

Digital Attendance System

Somashekhar B M¹, Akhila M², Lavanya A³, Sushma K⁴, Nayana C P⁵

¹*Asst. Professor, Dept of ISE, Maharaja Institute of Technology Mysore, India.*

^{2,3,4,5}*Engineering Student, Dept of ISE, MITM*

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ABSTRACT: The management of attendance can be great burden on the teachers if it is done by hand. To resolve these problems, smart and auto attendance management system is being utilized. But authentication plays a major role in this system. Generally the smart attendance system runs with the help of biometrics. Face recognition is the best biometric methods to improve this system being a prime feature of biometric verification. Facial recognition is being used enormously in several such applications, like video monitoring and CCTV footage system, an interaction between computer and humans and access systems present indoors and network security. By utilizing this framework, the problem of proxies and the students who are not physically present even being marked present can easily be solved. The main implementation steps used in the project is to detect the faces and to recognize the detected faces. In this project, we propose a framework that takes the participation of students for classroom lecture. The proposed system which takes the participation by naturally utilizing face detection and recognition. This participation is recorded by making use of a camera connected in front of the classroom which continuously captures the student's image, detect the faces in the image and contrast the distinguished appearances of a student face with the database and mark the attendance. This project first audit the related works in the field of participation administration and face acknowledgment. The project generates the timetable automatically. This system helps in eliminating the tedious task of manually maintaining the attendance records by automating it. At the beginning of the semester, the administrator collects the details of students as well as the lecturers. Class list is generated automatically. Keywords: Face Recognition, Face Detection, LBPH, Attendance update, Classification

I. INTRODUCTION

In this project, the framework that takes the students attendance for classroom lecture. The proposed system framework takes the student attendance naturally using face identification and recognition. In the paper [2], the attendance is recorded by using a camera connected in front of classroom that is continuously taking pictures of students, identify the student faces in image and contrasts the distinguished appearances and the database and mark the attendance to the particular student. This venture first review the related works in the field of support organization and face affirmation. By then, it shows our system structure and plan. At long last, tests are actualized and it demonstrates the change of the execution of the participation structure. Maintaining the attendance is essential in every one of the foundations for checking the performance of students. Each organization has its own technique. Traditionally student's attendance is taken physically by utilizing participation sheet, given by the lecturer in the class. The Current participation techniques are common and run-of-the-mill. In the paper [9], physically recorded participation can be effortlessly controlled. Aside from, it is extraordinarily hard to confirm all the students in a respective classroom environment with different branches whether all the students are really verified or not. Consequently this project is proposed to handle every one of these issues. The proposed Framework is in a manner which automatically captures the students and lectures faces as they enters the classroom with the help of face detection and recognition techniques. These techniques are commonly referred as the, analyzing the characteristics of a person's face image as a input through a camera. This measure overall facial expression such as distances between mouth, nose and eyes. Therefore, this system overcomes all the issues which occur in existing system.

II. PROBLEM STATEMENT

Smart attendance system which can automatically take the attendance of the students and adjust the time-table of the class. This project is being carried out due to the concerns that have been highlighted on the methods which lectures use to take attendance during lectures. The use of clickers, ID cards swiping and manually writing down names on a sheet of paper as a method to track student attendance has prompted this project to be carried out. Traditionally, student’s attendance are taken manually by using pen and paper which is a time consuming event, moreover it is very difficult to verify one by one in a large classroom. To overcome the problem of manual attendance we have come up with the idea of “Digital Attendance System”. Here we propose a visionary model for digital attendance system through Facial Detection and Recognition.

EXISTING SYSTEM

In the existing system, the authors have proposed a finger print based attendance system. In the paper [6], a portable fingerprint device has been developed which can be passed among the students to place their finger on the sensor during the lecture time without the instructor’s intervention. With this approach, it may distract the student’s attention towards the class and it may also disturb the lecturer hour. In the paper [4], a number of works related to Radio Frequency Identification (RFID) based Attendance Systems exist in the literature. In the paper [9], the authors have proposed RFID based system in which students carry a RFID tag type ID card and they need to place that on the card reader to record their attendance? RS232 is used to connect the system to the computer which saves overall recorded of the attendance from the database. This system may give rise to the problem such as the fraudulent access of the student’s attendance.

PROPOSED SYSTEM

Most of the colleges have varieties of course outcome and each of the courses has different number of subjects. Due to limited number of faculties, each faculty is engaging more than a subject. So, the timetable is very essential in order to schedule the faculty at particular class hour such that their timings should not overlap and the time table schedule makes best use of all faculty subject demands. We use a genetic algorithm for this purpose. In the timetable generation of genetic algorithm, timetable is made as an object. This object comprises of Classroom objects and the timetable for every hour likewise a fitness score for the timetable.

