SOFT COMPUTING TECHNIQUE BASED FACE EXPRESSION RECOGNITION

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ABSTRACT

Nowadays the face recognition is important part of the real world. The face recognition by using the principle component analysis (PCA) technique. The face recognition systems to enhance the security, secure access control, and protection process. In this method is one of the most popular representation methods for a face images and also detect the various type of expressions happiness, sadness, angry, fear, disgust, and surprise by using the technique. The neural network is also identifying the human face images and it is interconnected for processing elements. The principle component analysis technique is not only reducing the dimensionality of the images, but also retains some of the variations in the image data. And also improve the accuracy level then compared with existing face recognition methods. For face recognition the Eigen face approach uses the (PCA) algorithm. The database includes a variety of different faces, including individuals of different gender. Neural network provide significant benefits in face recognition. They are dynamically being used for such benefits as locating previously undetected patterns, controlling devices based on feedback, and detecting characteristics in face recognition.

Index terms: Face recognition, Principal Component Analysis, Neural Networks, Eigen faces, Eigenvectors.

I. INTRODUCTION

The Face recognition is one of the most active and widely used techniques because of its reliability and accuracy in the process of recognize a person's identity. Face recognition is such a challenging and motivating trouble that it has concerned researchers who enclose different backgrounds: psychology, pattern recognition, neural networks, computer vision, and computer graphics. In this method is good descriptor should have a high level classes for different persons or different expressions.

Nowadays a target is focused on development of a human interaction in the facial expressions. The face recognition is using the process of step is detect the human face images in the scene. The second step is to extract the expressions and convert the images pixel and sizes. And the third step is facial display is conveyed by the face using this technique,

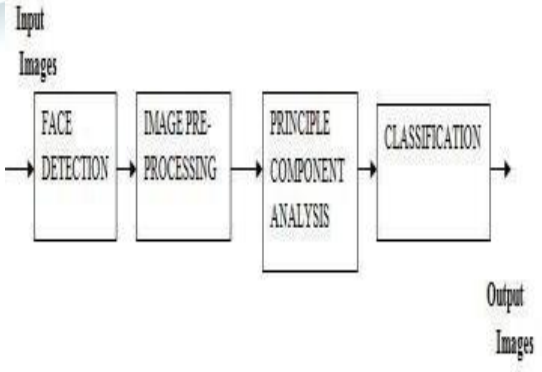

Fig.1.Architecture of face recognition system

Gabor filters, and the neural networks are using the expression recognition. The local descriptors are obtainable, respectively, and they finally used for face representation. These combinations of (LBP) Local binary pattern and Gabor filters are compared to the individual representation. The Combining information from different domains is usually for face recognition.

The face expression classifications are divided into two category: someone dependent and someone independent systems. In this system well recognized the facial expressions are the most expressive human emotions.

II. METHODOLOGY

Principal Component Analysis (PCA) is a technique is used for numerical pattern recognition and indicates the processing for data decrease. Principal Component Analysis (PCA) is a dimensionality reduction technique based on extract the required amount of principal components of the multi-dimensional data. The first principal component is the linear combination of the original scope that has the maximum variance. The first stage is face detection method. In this method the database of images are all most identical environment of distance, background, etc. the collection of all the images includes different poses of several neutral, anger, happiness, etc. For creating any type of database some images used for training and some for testing, both of which include number of expressions. The purpose of PCA is to reduce the huge dimensionality of the data space. And face images from the database with size 112×92 can be measured as a vector of dimension 10,304, or equivalently a point in a 10,304 dimensional space. The main idea of the principle component is to recover the vectors that greatest relation for the distribution of face images within the full image space.

A. FACE RECOGNITION OVERVIEW

This method to be implemented is PCA (Principle Component Analysis). It is one of the most successful techniques of face recognition and easy to recognize and express using the mathematics. This method is involves the Eigen faces. In PCA the first step is to produce a aspect detector (dimension reduction).Principal Components Analysis (PCA) was special because it is the largely efficient technique, of dimension decrease, in terms of data density. This allows the high dimension data, the images, to be represented by lower dimension data and so confidently reducing the complexity of mixture the images.

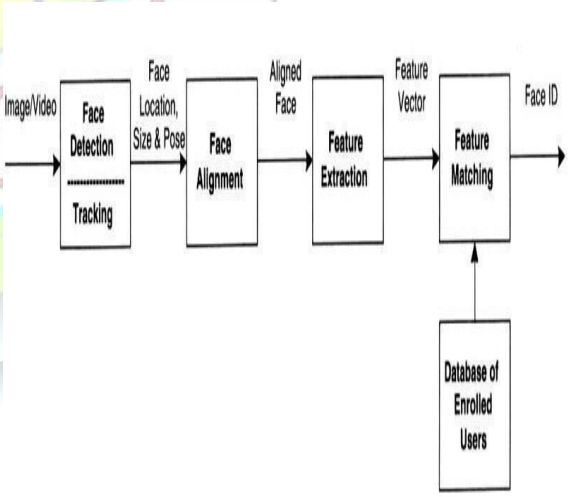

Fig.2. Method of face recognition

For emotion analysis, higher level information is required. With the appearance-based methods image filters, such as Gabor wavelets, are applied to either the whole-face or specific regions in a face image to remove a feature vector.

