



# Face and Appearance Detection Using Masquerade Method for Facade Testing

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**Abstract** -- An inspiring research topic is to make the Computer Systems to recognize facial appearances from the face image. A method of facial expression recognition, based on Eigenspaces is presented in this study. An algorithm for facial expression recognition can classify the given image into one of the seven basic facial expression categories (happiness, sadness, fear, surprise, anger, disgust and neutral). Here, the user's facial expressions are recognized from the input images, using a method that was customized from eigenface recognition. Evaluation was done for this method in terms of credential correctness using diverse facial expressions databases such as Cohn-Kanade facial expression database and Japanese Female Facial Expression database (JAFFE). By using these databases, the facial expressions are detected by the Masquerade method. It consists of four steps in finding the facial appearance. The four steps are 1. Face recognition, 2. Histogram generation, 3. Expression recognition, 4. Face retrieval. By using this method the face expression of the image in the databases can be found immediately. The results show the effectiveness of the proposed method.

**Index terms** - Facial expression recognition, eigenspaces, cohn-kanade facial database, masquerade method.

## I. INTRODUCTION

The human being face gives one of the powerful, flexible and traditional ways of communication, during public interaction. Facial appearances give significant communicative signals, which represent more than 50% of the outcome of a conversed message; so identification of facial expressions produce to be a most important modality in human computer interaction. For instance, in a Human Computer Interface, if the system can sense and recognize the users' objectives from their facial expressions, it is possible for the computer to

help them by providing implications and schemes according to identified circumstance.

The opportunity of making Computers to recognize facial expressions and use the statistics in Human Computer Interaction has improved major research interest over the last few years. This has given increase to a number of programmed methods to diagnose facial expressions in images or video. The set of Facial expressions can be extended from three expressions to six expressions (Fig. 1 & 2) and established the effectiveness of the algorithm on two altered databases, Cohn-Kanade database and JAFFE database. The famous Eigen face credentials technique is customized and used for recognizing facial expressions. The objective of the writers is to use dimensionality methods on a huge and diverse dataset to study a workable space for expressions and find the facial expressions of the user. The modernization of the proposed approach is its performance in classification, strength and need of preprocessing of images.

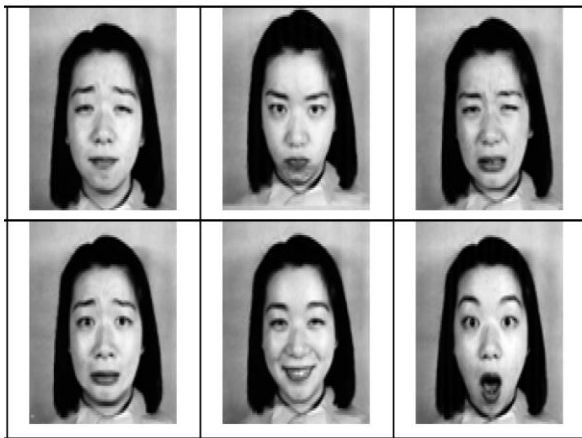
## Facial expression:

A study indicated that only 7% of message is because of languages, 38% is through paralanguage and more than 50% of message is transferred by facial expressions. This shows that the facial expression is a most significant modality in social communication. Thus the authors can visualize that, when designing the human computer interfaces, the facial expressions seem to be a most important factor for improving the communicability of message, even in human-machine communication. In recent years, a large amount of research has been done on recognition of facial expressions. Psychologists Ekman and Friesen conducted the first

methodologically sound studies and concluded that the emotions, “Happiness, Anger, Sadness, Disgust, Surprise and Fear” are shown and inferred in all human cultures in the same way. Fig.1 and 2 shows the universal expressions.



**Fig. 1: Sample Expressions from Cohn-Kanade facial expression database**



**Fig. 2: Sample Expressions from JAFFE database**

## II. RELATED WORK

In latest years, the research of emerging spontaneous facial expression recognition systems has fascinated a lot of devotion from many different fields. The methodologies to facial expression appreciation can be, approximately separated into two classes. The geometrical feature-based approaches rely on

the geometric facial features, which represent the outlines and positions of facial apparatuses such as eyebrows, eyes, nose, mouth. As for the appearance-based approaches, the whole-face or exact regions in a face image are used for the feature abstraction via visual flow or some kinds of filters. Many of the previous works on facial expression appreciation are based on the presence of six collective expressions. These universal expressions are based on the emotional results of Dalgleish and Power and the Facial Action Coding System (FACS), time-honored by Ekman and Friesen, which codes expressions as an amalgamation of 46 facial activities called Action Units. The amalgamation of these action units outcome in a large set of thinkable facial expressions. For sample, smile expression is deliberated to be a combination of “dragging lip corners and/or mouth opening with upper lip raiser and bit of crease deepening.”

