MATRIX Academic International Online Journal of Engineering and Technology
ISSN: 2348–3326 © MAIOJET
Volume III Issue I, April 2015

AUTOMATIC LECTURE ATTENDANCE SYSTEM USING FACE REORGANIZATION

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Abstract — This paper presents Automatic Lecture Attendance System Using Face reorganization in a real time background for a Student to mark their attendance. This system eliminates classical student identification such as calling student names, or checking respective identification cards, which can not only interfere with the teaching process, but also can be stressful for students during exam sessions. Basically this research is aimed for implementing a system that is capable of identifying the students, marking their attendance and handling their leave requests.

***Keywords*— Haar Cascade Classifie, Real Time Face Reorganization, PCA: Principle Component Analysis, leave management using NPL: Natural Language Processing, Face Reorganization**

I. INTRODUCTION

This system eliminates classical student identification such as calling student names, or checking respective identification cards, which can not only interfere with the teaching process, but also can be stressful for students during exam sessions. Basically this research is aimed for implementing a system that is capable of identifying the students, marking their attendance in every lecture and handling their leave requests. Therefore face recognition is used to mark the attendance of the students. This system also helps in some following features:

1. The system can be used also during exam sessions or other teaching activities where attendance is obligatory.
2. If the attendance of a student of classroom lecture is attached to the video streaming service, it is possible to present the video of the time when he was absent.
3. It is also possible to know whether students are awake or sleeping and whether students are interested or bored in lecture if face images are annotated with the students' name, the time and the place.
4. To increase the accuracy, efficiency and reliability of the recognition, algorithms are needed. Principle Component Analysis (PCA) and Haar cascade are used to address those tasks [3].
5. The PCA is one of the most successful techniques that had been used in image recognition and compression.

As far as the leave process of today universities are concerned, if any student takes a leave without leave application, it will give a bad impact on an internal mark. Most of them are using manual process to handle leave requests of employees. So it is time consuming, inefficient and unreliable. This system allows students to request a leave by using a simple SMS. To process theses requests Natural Language Processing (NLP) technology is used within the system [4]. NLP is a field of computer science, artificial intelligence and linguistics concerned with the interactions between computers and human (natural) languages. As such, NLP is related to the area of human-computer interaction. Many challenges in NLP involve natural language understanding that is enabling computers to derive meaning from human or natural language input [2]. Through practices, this system is proved to be easy-to-use and effective.

II. LITERATURE SURVEY

Face recognition has a wide range of applications especially in security and commercial areas. The growing interest in reliable verification and identification systems leads to replace the conventional methods (e.g. ID card and passwords) with human biometrics such as fingerprint, iris, retina, voice and face. Face recognition offers several advantages over other biometrics in terms of its public acceptance and nonintrusive [6].face is non rigid object and has a large variability so many challenges associated with face detection and recognition such as pose changes, facial structural features (e.g. beards, mustaches), facial accessories (e.g. glasses, scarves), facial expressions, occlusions, image

orientation, and imaging conditions need to be overcome [8]. So far, no approach has come with a complete solution to address the different variations that may present in face images under real environments [7].

A. Issues in existing system

A critical look at the available literature indicates that the following issues need to be addressed while designing a Automatic Lecture Attendance System Using Face reorganization.

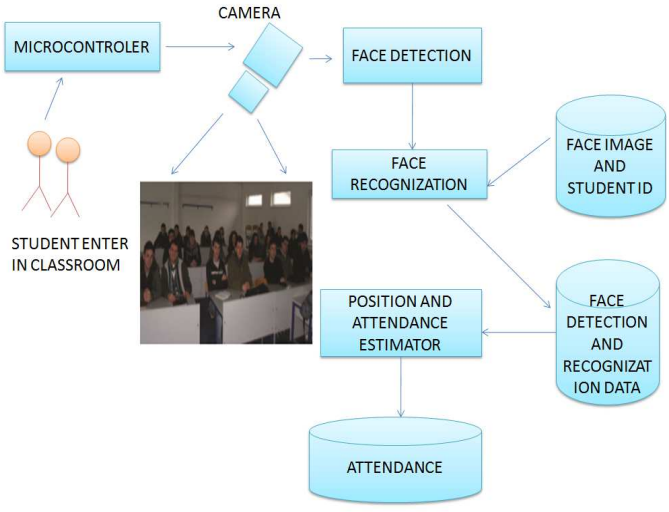
1) System not has leave management facilities.
2) Manually start the attendance process when lecture over.
3) Computational cost of PCA is high.
4) If some student come late or some student leave class in the middle of lecture then miss updating of attendance in database.

