Multiuser Face recognition With Attendance and Security System

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Abstract- *In today's world security is most essential part of our life. Security in Colleges, Government one's, Mall is very much important. Addition with security, if the system is able to mark the attendance of employees[4] without spending extra time then it will be a good service towards a company. The problem today's attendance system is the employees need to go to once and sign on muster with their in-time & out time. So we need such system from which we can maintain security as well as attendance of employee.*
In earlier methodology, the user recognition was done with the Biometric technology or with the help of Fingerprints[6].The major issue in this system is that the employees must have to maintain the queue for the registration purpose and this causes the more time consumption so its gives some amount of drawback over the attendance. Also, we have some face recognition techniques but it will not go for criminal's identification. We propose the solution for this problem. Capturing the multiple images by good resolution cameras to identify employees, or any unknown person capturing the images is done with the Real Time Image Processing System.

After capturing the images, the system will separate out the multiple faces from the images & try to match these faces to the database. When the face matches with an employee then the system will mark attendance otherwise checks in criminal's database if face matches then the system will automatically generate an alarm on police portal. If a person is not an employee or not a criminal then his/her image will be stored in a database for further use. This system also consists one of the advanced features for the purpose of security named as police portal for uploading images of criminals, so the system can check with the images stored in existing as well as the real-time database.

KEYWORDS- Face detection, Real-time Face Recognition, Principal component analysis (Recognition Algorithm), image matching pattern, handling huge databases, Parallel Processing.

1. INTRODUCTION

This system focuses on multiuser face recognition are known to be the most natural ones, for different purposes like attendance and security. Attendance using Real Time Face Recognition[4] provides flexibility to identify several employees at the same time separately rather than identifying one by one. To increase the accuracy, efficiency and reliability of the
recognition, algorithms are needed. Once the faces are recognized by the camera, the attendance gets marked. So an organization can recognize its regular employees while they are entering the organization. For the processing, the camera will be placed at the entrance point of the organization to capture multiple images. At the first step, the camera will catch image and pass to the system for identifying the images of employees from existing database. If captured image is matched with existing database then attendance get automatically marked. If the image will not match with the database that is the entry is new for the system so that image will be stored into the database for further use.
For security purpose, the system provides police portal which contains authorized login. If the police found any new criminal information which has only images without any kind of personal details like the name. On that situation police authority sends the images to our system for checking whether that particular person went through our organization then system will send the alert message to police portal.If not, then the system will store that image in our database for further process. If possible, the system will provide the direct message facility to the particular police whose contact details present with us.

2. PRINCIPAL COMPONENT ANALYSIS (PCA) ALGORITHM

Principal component analysis (PCA)[1][2] is one of the most popular methods for reducing the number of variables in face recognition. In PCA, faces are represented as a linear combination of weighted eigenvectors called as Eigenfaces these eigenvectors are obtained from the covariance matrix of a training image set called as the basis function.The number of Eigenfaces that obtained would be equal to the number of images in the training set. Eigenfaces take advantage of the similarity between the pixels among images in a dataset by means of their covariance matrix. These eigenvectors defined a new face space where the images are represented. To fix the required notation, let us introduce the following symbols. Let training image set I consist of N images each having size a×b pixels. Using conventional row appending method converts each of the images into an a×b dimensional column vector.

$K=\{k_1,k_2,\ldots\ldots k_N\}$ (1)

Covariance matrix *c* of training image set are calculated by using equation (2)

$C=\frac{1}{N}\sum_{n=1}^{N}(k_n - k)^T(k_n-\bar{k})$ (2)

Where is the mean vector of all images in the training set. Eigenvalue and eigenvectors of covariance matrix is calculated using equation (3)

$cv=\lambda v$ (3)

Where λ denotes the eigenvalues of *c*, and *v* stands for the corresponding eigenvectors. Note that the rank of the covariance matrix is N, hence at most N number of eigenvectors can be computed.