The pictures are classified in the following classes are,

1. Image01 to Image09 = Happy
2. Image10 to Image18 = Disgust
3. Image19 to Image27 = Anger
4. Image28 to Image36 = Sad
5. Image37 to Image42 = Neutral

Facial expression recognition is the last stage of automatic facial expression recognition systems. The facial changes can be identified as facial action units or prototypic emotional expressions.

B. GABOR FILTERING

Gabor filters, which show the popular characteristics of spatial locality and orientation selectively and are optimally contained in the space and frequency domains, have been extensively and successfully used in face recognition. The Gabor kernels used are defined as follows

$$\psi_{\mu,\nu}(z) = \frac{\|k_{\mu,\nu}\|^2}{\sigma^2} \exp\left(-\frac{\|k_{\mu,\nu}\|^2 \|z\|^2}{2\sigma^2}\right) \left[\exp(ik_{\mu,\nu} z) - \exp\left(-\frac{\sigma^2}{2}\right)\right]$$

Where, and define μ & υ the orientation and scale of the Gabor kernels, respectively. z=(x,y), and the wave vector is

$$k_{\mu,\nu} = k_\nu e^{i\phi_\mu}$$

defined as,

The Gabor kernels are all self-similar since they can be generated from one filter, the protect wavelet, by scaling and rotating via the wave vector. Hence, a group of Gabor filters is generated by a set of various scales and rotations. In this paper, use Gabor kernels at five scales and eight orientations with the parameter to derive the Gabor demonstration by convolving face images with corresponding Gabor kernels. For every image pixel we have totally 40 Gabor magnitude and phase coefficients, respectively. They can obtain 40 Gabor magnitude and 40 Gabor phase faces from a single input face image.

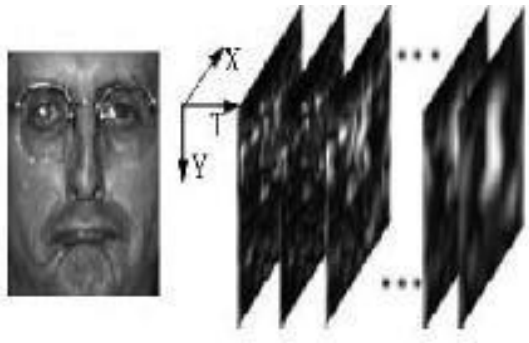

Fig.3. Face image and its equivalent third order Gabor volume

C. LOCAL BINARY PATTERN

The local binary pattern operator is defined as a gray-scale invariant texture measure, derived from a general definition of texture in a local neighborhood. The LBP operator can be seen as a unifying approach to the traditionally divergent statistical and structural models of texture analysis. Perhaps the most important property of the LBP operator in real-world applications is its invariance against monotonic gray level changes. Another equally important is its computational simplicity, which makes it possible to analyze images in challenging real-time settings. Fig.5.3, where the three axes X, Y, T denote the different rows, columns of

face image and different types of Gabor filters, respectively.

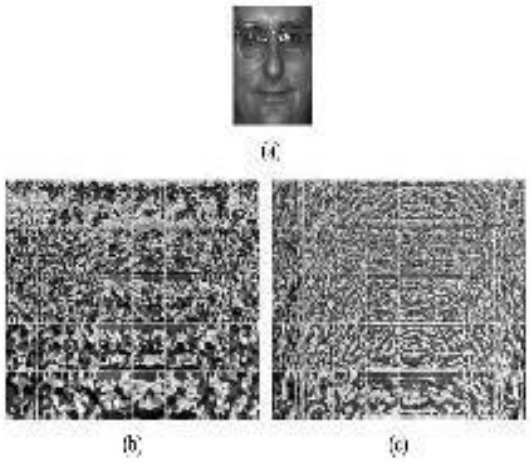

Fig. 4. (a) One face image and its E- LBP (b) Gabor magnitude faces and

(c) Gabor phase face

D. PCA ALGORITHM

In this algorithm using MATLAB is identifying the human face expressions. It is one of the most successful techniques of face recognition and easy to understand. The following steps are given below

Step 1 : Prepare the data-training set of faces.

Step 2 :Original faces transformed in to Eigenfaces.

Step 3 : Eigenfaces are calculated for each image of the training set and stored in the set W.

Step 4 :Calculate the covariance matrix, eigenvectors and Eigen values of the covariance matrix.

Step 5 : Select the Principal components.

Step 6 : Classification of image.

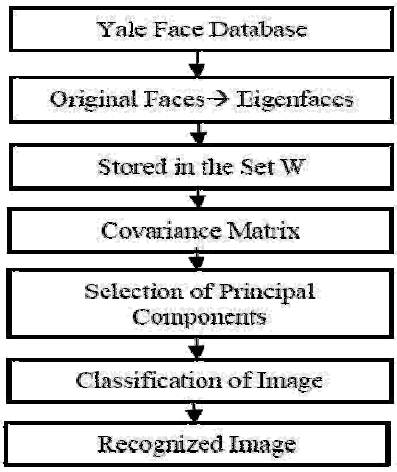

Fig 5. Proposed Algorithm.