In this paper a novel mechanism that has being proposed to address the above given issues.

III. PROPOSED WORK

We have proposed an Automatic Lecture Attendance System (ALAS) as shown in figure-1.This system requires a Face reorganizer (FR) to face detection. An efficient approach is improving the accuracy of ALAS system.

Figure -1: Architecture of Automatic Lecture Attendance System Using Face reorganization



A. COMPONENTS OF ALAS SYSTEM:

The proposed system has been categorized into six major components as given below:

1. Microcontroller
2. Image capturing
3. Face detection
4. Pre processing
5. Face reorganization
6. Attendance Estimator

1. Microcontroller

Microcontroller is a reliable circuit that takes over the task of controlling the counting number of person visited in the room very accurately. When someone enter into the room then the counter is incremented by one and camera start to take the image of classroom and when any one leave the room then the counter is decremented by one and camera again take the image of the classroom. The camera will stop taking the images when no one in the room i.e. the counter will be zero. The total no. of person inside the room is also displayed on the seven segment display. The microcontroller does that job it receive the signal from sensors, and the signal is operated under the control of software which is stored in ROM.

2. Image capturing

When microcontroller increments its counter, camera will start to take the images. Images are captured using a module build in the learning management system (LMS). The module is an application written in window presentation Foundation (WPF) framework. After an image is captured, using a web services transfers the image on server for processing. Together with the image, the web service accepts the course code. Using this course code, the LMS is aware of which students are enrolled in that class and do face matching only for those students. The camera continuously takes pictures on a given interval (by default each five minutes), until all faces detected are successfully identified or until the system is told to stop. This means that in some cases, e.g., when a face cannot be successfully identified, the camera keeps taking pictures until the class finishes.

3. Face detection

The process of detecting faces from still pictures containing multiple faces can be separated in few steps. There are plenty facing detection algorithms which can effectively detect a face (or any other specific object) in a picture. In the system presented here, most students face the camera frontally hence we chose to use the HAAR classifier for face detection. Detecting human face require that Haar classifier cascades first be trained. In order to train the classifiers, this PCA algorithm and Haar feature algorithms must be implemented. The core basis for Haar classifier object detection is the Haar-like features. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. "haarcascade_frontalface_default.xml" file is used in this research. It produced the best results from testing. However it may prefer one of the alternatives as many of these only detect faces in certain conditions i.e. facing the camera directly. This can help improve the accuracy of the recognizer and require less training data.

FIGURE-2: CLASSROOM IMAGE

FIGURE-3: EXTRACTED IMAGES FROM FIG.2

4. Pre processing

- **Cropping and image color conversion:** All the detected faces are cropped, converted into gray scale, and saved separately for normalization and face recognition.
- **Non face images elimination:** Face detection algorithm may produce some false alarms (non face) as faces so eye detection algorithm based on haar cascade classifier is employed to automatically eliminate these non face images from the dataset.
- **Scaling and alignment normalization:** Based on eye center coordinates, affine transform is applied to align and scale face images into 120x120pixels.

5. Face Reorganization

PCA is a well -known method for recognizing statistical patterns in data and computer vision. The underlying concept of face recognition with PCA is used in this approach. PCA is a useful statistical technique that has found application in fields such as face recognition (as shown in figure-4) and image compression, and is a common technique for finding patterns in data of high dimension.

This section will take you through the steps you needed to perform a PCA on a set of data.

