AUTOMATED FACIAL RECOGNITIION SYSTEM

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Abstract **:** Automated Facial Recognition System is the advancement that has taken place in the field of automation replacing traditional security systems. Automated Security Systems are generally bio-metric based and iris detection based. These systems are widely used in different organizations. The above mentioned systems have a less scope of security when compared to Face Detection System. This helps in having a great deal of security for any organization. This system is mainly proposed and developed for some crucial processes such as person identifications, verification or recognition especially for building access control, suspect identifications by the police, driver licenses and many others. The techniques used in this system is Eigen faces based on principle component analysis (PCA). The main factors taken into consideration are illumination, distance and subject's head orientation. The performance of the system is considered to be 80% efficient at the distance between 40-60cm.

IndexTerms **- Face Recognition, Eigenface, Principal Component Analysis.**

I. INTRODUCTION

Face recognition (FR) has received significant attention during the last two decades and many researchers study various aspects of it. The main reason is that we try to explore the wide range of commercial and security application. In fact, Facial Recognition has become an important issue in many applications such as access control, security systems and criminal identification. For example, the ability to model a particular face and distinguish it from other face images models would make it possible to improve one person identification or recognition. However FR system alone has limitation. Actually, the ability to detect faces at the first place, as opposed to recognizing them, can be very important because the process of face detection is considered the first step in an automated face recognition system. The first step of human face identification is to extract the relevant features from facial images. The question naturally arises as to how well facial features can be quantized. If such a quantization if possible then a computer should be capable of recognizing a face given a set of features. There are three major research groups which propose three different approaches to the face recognition problem. Most of face recognition algorithms fall into one of two main approaches: feature-based and image-based algorithms. Feature-based methods explore a set of geometric features, such as the distance between the eyes or the size of the eyes, and use these measures to represent the given face. These features are computed using simple correlation filters with expected templates. These systems are sensitive to aging and facial expressions. It is also not clear which features are important for classification. In this paper, an automated face recognition system application is designed for the purpose of access control. The Facial Recognition system developed is based on the well known Eigenface technique which is derived from Principle Component Analysis (PCA).

3.1 Data and Sources of Data

For this study we used primary data our data set. The data has been taken directly from the system while performing the experiment.

3.2 Theoretical framework

The system is basically divided into six stages which give us a description of the procedure of how the system works.

3.2.1. Image capture

The Camera is mounted at a distance from the entrance to capture the frontal images of the employees
The captured image is preferred to be of the size 640x480 to avoid resizing of the image in the back-end as we observed resizing may sometimes results in poor performance

3.2.2. Face detection

A proper and efficient face detection algorithm always enhances the performance of face recognition systems
Viola and Jones framework is used which gives a high detection rate and is also fast
Viola-Jones detection algorithm is efficient for real time application as it is fast and robust
We observed that this algorithm gives better results in different lighting conditions and we combined multiple classifiers to achieve a better detection rates up to an angle of 30 degrees

3.2.3. Pre-processing

The detected face is extracted and subjected to preprocessing
This pre-processing step involves with histogram equalization of the extracted face image and is resized to 100x100
Histogram Equalization is the most common Histogram Normalization technique. This improves the the contrast of the image as it stretches the range of the intensities in an image by making it more clear

3.2.4. Database development

This database development phase consists of image capture of every individual and extracting the features of face, and later it is enhanced using pre-processing techniques and stored in the database

3.2.5. Feature extraction and classification

The performance of a Face Recognition system also depends upon the feature extraction and their classification to get the accurate results

Principal Component Analysis (PCA) was the first algorithm that represents the faces economically

In PCA the face images are represented using Eigen faces and their corresponding projections along each Eigen face

Instead of using all the all the dimensions of an image only meaningful dimensions are considered to represent the image

3.2.6. Post Processing

In the proposed system, after recognizing the faces of the employees, the names are updated into an excel sheet

Systematic risk is the only independent variable for the CAPM and inflation, interest rate, oil prices and exchange rate are the independent variables for APT model.

