

Attendance System Using Face Recognition and Class Monitoring System

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Abstract — In this paper, we propose a system that takes the attendance of students in the lecture. This system takes the attendance automatically using face recognition. However, it is difficult to estimate the attendance exactly using each result of face recognition independently because the face detection rate is not sufficiently high. In our paper, we propose a method for estimating the attendance exactly using all the results of face recognition obtained by continuous observation. Continuous observation improves the performance for the estimation of the attendance. We constructed the attendance system based on face recognition, and applied the system to classroom lecture. In our system, we are using raspberry pi. we use OpenCv library which is installed in pi for face detection and recognition. The camera is connected to raspberry pi and student database is stored in the pi. With the help of this system time will reduce and attendance will be marked.

In this paper first review similar works in the field of attendance system and recognition of face. Then, it showing our system structure and plan. At the last, experiments are implemented to provide as manifest to support our plan. The result shows that uninterrupted observation improved the performance for the approximation of the attendance.

Keywords- Face Recognition; Identification; Monitoring.

I. INTRODUCTION

The Automated Attendance System is the progress that has taken place in the field of automation replacing the attendance marking activity traditionally. Automated Attendance Systems are generally bio-metric, RFID card and MATLAB based. These systems are widely used in different organizations. Traditional method of attendance marking is very time consuming and becomes difficult when the strength is high. Automation of Attendance System has boundary over conventional method as it saves time and also can be used for security purposes. This also helps to prevent fake attendance.

Computer visual class library (OpenCV) which source code is open, develops for application developers, including plenty of functions which used to tackle the common problems in computer visual field, for example, motion analysis and tracing, face recognition, three dimensional reconstruction and target recognition.

We propose a method that take the attendance using recognition of face based on continuous observation. In this paper, our purpose is to obtain the attendance, positions and images of students' face, which are useful information in the classroom lecture.

II. LITERATURE SURVEY

In [1] the authors have proposed a Automated Attendance Management System based On Face Recognition Algorithm. This system, which is based on face detection and recognition algorithm, automatically detects the student when he enters the class room and mark the attendance by recognition him. This technique is to be use in order to handle the treats like spoofing. The problem with this approach is that it capture only one student image at a time when he enter the classroom

thus it is time consuming and may distract the attention of the student.

In [2] the authors have proposed Automatic Control of Students Attendance in Classroom Using RFID. In this system in which students carry a RFID tag type ID card and they need to place that on the card reader to record his attendance. RS232 is used to connect the system with computer and stored the recorded attendance from the database. This system may give rise to the problem of fraudulent approach. An unauthorized students may make use of RFID card and enter into the organization.

In [3] the authors have proposed Wireless Fingerprint Attendance Management System. This system uses iris recognition system that does capturing the image of iris recognition, extraction, storing and matching. But the difficulty occurs to lay the transmission lines in the places where the quality of topography is poor. In [4] authors have consider a system based on real time face recognition which is reliable, secure and fast which needs improvement in different lighting conditions.

III. PROPOSED MODEL

The system architecture is as shown in Figure 1. The proposed attendance system using face recognition system and class monitoring system. Camera is present inside the classroom where the students are seated. The camera capturing the images of students from the video frame. A face recognition system which automatically identifies and verifies the identity of person from video frame from video source. We used OpenCv library that can be formulated as given images are identify or verify all the students seated in front of camera from the stored database of faces.

Face recognition have more advance than the other system which are given in the table I. The steps in the propose attendance system using face recognition system and class monitoring system shown in the Fig. 1.

A. Image Capture

The Camera is placed inside the classroom at a distance from the students and taking the video frame of the whole class. From the video frame it takes anyone frame to verify and identify the student to mark his attendance.

TABLE I
 Disadvantages of various Attendance Systems

Types of system	Disadvantages
1) RFID-Based	Fraudulent usage.
2) Fingerprint-Based	Time consuming for students to wait and give their attendance.
3) Iris-Based	Invades the privacy of the user.

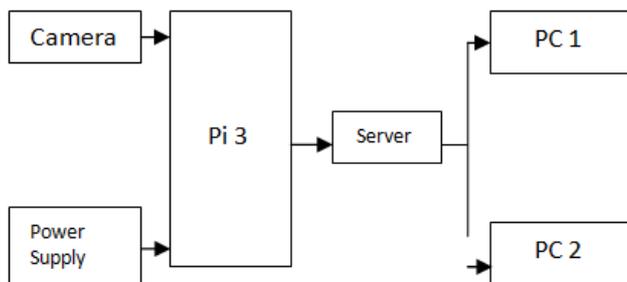


Fig. 1 System Architecture

B. Face Detection

A proper and efficient face detection always enhances the performance of face recognition systems. Various algorithms are proposed for face detection such as Face geometry based methods, Feature Invariant methods, Machine learning based methods. Out of all these methods we are proposed a framework which gives a high detection rate and is also fast.

Our system is efficient for real time application as it is fast and robust. Hence we chose OpenCv Library for the detection of faces. We system gives better results in different lighting conditions.

