

## 2D Assisted facial Expressions identification using PCA

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**Abstract:** Facial recognition is a technique makes it possible to use the facial images of a person to authenticate him into a secure system, for criminal identification, for passport verification. Facial expressions identification by using Principle Component Analysis (PCA) Mechanism. In PCA faces are represented as a linear combination of Eigen faces. It reduces the large dimensional space to small dimensional space. In this paper face recognition and the multiple expression images are taken for feature extraction and compare it with the registered database image. PCA can identify face and different expression such as Happy, Anger, Sad, Disgust, Neutral, fear etc. Training process that read all the faces where training database is stored and testing process that reads all the faces of the person where the test folder.

**Keywords:** Principle Component Analysis (PCA), Facial expressions identification, Eigen face, Gabor filter, Linear discriminate analysis,

### I. INTRODUCTION

Facial recognition technique makes it possible to use the facial images of person to authenticate him into a secure system, for criminal identification, for passport verification etc. Face recognition has been extensively used in applications like identity authentication, access control, human-computer interaction and communication. Facial expressions are play an important role in human communication. facial expression can be classified into some discreet classes (like happiness, sadness, disgust, fear, anger and surprise) whereas absence of any expression is the "Neutral" expression. Intensity of a particular expression can be identified by the level of its "dissimilarity" from the Neutral expression

### II. EXISTING SYSTEM

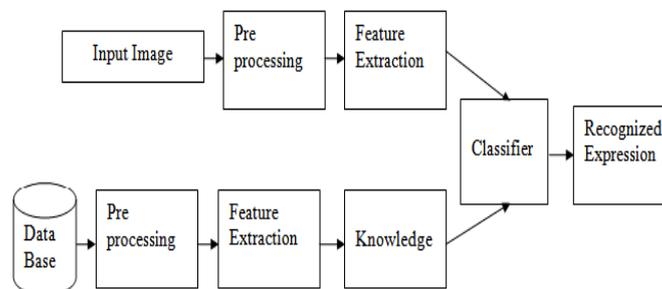
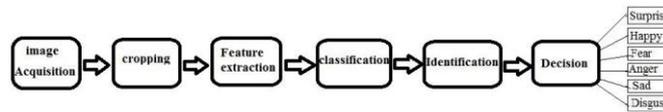


Fig. Facial expression detection system

The existing system only detect the different facial expressions but not find out the each person expression individually in the data base. There is difficult to findout the neutal expression in the data base. The existing system operate on the face detection procedure. Much more calculations are needed to detect the faces.

### III. PROPOSED SYSTEM



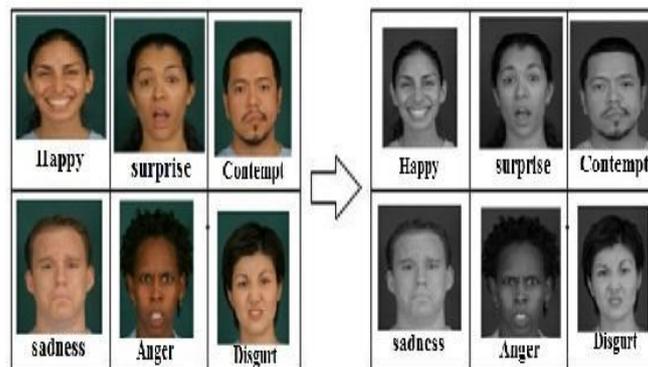
**Fig 3. Facial expression identification system**

#### 3.1 Facial expression process:

There are three principal add-ons for facial features , a feature Extraction, Principal component analysis and Euclidean Distance Classifier. To categorise the photographs final facial expression recognition approach uses Euclidean Distance Classifier.

#### 3.2 image acquisition:

An photo sequence contains potentially extra understanding than a still picture, considering the former also depicts the temporal dimensionality of enter photos, 2-D monochrome (gray-scale) facial snapshot sequences are essentially the most widespread kind of photographs used for automatic expression awareness. Nevertheless, colour portraits could become everyday in future, owing to the increasing availability of affordable color image acquisition gear, and the ability of color photos to convey emotional cues such as blushing

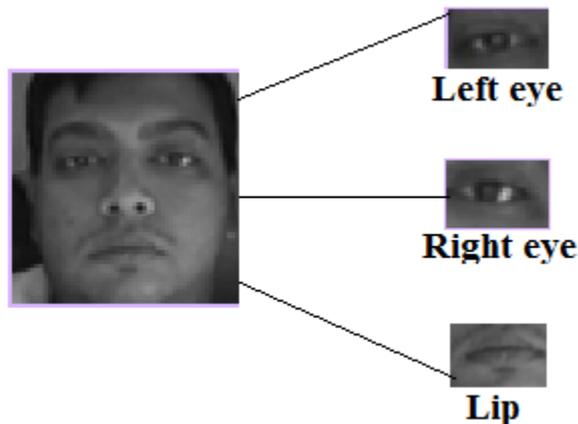


**fig: 5.1 Normal images converted in to gray scale images**

#### 3.3 cropping image:

Eyes, nostril and lip take one of a kind shapes for extraordinary expressions and colossal knowledge is carried with the aid of them. So instead of processing the complete face, eyes, nostril and lip are

processed. Before going for additional processing, 5 big portions are cropped from the picture as proven in Figureshown beneath and it might be known as as feature picture.



