

Real-Time Class Room Attendance Monitoring System based on Face Recognition

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ABSTRACT

The management of attendance can be a great burden on the teachers if it is done manually. To resolve this problem, smart and auto attendance management systems are being utilized. But authentication is an important issue in these systems. The existing smart attendance systems are generally executed with the help of biometrics. Face recognition is one of the biometric methods employed in these systems. 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 & humans and access systems present indoors and network security. By utilizing this framework, the problem of proxies and students being marked present even though they are not physically present can easily be solved. The main implementation steps used in this type of system are face detection and recognizing the detected face. After these, the connection of recognized faces ought to be conceivable by comparing with the database containing student's faces. This model will be a successful technique to manage the attendance and records of students.

Key words: Automated student attendance system, Attendance management system, Face recognition, SIFT Algorithms

1. INTRODUCTION

Each institute follows the traditional method taking attendance by calling the names or by sharing the attendance sheets. Several popular automatic attendance systems that are currently available include NFC, FINGERPRINT, RFID, etc. However, in most cases making queue is necessary. The NFC and RFID cards are also vulnerable to physical damage. One way to have a system that is both time and cost-efficient with no human intervention is to have a facial recognition-based attendance system. As the image processing techniques are improving day-to-day, there is a large scope of using facial recognition in attendance monitoring systems.

This system is attempting to provide an automated attendance system that carries out the face recognition over an image or video stream of lectures or sections and keeping the database of attendance. Once the database of candidates created, it requires almost zero efforts from the candidate side. Thus, intrusive nature is absent in this system and makes the system more effective.

2. MOTIVATION

Even in this world of technological advancements many industries still follow attendance systems that require access to attendance and effort from the user side. The proposed system came into existence by identifying various disadvantages of the existing system. The system classifies each face into one of the faces that previously trained to mark attendance. The system first, pre-processes the image then selects feature extraction and then performs classification. This reduces the user's efforts as well as increases the convenience of using the system.

3. LITERATURE REVIEW

3.1 An Efficient Automated Attendance Management System Based On Eigen Face Recognition [1]

Face Recognition technology finds major application in the field of education to efficiently automate and manage the attendance system. This paper discusses an effective system to mark the attendance of students automatically by recognizing their faces. Developing an efficient model of face detection and recognition is difficult because they are very complex and has a multidimensional view.

3.2 Motion Based Attendance System in Real-Time Environment for Multimedia Application[2]

The conventional methods are old enough are still used for student attendance at most universities and institutes. These systems have many loopholes as they help many students in marking fake attendance. Thus the new system which is a motion-based attendance system will mark the attendance automatically and keep track records of everything. With this system there is no need to analyze all the data, hence easy maintenance of the data

3.3 Automated Attendance System Using Surveillance Camera[3]

The main purpose of the automated attendance system is to record the presence of members in an organization. The automated attendance system is used to reduce the time consumption and effort in the manual attendance process and also reduce the wastage of resources for maintaining a large number of records. This system uses a higher resolution surveillance camera for capturing the video in a classroom. From this video, the attendance of students is marked. This system will also generate a report as per the requirement of institutions.

3.4 A Design & Implementation of A Wireless Iris Recognition Attendance Management System[4]

Iris recognition is one of the most widely used biometric for security and identification. This system is based on iris pattern biometrics and wireless technique to solve the problem of spurious attendance and the trouble of laying the corresponding network. It can make users attendances more easily and effectively.

3.5 Robust Face Recognition via Adaptive Sparse Representation[5]

A classification based on Sparse Representation (or coding) has acquired great success in face recognition in recent years. But, SRC gives much emphasis to the sparsity and overlooks the correlation information which has been demonstrated to be very critical in real-world face recognition problems.

4. SCOPE

The traditional attendance systems are inefficient that consume time and it is cumbersome to maintain a large number of records. So, the project is to deduce the correct attendance of each student depending on facial features. The proposed system uses image processing techniques to automate the attendance task [1]. This project is experimented using various classification methods, Facenet using the Tensorflow framework, SIFT algorithm, etc. This system automatically detects the student's faces and marks attendance by recognizing their face [4]. This system works by capturing human faces from the real-time image or video streams. The detected faces are compared against the previously trained faces to identify the students and mark attendance into the database [5].

5. BIOMETRIC ASPECTS

The proposed attendance system performs face recognition mainly consists of the following phases:

- **Image Acquisition:** The system uses a camera that mounted in front a classroom to capture the image of the classroom and sends it to the image pre-processing
- **Feature Extraction:** Feature extraction is performed over the image to detect and extract the facial features of individuals.