The proposed digital attendance system chiefly

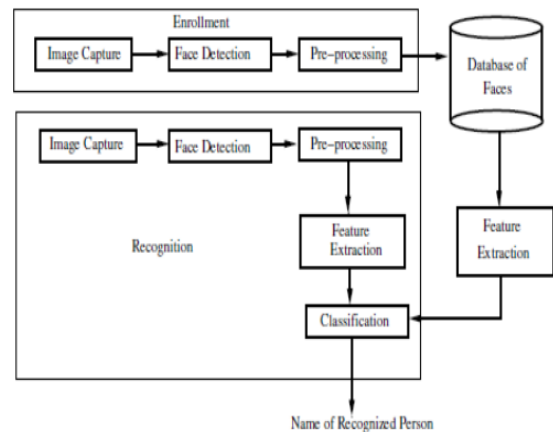
consists of Four phases; Image acquisition, Face Detection, Feature Extraction, Face Recognition. The working of the system is depicted as follows:

A. Image Acquisition: Here the system has a camera which captures the images of the students face sitting in the classroom and sends it to the image pre-processing and further the image is sent for face detection.

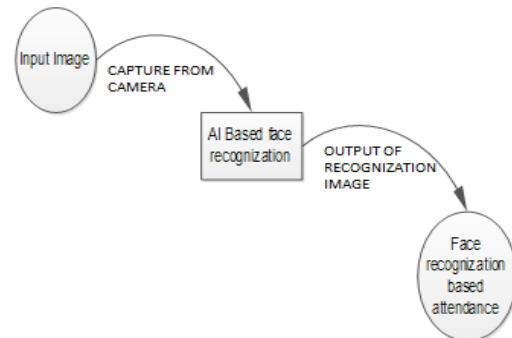
B. Face Detection: In this step, facial area is separated from the background image. These faces are further stored in the database.

C. Feature Extraction: This process is done in order to distinguish the faces from other students. Here the facial features like nose, mouth and eyes are extracted. This helps in the face detection and recognition.

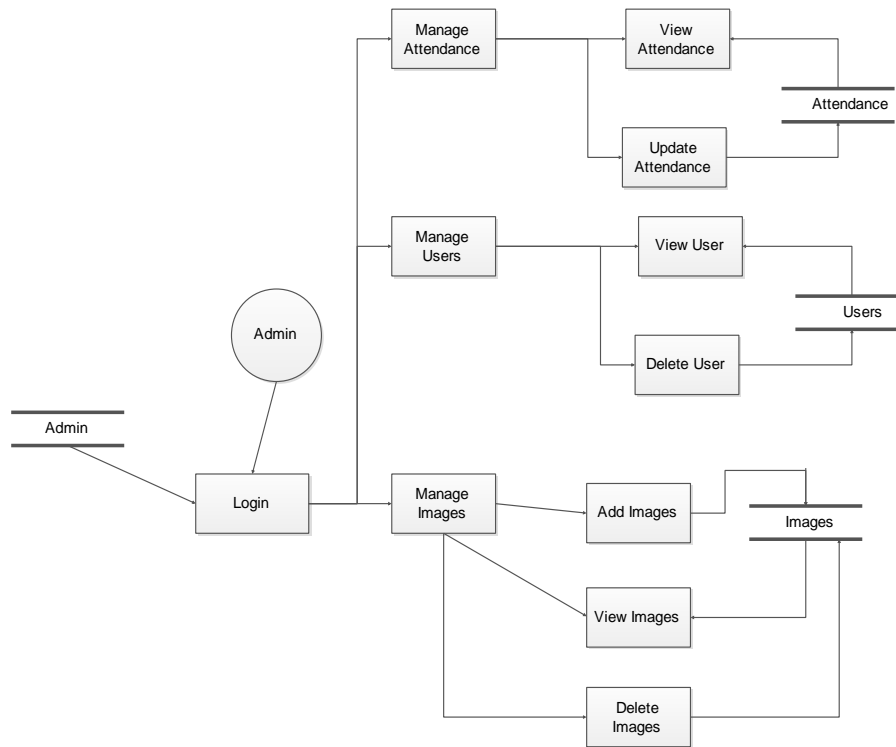
D. Face Recognition: Finally, the captured face image is compared with the image stored in the database. If the image is matched with the image stored in the database then the face is recognized and then the attendance is recorded for that particular student.