### 3.4 Feature Extraction:

The cropped photographs are resized and cropped nose and lip together. Eigenvectors are computed from these cropped images. On this work, the common expressions are set into six classes as the learning graphics. Eigenvectors and Eigenvalues of five extraordinary character segments of the snapshot is computed and stored. For a single type, after the resolution of a unique function, a matrix is bought which is stored as, say L of dimension P x Q. In a similar fashion for the relaxation of the features also, Eigenvectors and Eigen values are computed and stored as a matrix. First the mean based characteristic photograph vectors is bought by subtracting the mean from the feature photograph. This photograph vectors are depicted as matrix simplest. Then the covariance matrix of each character characteristic snapshot is got with the aid of calculating the covariance of the matrix of each imply situated photo vectors, and from each covariance matrix, the associated eigenvectors and Eigen values for the for my part extracted elements are computed. Five huge Eigenvectors are regarded for extra processing which might be sorted in the decreasing order of the related Eigen values of the covariance matrix. With the on hand eigenvectors of expressions, separate subspaces for all of the six universal expressions are created. With the available expression subspaces, the enter snapshot could be identified by way of incorporating a decision making system.

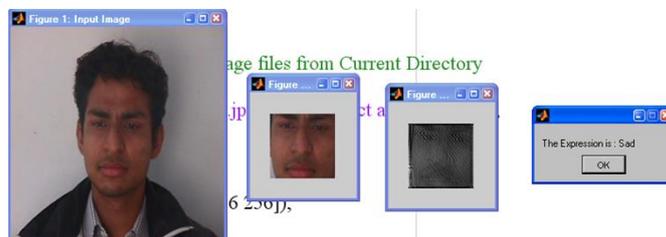
### 3.5 Classification:

The classifier headquartered on the Euclidean distance has been used which is obtained by using calculating the gap between the image which might be to be demonstrated and the already on hand

portraits used as the educational photographs. Then the minimum distance is found from the set of values. In checking out, the Euclidean distance (ED) has been computed between the new (checking out) picture Eigenvector and the Eigen subspaces for each expression, and minimum Euclidean distance centered classification is finished to admire the expression of the enter photo. The components for the Euclidean distance is given by means of.  $ED = (x_2 - x_1)^2$

### 3.6 Identification:

In this module we can identify the person who is showing their expression in front of the software that mean the database is already made up for this purpose in that data base the identification details of the person are saved and can be utilize at the time of identification of the person. This module is also based on face recognition system because the identification process can be done using facial recognition of the person so that this modules plays very important role in this software



**Fig 3.6 expression identification of Happy**

## IV. PCA ALGORITHM

Principle component analysis (PCA)[3] is a method of classical characteristic extraction and the information representation manner which is largely used in the sample cognizance. The purpose of the PCA is lowering the giant dimensionality data space into the smaller dimensionality characteristic space must describe the data economically. Face is the multidimensional structure and wants excellent computing approaches for attention. Face recognition is an fundamental part of the biometrics. The biometrics normal that traits of any human pics that match to the existing database picture and show the effect in line with their database identification. This facial features identification will also be carried out by means of utilising the PCA, in view that PCA is dimensionally lowered in knowledge

If there are a so many images that are close to each other in the PCA space, it means that the images quite resemble but differ slightly from each other. The directions of these variations is important because it „says“ something about in what the images differ. A “cloud” of these images could therefore be spanned by the directions of the variations, which are called the Principal Components.

The mager expertise of utilizing PCA is that Eigen faces methods helps in decreasing the size of the information base required for consciousness of a test image. The trained images should not saved as a raw images , as an alternative than they're stored their weights which are found via projecting every photograph within the training set onto the set of Eigen faces acquired.

## V. LINEAR DISCRIMINATION ANALYSIS

Linear Discriminate Analysis (LDA)[7] is a classification method. originally developed in 1936 by R. A. Fisher. It is simple, mathematically robust and often produces models whose accuracy is as good as more complex methods.

The purpose of discriminate analysis is to classify objects i.e. people, customers, things, etc. into one of two or more groups based on a set of features that describe the objects e.g. gender, age, income, weight, preference score, etc. If one can assume that the groups are linearly separable, one can use linear discriminate model (LDA). If only two features, the separators between objects group will become lines. If the number of features is three, the separator is a plane and if the number of features i.e. independent variables is greater than three, the separators become a hyper-plane. linear discriminate analysis LDA is also known as fisher's discriminate analysis and it searches for those vectors in the underlying space that best discriminate among classes. The objective of LDA is to perform dimensionality reduction while preserving as much of the class discriminatory information as possible. The goal of LDA is to maximize the between-class scatter matrix measure while minimizing the within-class scatter matrix measure.

It has been used widely in many applications such as face recognition , image retrieval.

In this project LDA used as a classifier to identify the expression of a person in the image. And it is used to classify the different persons with different expressions in the data base.

## VI. CONCLUSION

In this paper the method Principal component analysis for facial expression detection started initially with one training image and 4 testing images from each expression. After successfully tested the testing images gradually increased training set images. The principal components are selected from each expression to reduce the Eigen space. With the Eigen spaces Eigen vectors are calculated. The Eigen vectors are classified based on Euclidian distance. The training set images with 8 different expressions are successfully identified.

## VII. APPLICATIONS

The facial expression recognition is applied in one-of-a-kind areas of existence equivalent to protection and surveillance, they may be able to predict the offender or crook's behaviour by means of analysing the pictures of their faces which are captured by means of the manage-camcorder. Moreover, the facial features consciousness system has been used in conversation to make the answer machine more interactive with individuals. The answer computer has come to be more wise by using analysing the consumer's voice and dealing with the responses in line with their feelings. Additionally, it is powerful in signed language awareness method that deals with the deaf and dumb persons. The facial features consciousness procedure is used for game and entertainment subject apart from its use to broaden the effectivity of robots for specified army tasks, scientific robots, and manufacturing servicing .

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