However, this is only one kind of a smile; there are many dissimilarities of the above motions, each having a different amount of actuation. Regardless of its limitations, this method is the utmost widely used method for computing human facial motion for both human and machine perception. Predictable methods excerpt features of facial organs, such as eyes and a mouth, in gray or color images of front faces and make out the expressions from changes in their outlines or their geometrical interactions by diverse facial expressions. However, estimation of their specific points and outline attributes in real images is difficult, on account of the wide variability of the face structures, skin color/brightness, illumination conditions and geometrical variations such as head orientations.

As a consequence, a lot of the systems need human assist such as assigning marks on the subject’s face or postulating windows covering each organ in the image. Neural networks appear hopeful for identifying facial expressions, but the methods using Neural Networks assumes settings of facial organs are to be delivered as its input. Another impression is to guess the measure of muscles from ocular flow to spot facial expression. Its achievement hinges on the dependability of optical pour estimation from image sequences and its truthful valuation seemstough because of the complexity of facial images.

The accomplishment of facial expressions recognition system rest heavily on how well the movement of the crucial features points, like eyeballs

and mouth corner, are pursued on the human face. To expedite the tracking process, in the contemporary practice the facade of the human performer is painted with color temperament or attached with some small illuminative balls. However, the non-natural attachment is invasive to humans, possibly jeopardizing the quality of the human act. To disregard such restrictions and to take the rewards of resemblance measure between face and facial expression, in the authors have proposed a method to recognize facial expressions from the whole face, reasonably than from fluctuations in the shape of the facial body part such as eyes and a mouth, or their geometrical affiliations. In supplementary words, the expressions can be acknowledged devoid of extracting the individual facial features. The idea is akin as the face identification method proposed by Turk and Pentland and technique used in Frank and Noth, but the individualities of the problem domain are quite different. Our system was designed to recognize the expression of a mysterious subject from a single front view of his/her face.

### III. SYSTEM DESIGN

#### Implementation:

The following modules are used for the implementation in masquerade for facade testing approach:

1. Face recognition
2. Histogram generation
3. Expression Recognition
4. Face Retrieval

#### Modules Description:

##### 1. Face recognition:

In the main module, the system is deliberated such that first the image dataset folder have to be indexed by the user. Afterward index is completed, it demonstrates the amount of images in the folder which we indexed. Following the query image is carefully chosen by the user. The LH and MLH are cast off during the face recognition process. The goal is to equate the encoded feature vector from one person with all other applicant's feature vector with the Chi-Square distinction measure. This measure between two feature vectors,  $F_1$  and  $F_2$ , of length  $N$  is measured. The equivalent face of the feature vector with the lowest measured value designates the match found.

##### 2. Histogram generation:

In this segment, the histogram is engendered based on the query image nominated from the image dataset. The horizontal axis of the graph signifies the tonal deviations, while the vertical axis represents the number of pixels in that certain tone. The left side of the horizontal axis epitomizes the black and dark areas, the middle characterizes medium grey and the right hand side symbolizes light and pure white areas. The vertical axis denotes the size of the area that is seized in each one of these zones. Thus, the histogram for a very dark image will have the mainstream of its data points on the left side and center of the graph. On the other hand, the histogram for a very bright image with few dark areas and/or shadows will have utmost of its data points on the right side and center of the graph.