$$U=(k_n-\bar{k}) \times v \quad (4)$$

Where *n* = 1, 2,..., N.
The Eigenvectors found, *U* have a face like appearance, they are called Eigen faces. Sometimes, they are also called as Ghost Images because of their weird appearance After the face space has been constructed, the feature vectors are formed as a linear combination of the eigenvectors of the covariance matrix. Project an image $k_n$into the face space with the help of following equation.

$$P_n=U^T\times(k_n-\bar{k}) \quad (5)$$

Where P*n*, *n* = 1, 2,..., N are the vector of weights associated with the eigenvectors in *c*. One can experiment with the number of eigenvectors to compute the weights, generally only a few amount provide sufficient information for adequately representing the images in the face space. For recognition of unknown face or test image, normalize it by subtracting from mean vector of all images in the training set. Then using equation (4) project the normalized test image as shown in the following equation

$T=U^T \acute{} D$

(7) Where D is normalize the test image. After the feature vector (weight vector) for the test image have been found out, next step is to classify it. For the classification task we could simply use Euclidean distance classifier.

$$e=\min||T-P_n|| \quad (8)$$

n= 1,2,...,N. If the distance is small, we say the images are similar and we can decide which the most similar image in the database.

3. SYSTEM DESIGN

In this application, while capturing the images through the web camera, web camera creates video sequence and using a different kind of algorithm extract multiple images. From that image algorithm, extract faces then we try to match that face with DB-1 i.e. employee databases if the face matches then attendance is marked otherwise check in DB-2 i.e. criminal database if the face matches with the criminal database then the message will send to police portal. Further, if that face is not matched with DB-1 andDB-2 then capture face is store in new database i.e. customer database.