E. SOFTWARE DESCRIPTION

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations. The system is implemented in MATLAB 7.6.0 is widely used in academic and research institutions as well as industrial enterprises. This is a vast collection of computational algorithms ranging from elementary functions like sum, sine, cosine, and complex arithmetic to more sophisticated functions like matrix inverse, matrix Eigen values, Bessel functions, and fast Fourier transforms.

The MATLAB used in the (PCA) principle component analysis technique is very efficient for facial expression recognition. And the input and output from a MATLAB session to a file, use the diary function. It is now also used in education, in particular the teaching of linear algebra and numerical analysis, and is popular amongst scientists involved in image processing. The application is built around the MATLAB language. The main purpose of this method is facial expression recognition; therefore, the sample pictures are taken under special

consideration to ease up the face detection process.

III. RESULT ANALYSIS

This technique is used for identify the human face expression recognition. They are different type of expression to be identifying their images. And the expressions are given below

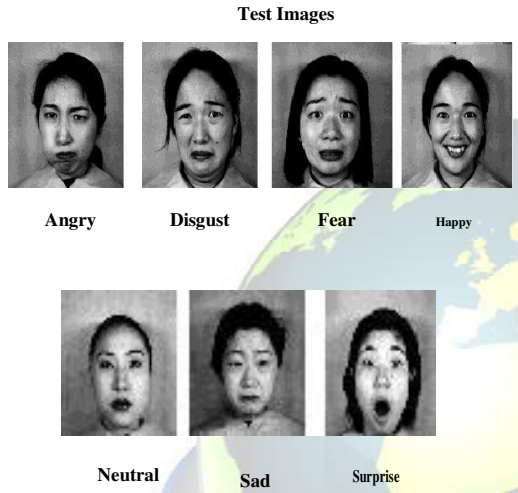

Fig.6.Different face expressions

The most important component of this provides the system with a person image and identifying him using the stored data. The face images are recognized by using MATLAB coding function. The facial expression detection was originally taking place with 3 training pictures and 6 testing pictures from each category of expression. And the PCA to identify their which type of expression in the human faces to put the output in this technique. The results are given following

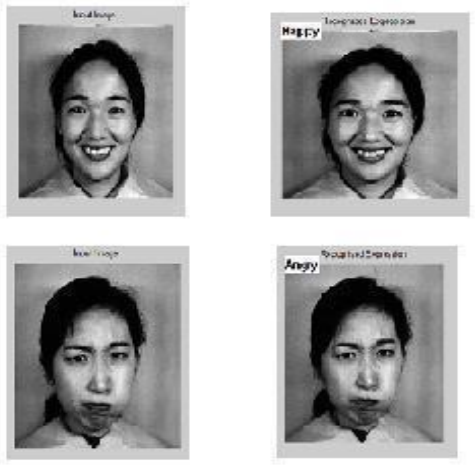

Fig.7. Recognised face expression.

The Eigen faces are calculated from the training set. These training set images are matched with the greatest eigen faces, which have the largest Eigen values. For calculate those Eigen values using principle component analysis (PCA) .

Performance Comparison of face recognition in terms of elapsed time

Image Sequences	PCA	Neural Networks
Image1	0.20	0.1
Image2	0.061	0.020
Image3	0.074	0.008
Image4	0.055	0.0091

Table.1. comparison of face images with different technique**.**

The recognition ratio by using Principal Component Analysis is better by using the Principal Component Analysis with Neural Network. The principal components are selected for every class separately to reduce the Eigen space. With these eigenvectors the input test images were. The face identified using the elapsed time is graph of their performance. And this analysis are given

Performance Analysis Graph

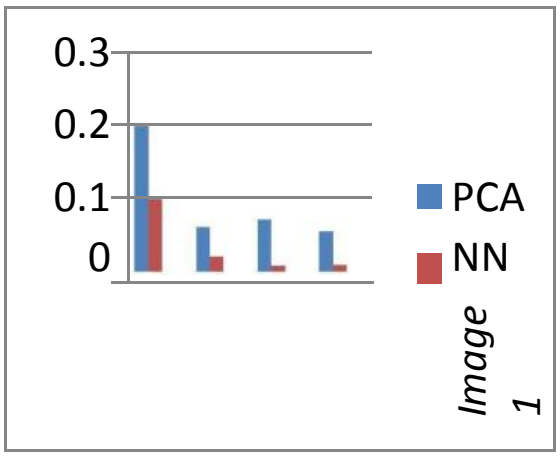

Fig.8.Graph of face recognition

IV. CONCLUSION

Facial expression recognition rate highly with many issues like varying illumination conditions, pose variation, incidence of glasses and facial hair etc. The proposed system is the face expression recognition using principle component analysis technique. In this technique to find the human face images and resize with the images. Then the face images are calculated the exacting faces of Eigen values and Eigen vectors. And the values are compared with the previously data set of face images. Then displayed the face expression of human face images. The PCA method has the greater accuracy with consistency. The Recognition accuracy level is 99.8% and better discriminatory power.

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