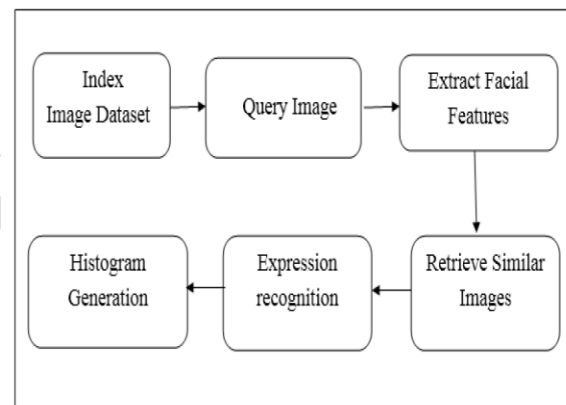


Fig. 3: System Architecture Design

##### 3. Expression Recognition:

The facial expression recognition accomplished by using a Support Vector Machine (SVM) to appraise the enactment of the proposed method. SVM is an administered machine erudition technique that implicitly maps the data into a higher dimensional feature space. Accordingly, it treasure trove a linear hyper-plane, with a maximal margin, to distinct the data in unlike classes in this higher dimensional space. Afterward the histogram identified in the previous module and excerpt all the feature spontaneously and the features are deposited separately. Based on the extracted features, the expression is acknowledged.

##### 4. Face Retrieval:

In this module, the similar images will be retrieved based on the expression recognized on the

previous module. The productivity of the descriptor depends on its illustration and the easiness of extracting it from the face. Supremely, a good descriptor should have a high alteration in the middle of classes (between different persons or expressions), but little or no variation within classes (same person or expression in different conditions). These descriptors are recycled in a number of areas, such as, facial expression and face recognition.

#### IV. PROPOSED METHOD

In the proposed technique, facial expressions of the human face are recognized from the input image using Eigen spaces process. The method is adapted from the well-known Eigen face documentation technique. To validate the achievability of using Eigen space for facial expression recognition, the PCA modernization method is modified and the revised PCA refurbishment method is shown in Fig. 4. If the input image is comparable to some expression training set, the reassembled image will have less falsification than the image reconstructed from other eigenvectors of training expressions. Based on this idea, the authors distributed the training set into six classes affording to entire expressions as shown in Fig. 1 and computed the Eigenspaces of each class. For a test face image, they first project it onto the Eigen space of each class autonomously and formerly originate renovated image from each Eigen space. By measuring the correspondence between input image and the remodeled image of each class, they can categorize the class of input image whose recreated image is most analogous to the input image.

#### Eigen spaces for facial expression recognition:

When using Eigen spaces for facial expression recognition of unrevealed faces, one preference is to work out one Eigen spaces for every single facial expression from a docketed database of altered persons. The classification process tallies to that of face recognition: Plan an innovative image to every single Eigenspaces and select the Eigenspaces, which best portrays the input image. This is finished by work out the Mean Square Error. However, the problem with facial expression categorization is that the person is unrecognized. Each person uses a diverse smile. Nonetheless, each smile of each person be invented to be classified as smile. In order to deal with this reality, the writers have reformed the Eigenface recognition method so that a detached subspace is fashioned for each facial expression of the human, instead of having a solitary subspace for

all expressions as in the inventive method i.e., all six facial expressions will have their individual expression space as a subspace of the image space as shown in Fig. 4. With the expression subspaces accessible, the authors could then continue for appreciation of expression in any given image. Parallel to the images for attainment of the expression subspaces, the new image is first warped to the corresponding column vector. The authors at that juncture consider the expression subspaces one at a time and work out the distances between the new image vector and the subspaces. Whichever expression space having the shortest distance to the input image, the corresponding expression will be nominated as the facial expression confined in the input image.

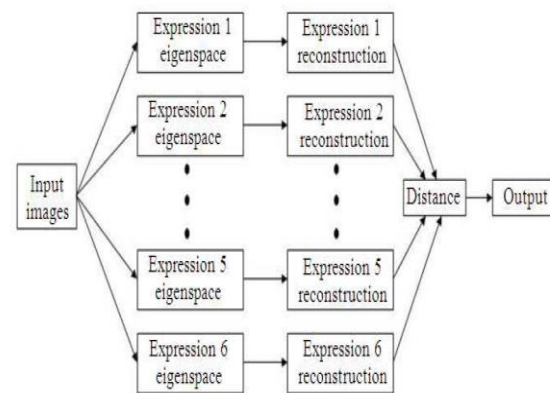


Fig. 4: Diagrammatic representation of proposed PCA reconstruction

#### V. RESULTS AND EVALUATION

This method is tested using the Cohn-Kanade facial expression database. The database involves more no. of university students with six expressions (Happiness, Sad, Surprise, Fear, Anger and Disgust). The accuracy rates are increased by 10% for Happiness and by 28-30% in case of surprised and sad respectively when compared with previous methods.