System Architecture



Flowchart for face detection and recognition for automatic attendance system



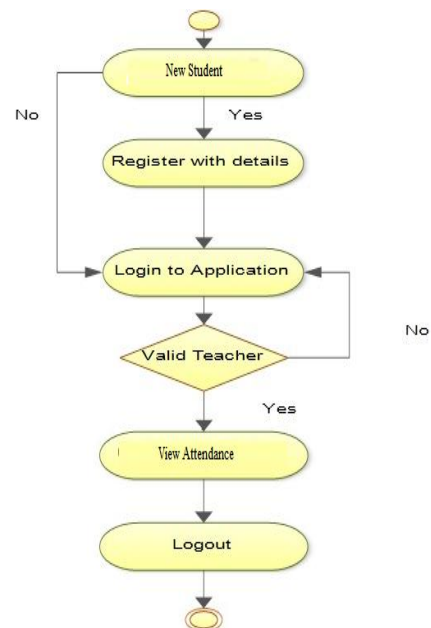
Flowchart for admin

Admin In the above diagram represent a level 1 DFD of admin, here firstly the admin login the application where he can manage both the students and the lecturer attendance report where as

Similarly there are DFD for the HOD, lecturer and the students. The level 1 DFD of HOD, here HOD login to the application and manage lecturer and student attendance report. Here the HOD can add the lecturer or he can delete the lecturer once the lecturer leaves the college and even he can view the student attendance report and can send the mail to the parents in the case of students having lesser attendance percentage.

The level 1 DFD of a lecturer, here lecturer login to the application once admin approves the registered lecturer account after that he can login to application and student attendance is automatically taken once the lecturer face is captured. In the level 1 DFD of student, the student should login and register by providing all the data.

the admin has the overall control that he can edit and update the attendance report successfully.



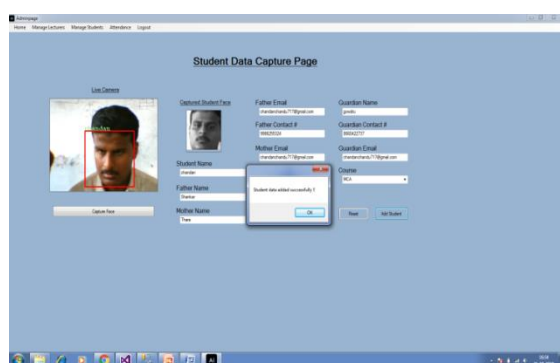
Control Flow Diagram

III. METHODOLOGY

The proposed attendance system mainly consists of Four main module of the system and the functionalities are as follows:

A. Image Capture

The camera is placed inside the classroom at a distance in order to capture the images of the students. The captured image is desired to be the size of 640*480 in order to avoid the image resizing in the back-end because resizing the image may cause poor performance.



Student registration

B. Face Detection

A correct and effective face detection algorithm always intensifies or increases the capability of face recognition system. Different algorithms were proposed to detect the faces such as the Face geometry based methods, Feature Invariant methods, Machine learning based methods. Out of all these methods Viola and Jones algorithm which had a framework that gives a higher face detection rate and it is even fast. Viola-Jones face detection algorithm is more efficient for real time application because of its robustness and fastness.

C. Pre-processing

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

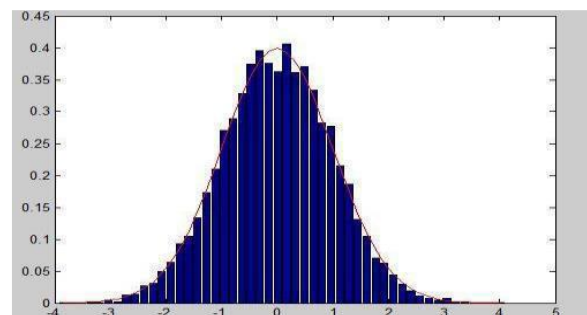
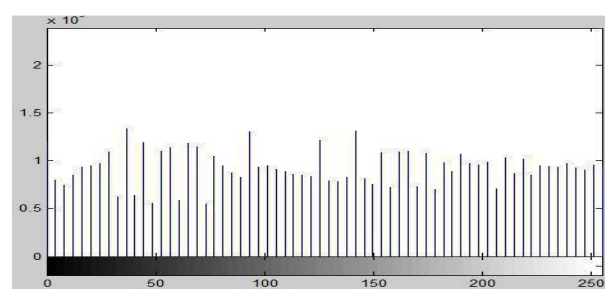


Image input for Histogram

For dissimilarity enhancement in spatial domain histogram normalization is a good method. This helps to identify the learner's meeting on rear rows are obviously realized now.