- **Face Recognition:** The captured face images are matched against the previously trained faces. Unknown faces are stored separately for later inspections and admin will get notified whenever unknown faces are met.
- **Faculty/Student Recognition:** A login id provided to each faculty and students to get the attendance report.

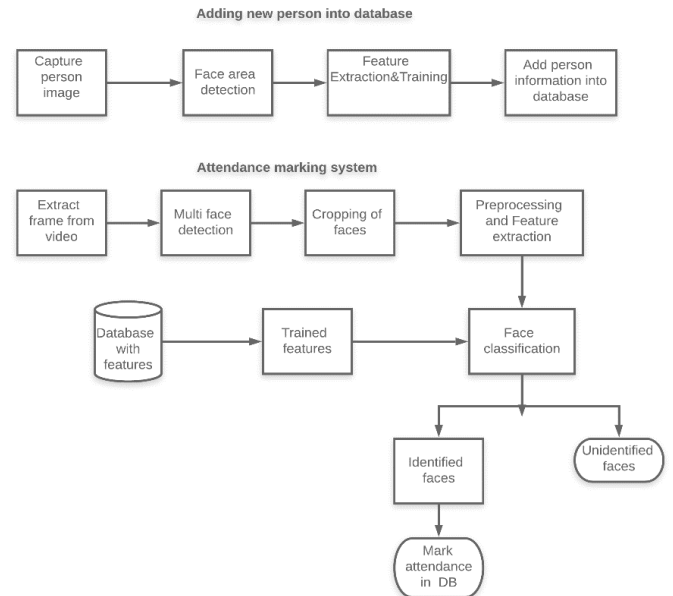


Figure 1: Image Processing

6. METHODOLOGY

The process starts with capturing the video from a video capturing device followed by frame extraction. This frame is examined to detect the multiple faces followed by feature extraction and identification of faces. During the identification, it checks the likelihood of the face belongs to one person and receive a confidence score. This can be done with Euclidean distance between face landmarks. Identified students will be marked on to the database as the present.

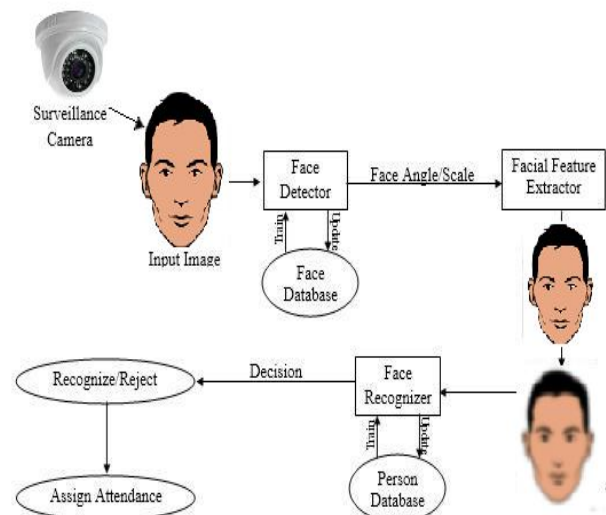


Figure 2: System Architecture

7. DETAILED FUNCTIONING

The task of the proposed system is to capture the face of each student and to store it in separate folders named with their registration number or any other unique information. These images of students will be used to train our system. The faces of students present in the classroom are detected and aligned to avoid the conflict due to posture and seating. The system automatically takes attendance by extracting video frames from the camera and through further processing steps the face is being recognized and the attendance database is updated.

7.1 Capture video:

The Camera is fixed at a specific distance inside a classroom to capture videos of the frontal images of the entire students of the class.

7.2 Separate as frames from the video:

The captured video needs to be converted into frames per second for easier detection and recognition of the students' faces to generate the attendance database.



Figure 3: Sample video frames

7.3 Face Detection:

Face Detection is the process where the image, given as an input (picture) is searched to find any face, after finding the face the image processing cleans up the facial image for easier recognition of the face. Various face detection algorithms can be implemented to detect the faces.



Figure 4: Face Detection

7.4 Face Recognition:

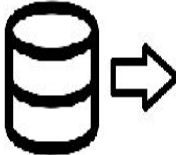
After the completion of the detection and processing of the face, it is compared to the trained faces of students. This comparison can be implemented using classifiers. The student database contains a unique face id generated for each student that has been trained from their facial features so that each student can be differentiated in the database containing their details such as roll number, name, etc on recognition.



Figure 5: Face Recognition

7.5 Post-Processing:

The post-processing involves updating the names of students into an attendance database with a table corresponding to the date. The database can be used to calculate the attendance percentage of students on an individual or whole class basis. Further, the faculties can easily get the attendance of each student in their hours. In case the system failed to mark the attendance of a student who is already present in the class, it also provides a means to put the attendance manually.