Stage 1: Subtract the Mean of the data from each variable
Stage 2: Calculate and form a covariance Matrix.
Stage 3: Calculate Eigenvectors and Eigen values from the covariance Matrix
Stage 4: Chose a Feature Vector (a fancy name for a matrix of vectors)
Stage 5: Multiply the transposed Feature Vectors by the transposed adjusted data

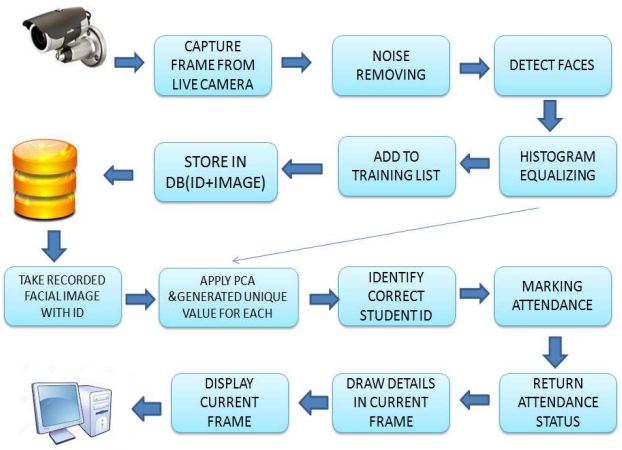


Figure-4: Architecture of Face Reorganization

As an extension of traditional PCA technique, 2DPCA, a matrix-representation method, is proposed to overcome the computational cost of PCA. Since the speed is a big concern in real-time applications, we applied 2DPCA for face recognition.

6. ATTENDANCE ESTIMATOR

Attendance information processing estimation by interpreting the face recognition data by observing it continuously. The module obtains the most likely correspondence between the student and the seat. The result will record in the attendance database (as shown in figure-1)

IV. AUTOMATIC LEAVE MANAGEMENT SYSTEM USING NLP

NLP is the other research application developed in Automated Lecture System (as shown figure -5) and it is used to process and handle leave requests of employees. NLP process running throughout the system is illustrated in Figure -5 Employees can request leaves easily by sending a SMS or using web interface and those leave requests are processed using NLP application, and accept or reject result is generated by considering several conditions and rules. NLA is used to imitate the brain and to make decisions. If this decision making process gives correct result within the system, sometimes it is not compatible with solutions of real world problems, because machines cannot think exactly like the human brain.

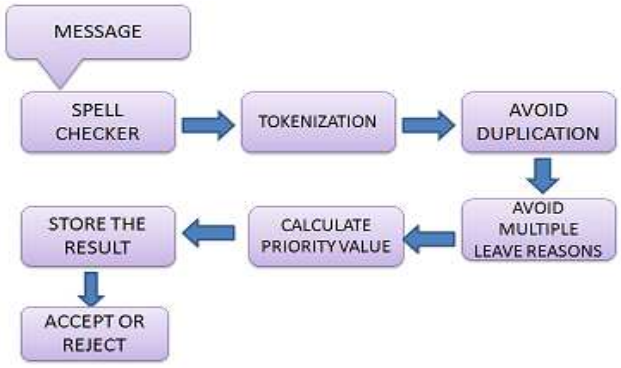


Figure-5: Architecture of leave management system

V. RESULT AND DISCUSSION

This system proposed to work in a real time , when a student enter in a classroom microcontroller updates its counter, then camera start to take the image and store the result in a database . If some student go from between the lecture then microcontroller decrease its counter to one and again take the image from camera. In this way database contain images of only that student those sit in a class up to lecture get over. When lecture over and faculty comes out from class and next faculty came to class then through micro controller it automatically cameras take the attendance of next lecture.

This system is developed in a way that student should face directly at blackboard i.e. face in an upward direction. The students should appear as same as their photo saved in the system. For example if the student is not wearing glasses in the photos then he should remove the glass when he marks attendance. And also if there's a significant change in the face such as growing a beard then it is recommended to change the saved photos of him in the system. Then the particular employee can check, whether their attendance is marked or not.

The accuracy depends on the clarity of the picture. The camera should be installed in a place with good light in the background and free of obstacles.

PCA was chosen for face recognition algorithm because it is the most efficient technique, of dimension reduction, in terms of data compression. This allows the high dimension data, the images, to be represented by lower dimension data and so hopefully reducing the complexity of grouping the images. And also PCA gave better results for varying processes.

VI. CONCLUSIONS

It can be concluded from the above discussion that a reliable, secure, fast and an efficient system has been developed replacing a manual and unreliable system. This system can be implemented for better results regarding the management of attendance and leaves. This system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus. Hence a system with expected results has been developed but there is still some room for improvement. Under future development of face recognition, it should be capable of detecting any faces under any light conditions. In the NLP process currently this system can identify only limited number of words. So in future this system should be able to handle and identify large number of key words.

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