Equalized image of histogram

D. Timetable Generation

Timetable Generation will be done based on the needs of the class allotments and timings. Here automatic timetable adjustment based on how the lecturer engage the classes.

Suppose if the first period had been allocated to one of the faculty and if that faculty is unable to engage that particular class. In place of first period if the second period faculty engages the class, it captures the faculty face as the faculty enters the class and automatically updates the class timetable. If the faculty engages the class for more than one period or other than faculty if the college management people engages the class even this will be automatically updated.

ALGORITHM

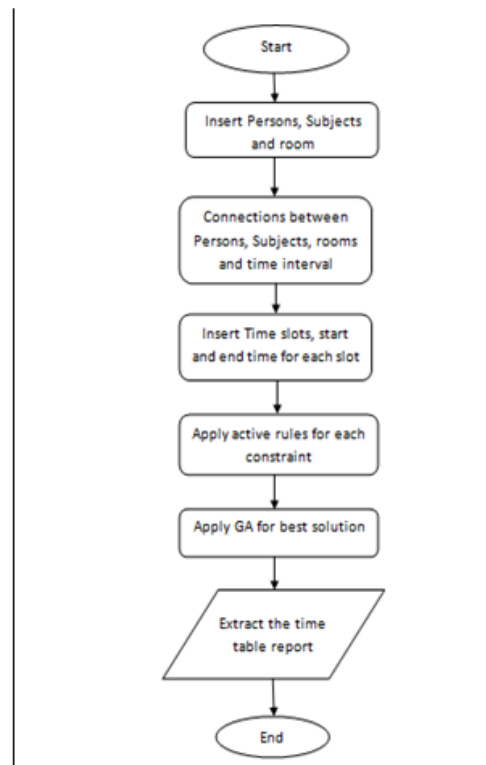
PCA Algorithm:

Both Multiple Discriminate Analysis (MDA) and Principal Component Analysis (PCA) are linear transformation methods and closely related to each other. In PCA, we have focused to find the components which maximize the variance in the dataset. Where as in MDA, we are auxiliary focused to find the directions which maximize the separation or the discrimination between various classes. For example, in pattern classification problems where the dataset consists of multiple classes. In contrast to PCA, this ignores the class labels.

Catalogued below are the six major steps in order to

perform a principal component analysis, which we will analyse in the following portions.

1. Take the complete dataset which consists of dd -dimensional samples while neglecting the class labels
2. Calculate the dd -dimensional mean vector that is the mean for every dimension of the complete dataset
3. Calculate the scatter matrix (if not calculate the covariance matrix) of the complete dataset
4. Calculate the eigenvectors for the complete dataset that is $(ee_1, ee_2, \dots, ee_d)$ and their corresponding eigenvalues that is $(\lambda_1, \lambda_2, \dots, \lambda_d)$
5. Classify the eigenvectors by decreasing the eigenvalues and choose k eigenvectors with the largest eigenvalues to form a $d \times k$ dimensional matrix W
6. Use this $d \times k$ eigenvector matrix to transfer these samples onto the new subspace. This can be tabulated by the mathematical equation which can be represented as follows: $yy = WWT \times xxx$ (where xxx is a $d \times 1$ -dimensional vector representing one sample, and yyy is the transformed $k \times 1$ -dimensional sample in the new subspace.)



Structure of Timetable generator

Haar cascade Classifier Algorithm:

Object Detection can be done with the help of Haar feature-based cascade classifiers is an efficient object detection method initiated by Paul Viola and Michael Jones in their paper, "Rapid Object Detection that uses a Boosted Cascade of Simple Features" in 2001. Here cascade function is trained from a lot of positive and negative images based on the machine learning approach after that it is used to detect the objects in other images.

Here we will work with face detection. Basically, the algorithm needs to train with a lot of positive and negative images to train the classifier. Then the feature extraction takes place. They are just like our convolution kernel. Each feature is a distinct value obtained by withdrawing sum of pixels under the white rectangle from sum of pixels under the black rectangle.

Genetic Algorithm:

The Genetic Algorithm is used for the purpose of timetable generation. With the help of Genetic Algorithm we can reduce the time required to generate a timetable. The most important thing is that we need to enter the data regarding by manually and the generated timetable will be more accurate. In order to generate the algorithm first and the classes, subjects, faculties and the time allotments for the particular period and even the laboratory details need to be entered.

