

#### B. Pre-processing

Pre-Processing plays a key role in overall process. PreProcessing stage enhances the quality of input image and locates data of interest by removing noise and smoothing the image. It removes redundancy from image without the image detail. Pre-Processing also includes filtering and normalization of image which produces uniform size and rotated image [14].

#### C. Segmentation

Segmentation separates image into meaningful reasons. Segmentation of an image is a technique of dividing the image into homogenous, self-consistent regions corresponding to different objects in the image on the bases of texture, edge and intensity.

#### D. Feature Extraction

Feature extraction can be considered as “interest” part in image. It includes information of shape, motion, color, texture of facial image. It extracts the meaningful information from image. As compared to original image feature extraction significantly reduces the information of image, which gives advantage in storage.

#### E. Classification

Classification stage follows the output of the feature extraction stage. Classification stage identifies the facial image and grouped

them according to certain classes and help in their proficient recognition. Classification is a complex process because it may get affected by many factors. Classification stage can also called feature selection stage, deals with extracted information and group them according to certain parameters [15].

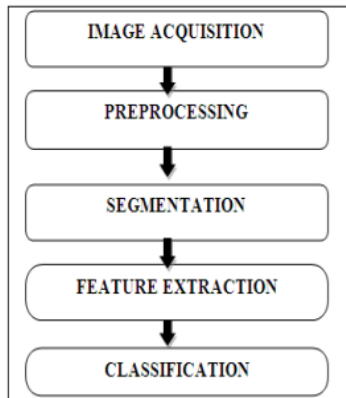


Fig 2. Facial expression Recognition System

### V. APPLICATION AREA

With the rapid development of technologies it is required to build an intelligent system that can understand human emotion. Facial emotion recognition is an active area of research with several fields of applications [16]. Some of the significant applications are:

- Alert system for driving.
- Social Robot emotion recognition system.
- Medical Practices.
- Feedback system for e-learning.
- The interactive TV applications enable the customer to actively give feedback on TV Program.
- Mental state identification.
- Automatic counseling system.
- Face expression synthesis.
- Music as per mood.
- In research related to psychology.
- In understanding human behavior.
- xii) In interview.

### VI. CONCLUSIONS

In this paper, we have presented several approach for facial emotion recognition in the pictures. There are various techniques that are implemented for emotion recognition through image, whether it be a real time image or still image. There are several databases available for the resolution of emotion recognition. Through this paper it is well understood that emotion recognition

is done through different method such as PCA, FLD, ICA, MIA etc.

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