C. Pre-processing

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

D. Database Development

As we chose bio-metric based system Enrollment of every individual is required. This database development phase consists of image capture of every individual and extracting the bio-metric aspect, in this case it is face, and later it is enhanced using pre-processing techniques and stored in the database. In our project we have taken the images of individuals in different angles, different expressions and also in different lighting conditions. A database of 50 individuals (MySQL-database) with 20 images of each has been collected for this project. Faces stored in the database shown in fig below.



Fig. 2 Captured Database

E. Feature Extraction and Classification

The performance of a Face Recognition system depends on the feature extraction and their classification to get the accurate results. Feature extraction is achieved using holistic techniques. In holistic technique we can use of dimensionality reduction before the classification. We compared the results of different holistic approaches used for feature extraction and classification in real time scenario.

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. Mathematically an image using PCA is represented as

$$\chi = W Y + \mu$$

where χ is the face vector, Y is vector of eigen faces, W is the feature vector, and μ is the average face vector.

Now that you have detected the face we can used that face image for recognition how however if you try to simply perform face recognition directly on normal photo images you will probably gate less than 10% accuracy. The problem with image representation we are given is its high dimensionality. Two-dimensional pxq grayscale images span a m=pq dimensional vector space, so an image with 100x100 pixels lies in a 10,000 dimensional image space already. We can only make a decision if there's any variance in data, so what we are looking for are the components that account for the information. The Principal Component Analysis (PCA) is

used to turn a set of possibly correlated variables into a smaller set of uncorrelated variables. The idea is that a high-dimensional data is repeatedly described by correlated variables and therefore only a few meaningful dimensions account for most of the information. The PCA method finds the directions with the greatest variance in the data, called principal components.

Algorithmic Description

Let $X = \{x_1, x_2, \dots, x_n\}$ be a random vector with observations $x_i \in \mathbb{R}^d$.

1. Compute the mean μ

$$\mu = \frac{1}{n} \sum_{i=1}^n x_i$$

2. Compute the the Covariance Matrix S

$$S = \frac{1}{n} \sum_{i=1}^n (x_i - \mu)(x_i - \mu)^T$$

3. Compute the eigenvalues λ_i and eigenvectors v_i of S

$$Sv_i = \lambda_i v_i, i = 1, 2, \dots, n$$

4. Order the eigenvectors descending by their eigenvalue. The k principal components are the eigenvectors corresponding to the k largest eigenvalues.

The k principal components of the observed vector x are then given by:

$$y = W^T(x - \mu)$$

where $W = (v_1, v_2, \dots, v_k)$.

The reconstruction from the PCA basis is given by:

$$x = Wy + \mu$$

where $W = (v_1, v_2, \dots, v_k)$.

So Face Recognition involves in two stages, feature extraction and classification. The above mentioned feature extractors combined with classifiers are compared in various real world scenarios such as lighting conditions, Unintentional facial feature changes (occluded faces), Expressions. System

Performance is also evaluated in terms of recognition rate, distance, false positive rate, time taken for training. False Positive Rates are calculated by considering 50 real time image frames. It has been observed that LBP based algorithm gives least false positive rate and good recognition rate as it correctly differentiates between the unknown and known faces. LDA can make correct discrimination between the images only if the discrimination is provided in the database (for example images at different lighting conditions). Distance also plays as a criteria in this system as the video frames are taken when all students are seating in the classroom. So the face region captured at about 4 feet and 7 feet gives better results for LBPH and other algorithms respectively. For a Training data of 500 images training time is calculated. LBP based algorithm requires minimum time for training where as SVM and Bayes classifiers take time for training.

F. Post-processing

In the proposed system, after recognizing the faces of the students, the information of students are updated into an MySQL database. The data of present student are then send to server computer and stored so that authorised person can see it.

IV. GRAPHICAL USER INTERFACE (GUI)

The GUI is developed using WampSever, it is a window web development environment. It allow you to create web application with Apache2, PHP and a MySQL database. Alongeside, PhpMyAdmin allows you to manage easily your databases.

The system provides the following functions.

- Name
- Date
- Time
- Attendance: Present/Absent

Excel Sheet is generated when Recognition is completed. Figure 3 shows the extraction of face region and updating to the database after pre-processing. Figure 3 shows the recognition process. Post-processing step in-cludes updating the excel sheet with students names who are present as shown in Figure 4.

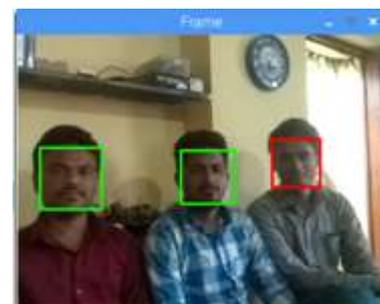


Fig.3 Recognizing the Faces

Roll No.	Name	Attendance	Class/Time
10	Sudesh	Present	8.00AM
11	Nikhil	Absent	8.00AM
13	Chetan	Present	8.00AM

Fig.4 Attendance Excel Sheet.

V. CONCLUSION AND FUTURE WORK

Attendance system using face recognition and class monitoring system based on face recognition techniques thus proved to be time saving and secure. In real scenarios LBPH outperforms algorithms with better recognition rate and low false positive rate.

In future work is to improve recognition rate and Using Raspberry pi the current project can be modified by infrared camera interfacing , it can be used in smart surveillance monitoring security system.

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