LBPH Algorithm:

Local Binary Pattern is a very simple and efficient texture operator which is used to label the pixels of an image. It is one of the most powerful features for texture classification. The algorithm contains five major steps:

1. Parameters: The LBPH uses 4 parameters:

- **Radius:** This radius is used to generate the circular local binary pattern and represents the radius around the central pixel which is usually set to 1.
- **Neighbours:** The number of sample points to generate the circular local binary pattern. The more sample points we include, the higher the computational cost. It is usually set to 8.
- **Grid X:** These are the number of cells in the horizontal direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector which is usually set to 8.
- **Grid Y:** These are the number of cells in the vertical direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector which is usually set to 8.

2. Training the Algorithm: First of all, we need to train the algorithm. In order to train the algorithm we need to use a dataset with the facial images of the people we want to recognize. We also need to set an ID for each image, so that the algorithm will use this information to recognize an input image which gives an output. Images of the single person must have the same ID.

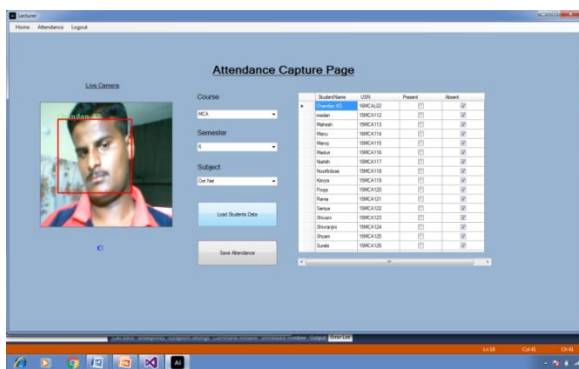
3. Applying the LBP operation: The first step of the LBPH is to create an intermediate image that describes the original image, by highlighting the facial characteristics. In order to work, the algorithm uses a concept of a sliding window, based on the parameters.

4. Extracting the Histograms: Now, using the image generated in the previous step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids.

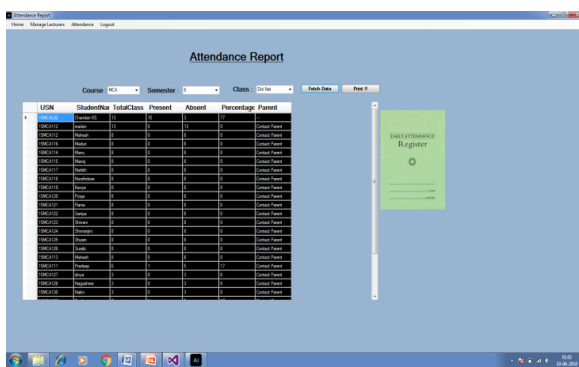
5. Performing the face recognition: In the last step, the algorithm is finally trained. The histogram created is used to represent each image from the training dataset. Once the input image is given, we can perform these steps for the new image Where the histogram is generated and image is displayed.

IV. EXPERIMENTAL RESULTS

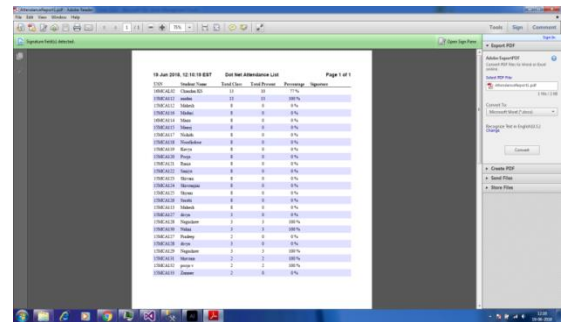
The Digital Attendance System helps in recognizing the student’s faces in a classroom with the help of camera. Even the lecturer’s face are captured and identified at the beginning of the class and automatic timetable generation is done using Genetic algorithm. Once the attendance is updated successfully, the HOD can view the report and the students who have the least attendance percentage, their parents will be notified through the mail.



Lecturer attendance captured for automatic timetable generation



Attendance Report



Subject-wise Attendance list

V. COMMENTS AND CONCLUSIONS

Digital Attendance Systems which is based on face recognition techniques thus proved to be time saving and secured. This system can also be used to identify an unknown person. In real time analysis LBPH outperforms other algorithms with better recognition rate and low false positive rate. SVM and Bayesian also proves to be better classifiers when compared to distance classifiers.

The application has been developed to capture the attendance and to visualize the data of attendance in the form of report and to send the alert message to the parents email through SMTP protocols about the status of attendance of their students.

FUTURE ENHANCEMENT

The future work is to improve the recognition rate of algorithms and the system developed only recognizes face up to 30 degrees angle variations which has to be improved further. Gait recognition can be merged with the face recognition systems in order to achieve better performance of the system. The system generated timetable is a unique component as it generates the timetable based on the time slot allotments. Even SMS integration will be done.

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