Equations

Mathematically an image using PCA is represented as

$$\chi = WY + \mu$$

Where χ is the face vector, Y is vector of Eigen faces, W is the feature vector, and μ is the average face vector

These projections (feature vectors) are then used as classification features in face recognition

I. RESEARCH METHODOLOGY AND DEVELOPMENT

The development of this automated face recognition system is done in typical face recognition's two stages which are training stage and evaluation stage. In the first stage, the specific number of training image of face candidate is captured. The features are extracted using principle component analysis. The system will then learn on the extracted features and store them in its database.

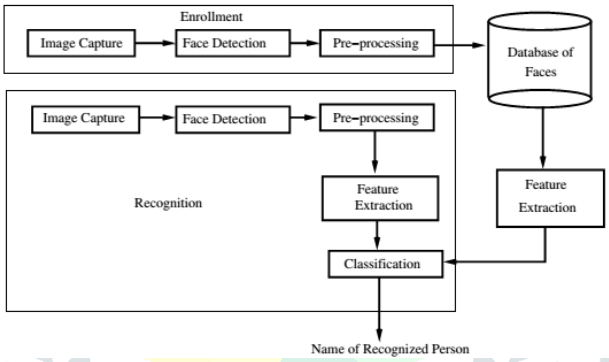

Figure 1: System Architecture

The development of Graphical User Interface (GUI) has been done by using MATLAB. There are images for each person where the variations of frontal face positions are captured perpendicular to the camera. These images are captured in advance using camera, cropped and then are trained into the system and kept inside system's face

Database. The characteristics of these captured images are similar to the first type of face databases. Figure 2 show the GUI snapshot of FR system.

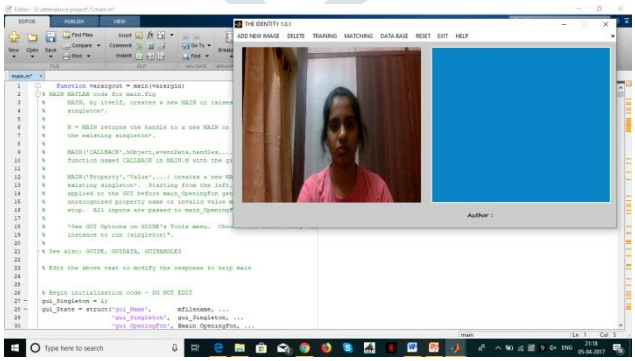

Figure 2: Interface of the system

In this project, the application of face recognition has been studied in order to investigate the suitability of designing an automated face recognition system for door access control. Illumination is considered as major factor that influence the performance of any face recognition system. The source of the light is located at the camera of Face Recognition system itself. In the second factor which is the distance of subject, usual measurement unit in centimetre has been used. This measurement represents the distance from Face Recognition camera to the frontal face of the subject. Another factor has been taken into consideration i.e. Angle of the head to the camera, which is considered to be perpendicular.

With the three factors under consideration, the system has

been tested with many different individuals where their frontal face images have been captured and stored in the face database. The tests have been performed with the variation of subject's distance and the system's illumination.

From the results obtained, the developed automated face recognition system has been able to recognize nearly 78% of different orientation position of the subject's face at 40 cm from the camera

II. CONCLUSION AND FUTURE REFERENCE

Automated Facial Recognition System thus proved to be time saving and secured. This system can also be used to identify an unknown person. In real time scenarios LBPH outperforms other algorithms with better recognition rate and low false positive rate. SVM and Bayesian also prove to be better classifiers when compared to distance classifiers. The future work is to improve the recognition rate of algorithms when there are unintentional changes in a person like tonsuring head, using scarf, and beard. The system developed only recognizes face up to 30 degrees angle variations which has to be improved further. Gait recognition can be fused with face recognition systems in order to achieve better performance of the system.

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