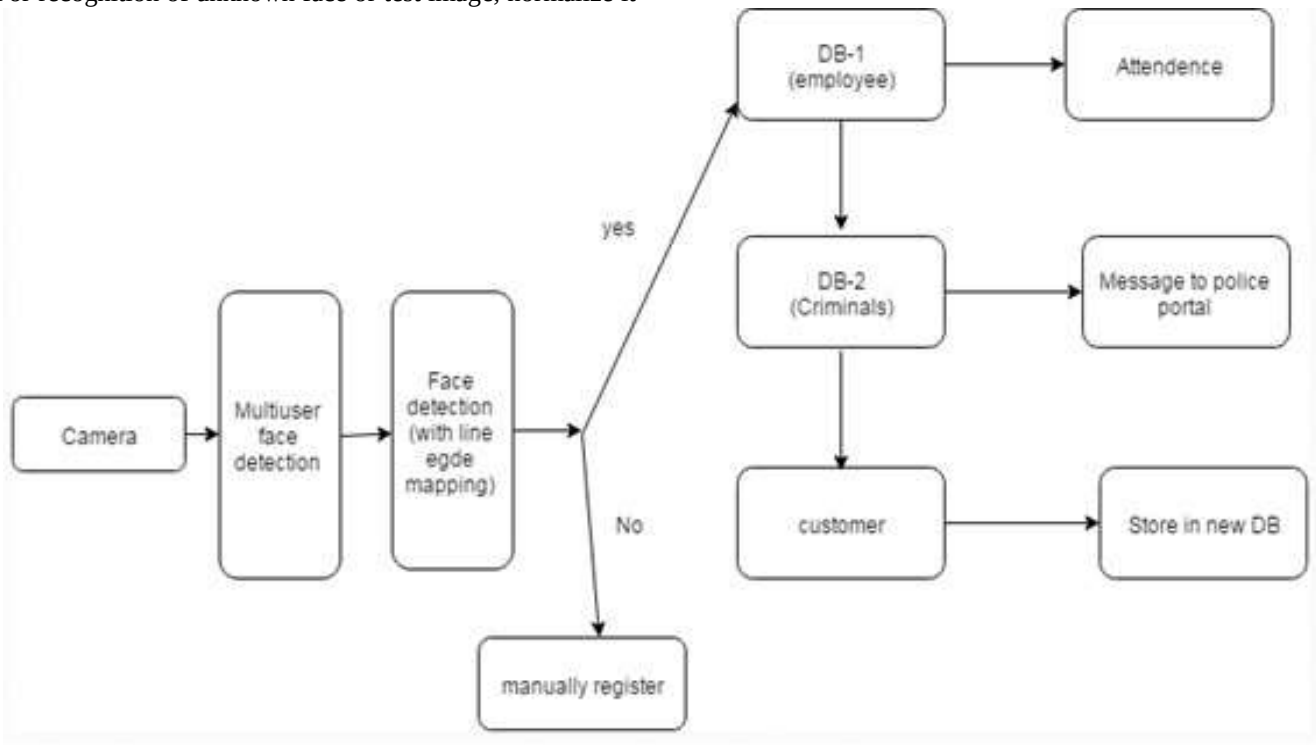

Figure 3.1: System Architecture

3.1. FACE DETECTION:

In the system presented here[3][5], most peoples face the camera frontally hence Haar classifiers have been used for detection. Initially face detection algorithm was tested on the variety of images with different face positions and lighting conditions and then algorithm was applied to detect faces in real time video. Algorithm is trained for the images of faces and then applied on the image for detection of

multiple faces in the image. After a face has been detected, the rectangle enclosing this face is cropped and processed later by the face recognition module. This rectangle represents a single face, and after being cropped as an image is transferred on the system for further check. Each file transferred is renamed to have a unique value.

3.2. FACE RECOGNITION:

Typical structures of face recognition system[3] [5]consist of two major steps, acquisition of face data, extracting face feature and face recognition system in which subject under consideration given to the system for the recognition purpose this is consider being an acquisition of face image. Later on, the feature is extracted from the image and finally, it is given for the recognition purpose. These steps are elaborated as follow.

3.2.1. ACQUISITION OF FACE DATA

Acquisition and Processing of Face Data are first steps in the face recognition system. In this step face images is collected. The sources may be camera or readily available face image databases. The collected face images should have the pose, lighting and look etc. variation in order to check the performance of the face recognition system under these conditions.

3.2.2. EXTRACTING FACE FEATURE

This step can be defined as the procedure of extracting a face image. In feature extraction, a mathematical representation of an original image is generated, which is stored in the database and perform face recognition task. After the face detection step, the next is face recognition. This can be achieved by cropping the first detected face from the image and compare it with the database. In this way, faces of employees are verified with the database using the Eigen Face method and attendance is marked on the system. The system consists of a camera that captures the images and sends it to the system for performing different processing such as Eigenvalues, Eigenvectors etc, the image comes in the Face Detection and Recognition modules and then the attendance is marked on the database system. If the image will not match with the database that is the entry is new for the system so that image will be stored into the database for further use for security purpose, the system contains police portal which contains authorized login. If the police found any new criminal information which has only images without any kind of personal details like the name. On that situation police authority sends the images to the system for checking whether that particular person went through our organization then we will send the alert message to police portal. If not then store that image in the database for further process. The system will provide the direct message facility to the particular police. The camera takes the images continuously to detect and recognize the entire employee in the organization. In order to avoid the false detection, the system will be using the skin Classification technique. Using this technique enhance the efficiency and accuracy of the detection process. In this process first the skin is classified and then only skin pixels remains and all other pixels in the image are set to black, this enhances the accuracy of face process.

4. CONCLISION

There are different methods such as biometric, RFID-based etc. which are time-consuming and not reliable. So to overcome this above system is the better and reliable solution from every perceptive of time and security. Thus, we have achieved to develop a reliable and efficient attendance system to implement an image processing algorithm to detect faces in public places and to recognize the faces accurately to mark the attendance. Sometimes security issues are rising, on public places there are 24*7 cameras start and captures the video and simply it will be stored in databases. But our system can use that video and perform image extraction from that video by using some algorithms and if an image will found as a criminal or any other missing person then at that time record and image of that person will send to the police portal.

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