

# Face Recognition using PCA Gabor Filter SVM Techniques

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**Abstract:** Face recognition is the hot research topic from last few years but still it has become so difficult and large problem. The face recognition is the modulus operandi that human performs in their daily lives. The main challenges faced by the researchers are variation caused due to different expression and pose. The main feature that can be used to extract the features from variant images that are caused because of different variations is Gabor Wavelets. Face recognition is the process of identification of a person by their facial image. This technique makes it possible to use their facial image of a person to authenticate him into a secure system. In this thesis we have analysed the face images and non-face images using Gabor filter and SVM. In this we have created a training set using the eigen faces and the eigen faces are formed by using the Principle Component Analysis. The Principle Component Analysis face recognition algorithm is the one of the most important technique used for recognizing faces. The PCA is the technique that effectively and efficiently represents pictures of faces into its eigen faces components and these eigen face components form eigen faces these eigen faces are the ghost images of original images. The significant feature known as eigen faces don't necessarily correspond to features such as eyes, ears and noses. It provides the ability to learn and later recognize new faces in an unsupervised manner.

**Keywords:** SVM, PCM, Face recognition

## I. INTRODUCTION

(Size 10 & Normal). With the advent of electronic banking, e-commerce, smart cards, and an increased emphasis on the privacy and security of information stored in various database, automatic personal identification has become a very important topic. Accurate automatic personal identification is now needed in a wide range of civilian applications involving the use of passports, cellular phones, automatic teller machines and driver license. Traditional knowledge-based (Password or Personal Identification Number (PIN)) and token-based (Passport, driver license, and ID card) identification are prone to fraud because PINs may be forgotten or guessed by an impostor and the tokens may be lost or stolen. Therefore, traditional knowledge-based and token-based only approaches are unable to satisfy the security requirements of our electronically interconnected information society. A

perfect identity authentication system will need a biometric component [5].

An identification system matches the input face with a large number of faces in the database and as a result, algorithm efficiency is a critical issue in an identification system [1].

## II. PERFORMANCE CRITERIA

### A. Identification System

Face identification systems performance is usually evaluated by recognition rate, which is calculated by matching a set of test face images with those in the database. Different algorithms can be evaluated by matching each test face image [6]

### B. Verification System

In a face verification system, system level performance evaluations are usually performed by cross matching the face images in the database. Different algorithms can be evaluated by matching each face image in the database with the rest of the images in the database. A threshold value is normally used such that a matching attempt is considered authentic when the matching score is equal to or above the threshold value.

## III. CONTRIBUTIONS OF THIS RESEARCH

The main contributions of the research are as follows:

- The thesis presents new insights and experimental results for the use of face as a non-invasive biometric for human identification.
- The thesis presents a novel approach for spatial segmentation of face images.
- The approach is well suited for dealing with occlusions.
- The thesis presents experimental results for multimodal approach with face images.
- The thesis presents a novel approach of feature vector concatenation in the PCA space.
- The thesis presents the use of Gabor wavelets and SVM for face recognition.

## IV. BIOMETRIC TECHNOLOGY

Biometrics technology is used to conduct the genuineness of identification and authenticity as per the physiological or behavioural statistics [4].

Biometric is a combination of two words ‘Bio’ implies physiological aspects, whereas ‘Metric’ refers to measure characteristics[3] i.e. personal identification data. Besides safe and convenient, this technology is very reliable and secure. Biometric is very important in today’s world of fast development in computer technology [2].

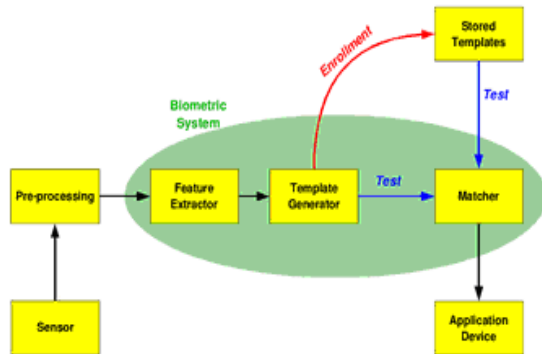


Figure1.1 Basic Block Diagram of Biometrics[7]

**V. IMPLEMENTATION USING MATLAB**

The entire sequence of training and testing is sequential and can be broadly classified as consisting of following steps:

1. Database Preparation
2. Training
3. Testing or identification

The above steps functioning are shown by the below flow chart:

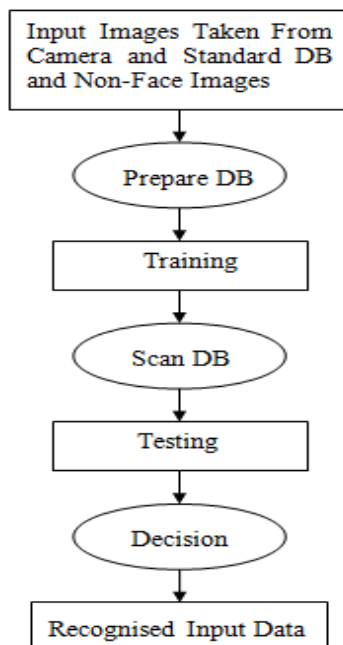


Figure1.2Flow Chart Indicating the Sequence of Implementation

**DATABASE PREPARATON:**

The database was obtained by taking photographs of different persons by using camera etc. in similar

condition like lighting, size, resolution etc. The database used in this thesis is formed by using three types of images such as photograph taken from camera, standard database downloaded from internet i.e. UCI database and some Non-faces images are downloaded from internet. These images were stored in training folder. The size of image must be equal to 1200×900 pixels and resolution must be set to 80 pixels/inch.

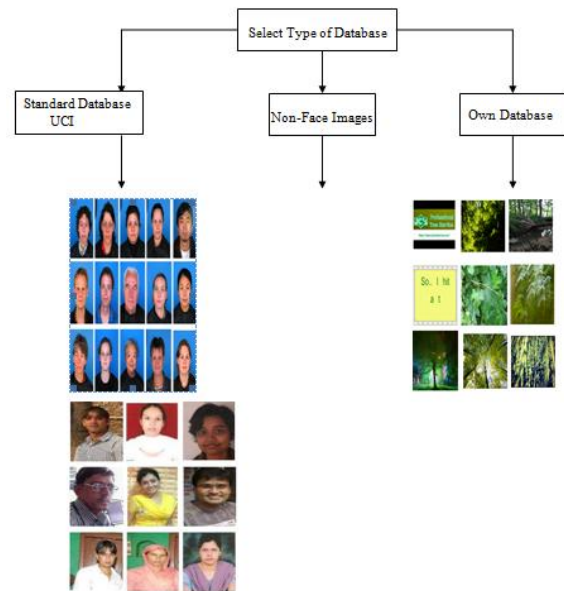


Figure1.3 Types of Database Used

**TRAINING:**

The different steps involved in training are explained below:

- Select one (.jpg) file from database train database.
- By using that read all the faces of each person.
- Normalize all the faces and convert them to grey scale.
- Find the mean of all face images and subtract that mean from the data matrix of all face images read from train folder.
- Then form the co-variance matrix.
- Find the Eigen vectors of co-variance matrix.
- By using the values of these Eigen values and vectors form the eigen faces and display each Eigen face with its corresponding eigen value.

Flow chart for training set explains the sequential operation taken while training:

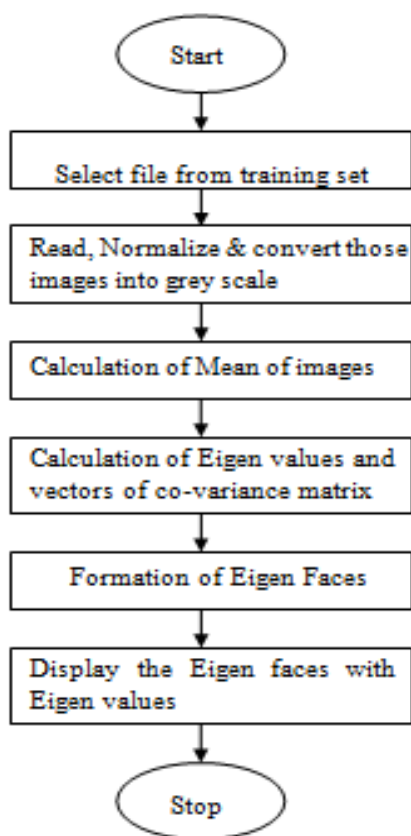


Figure1.4 Flow Chart for training

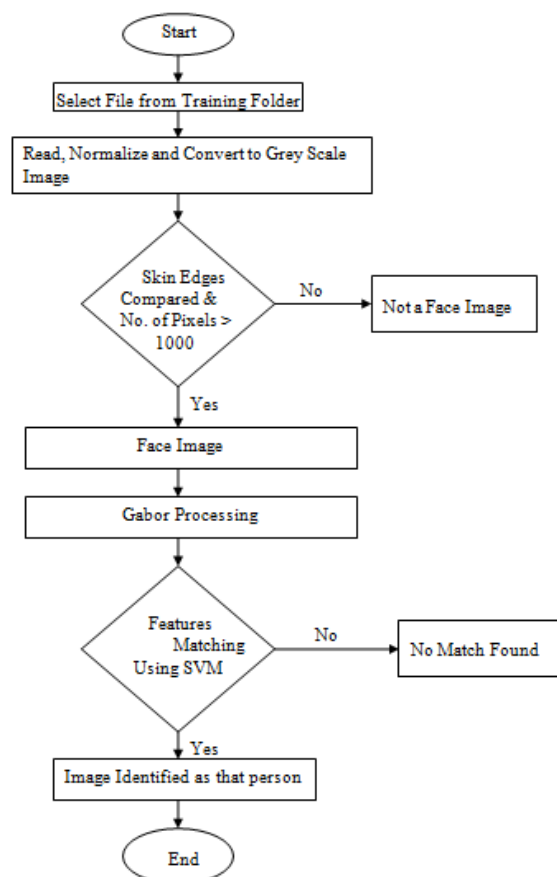


Figure1.4Flow Chart for Testing

**TESTING:**

Testing is carried out by following steps:

- Select an image to be tested using open file dialog box.
- An image is read and normalizes and converted into grey scale.
- Then detect whether the selected image is a face image or not. It is performed by finding the number of pixels that must be greater than 1000 for a face image and skin edges and edges are determined by using canny edge detector. Then dialog box appears and shows the image is face or not.
- Then Gabor filter is applied and it perform the fast Fourier transforms analysis on the images and extract the features by rotating the images at different angles with different orientations and we obtain 40 Gabor oriented wavelets whose one block size equals to 64 ×64 with different values of k. Then negative of the image is formed to obtain the difference between the images.
- Last step matching is performed and the matching is done by using SVM that works as a classifier and classifies the image with the stored database in training folder.

**VI. RESULT**

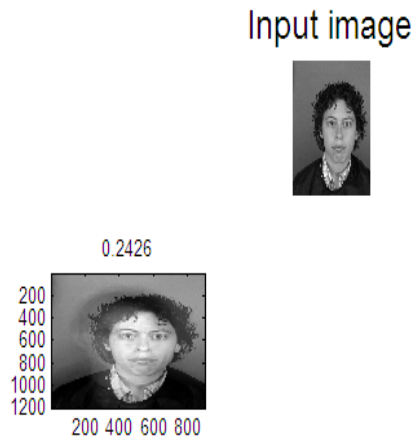
The result and discussion section is divided into three parts. In the first part, the set of images are loaded to create a training set and the types of database used are discussed. The second part consists of discussion of training set and the different processing steps are discussed. Finally, in third part the testing results are discussed which are obtained using the Gabor filter and SVM.

The testing phase will helps us in identifying the image that we want to identifies. This phase first select the image from open dialog box then gabor and SVM are applied on it for extracting features and matching the selected image to the stored template that is created using the training set. The image is transfer under different luminance and chrominance because in CBYR complete set of operation is shown and this helps us in clearing and refining the image parts.



**Figure1.5** This shows the selected image and its different forms under different conditions

Now matching of the image is performed using SVM classifier that will identified that the selected image is matched or not and gives us output with specified eigen value and Euclidean distance.



**Figure1.6**The figure shows that image selected is matched and with specified eigen value.

In case if the selected image is Non-face image then the processing will stops when the skin edges and the number of pixel of selected image are determined and then dialog box appears that the image selected is not a face image. Now at last the comparison of different images selected is shown in the table that how many images are processed and what result we get.

## VII.CONCLUSION AND FUTURE

### WORK:-

In this thesis the still images facial recognition technique is developed. This research is divided into three phases. In the first phase, we apply eigen faces approach and they are formed by using Principle Component Analysis. PCA can significantly reduce the dimensionality of the original feature without loss of much information in the sense of representation.

### Future Scope:

Eigen faces approach is used to analyse the face and non-face images. The eigen faces are formed using PCA. PCA can significantly reduce the

dimensionality of the original feature without loss of much information in the sense of representation, but it may lose important information for discrimination between different classes. So for increase performance in future works additional methods such as combination of PCA and LDA can be applied also recognition time can be reduced using it. Instead of Gabor filter and SVM the ANN network can also be applied for analysing the eigen faces.

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