##### A. Home Page

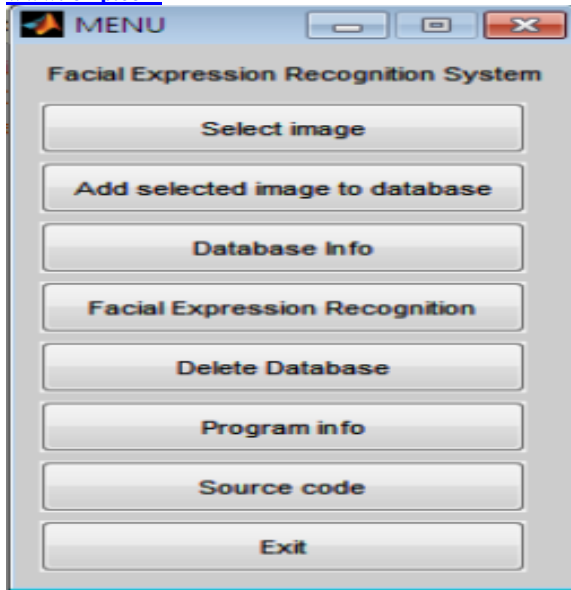


Fig. 5a: Home Page

B. Train Image Selection

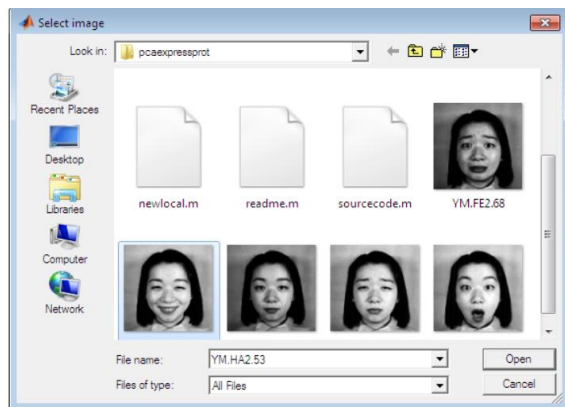


Fig. 5b: Train Image Selection

C. Reference Image



Fig. 5c :Reference Image

D. Loading Image to Database

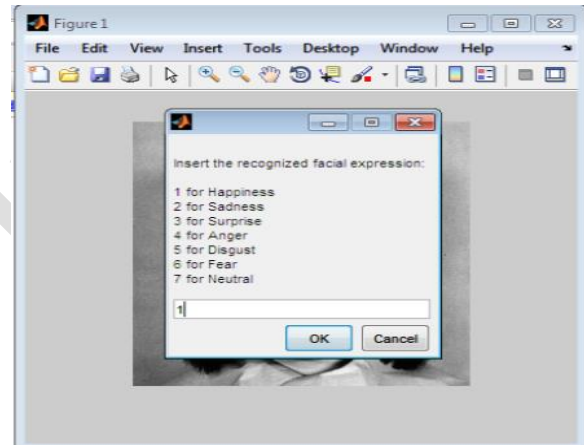


Fig. 5d :Loading Image to Database

E. Image added to database

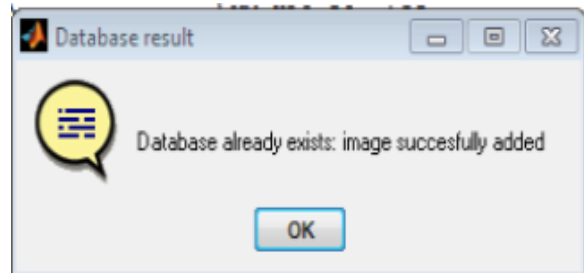


Fig. 5e : Image loaded to database

F. Expression Recognition

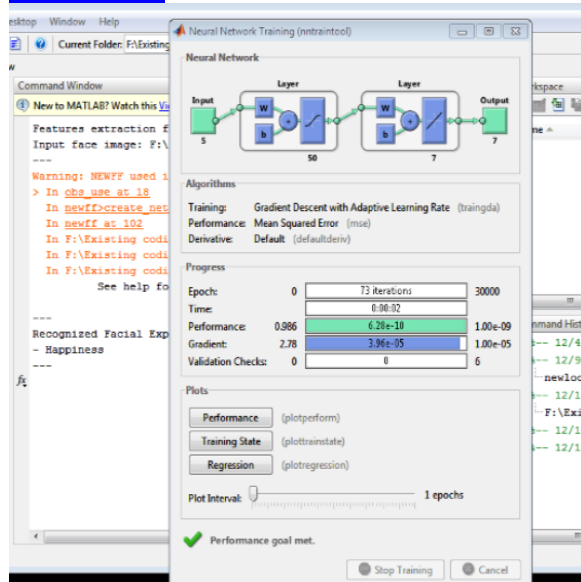


Fig. 5f :Expression Recognition

G. Performance

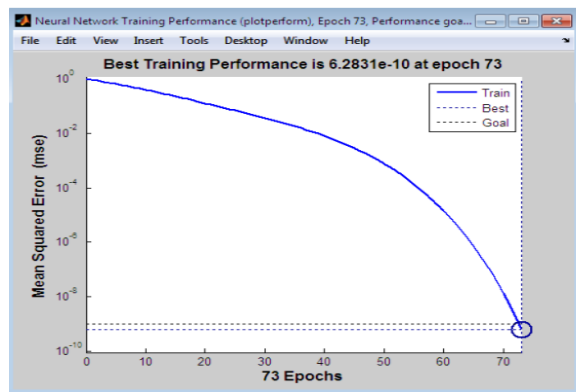


Fig. 5g :Performance

H. Training State

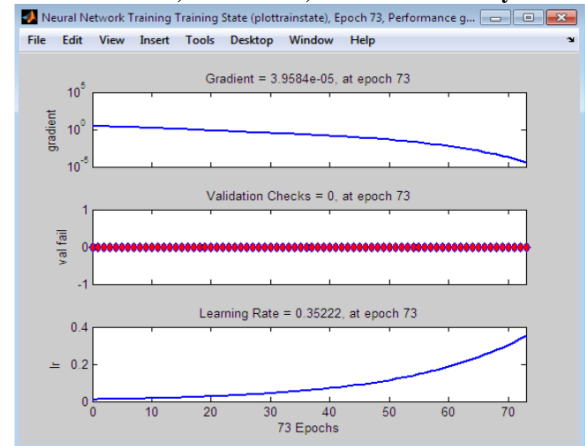


Fig. 5h :Training State

I. Regression

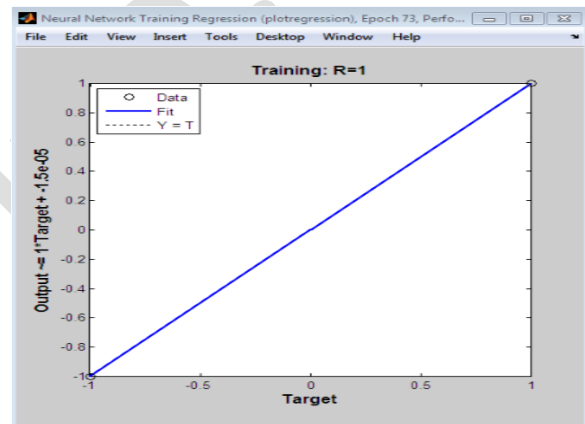


Fig. 5i :Regression

VI. CONCLUSION AND FUTURE WORK

When investigating facial expressions, the authors always deliberate perspective statistics of the circumstances, acquaintance about the observed person, voice, speech and hand and body signals. Even supposing humans recognize facial expressions deprived of attempt or wait, reliable expression recognition by system is still a vast challenge. When compared with the facial expression recognition method based on the video sequence, the method based on the static image is further difficult because of the deficiency of chronological information. The most important role of this study is to examine the facial expression recognition based on static image and to suggest a new recognition method using Eigenspaces. The planned system is tested



using Cohn-Kanade Facial Expression database and JAFFE database. The investigational results show the effectiveness of the suggested method.

In future, the study can be done to develop facial expression recognition system by the steps involved in the masquerade approach, which will make use of both neural network and wavelet transformations.

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