ID	Name	Roll	personID
1 53	Midhun Mano...	mlm16cs053	4e87eaa3-64f...
2 92	Rahul Thomas	mlm16cs092	a74105c0-336...
3 19	Joel S Joy	mlm16cs019	26d70589-8fc...
4 72	Vipin Kumar	mlm14cs072	463dca1e-4c4...
5 9	Joby Johnson	mlm16cs009	c4f320bc-f196...

Figure 6: Stored database

8. SYSTEM REQUIREMENTS

Here we need both software and hardware requirements for the implementation.

8.1 Software Requirement

- Operating system: Windows/Linux
- Coding Language: Python
- Database: MySQL

8.2 Hardware Requirements

- Processor: Multi-core Intel i5/i7/i9.
- Speed: 3.4 GHz.
- GPU: RTX 2080
- RAM: 8-32 GB(ideally at least 16GB)
- Hard Disk: 500 GB (Min).
- Key Board: Standard Windows Keyboard.
- Mouse: Two or Three Button Mouse.
- Monitor: LCD/LED
- Camera: 1080p/720p

9. TEST CASES

The below-given table consists of the test cases that have been used for testing the accuracy and working of the proposed system. All the modules have been tested to ensure proper working and message passing between the modules.

Table 1: Test Cases

TCID	Feature Tested	Test Procedure	Expected Result	Actual Result	Status
1	Enrol	Click Enrol button in local machine interface	The window for entering student details and capture student images	The window for entering student details and capture student images	Successful
2	Detect and Identify students	Send video footage to the local machine which will do the rest of the processing.	Extract frames from the video and performs face detection as well as identification.	Extract frames from the video and performs face detection and identification.	Successful
3	Attendance marking	Check the identified students against the stored database and mark it.	Mark attendance as PRESENT in the attendance database if they are present	Mark attendance as PRESENT in the attendance database for those who are present	Successful
4	Faculty registration	Register faculty with their subject and hours	Verify and register successfully	Signup successfully	Successful
5	Student registration	Register student	Verify and register successfully	Signup successfully	Successful
6	Admin login	Login using username and password	Verify login and monitor attendance of entire class	Verify login monitor attendance of entire class	Successful
7	Faculty login	Login using username and password	Verify login and monitor the attendance	Verify login and monitor the attendance	Successful

10. RESULT

Sample output of the system are given in the below figures. The web interface is provided for easy access over a local area network.

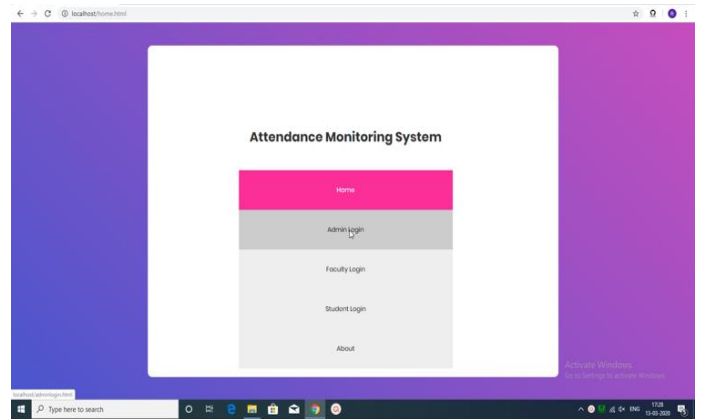


Figure 7: Home page

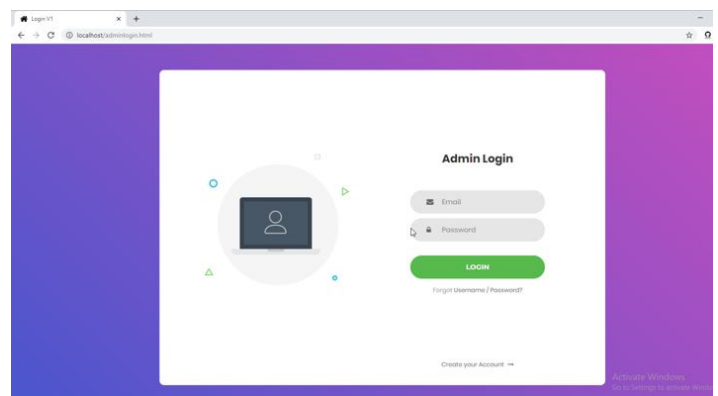


Figure 8: Admin login page

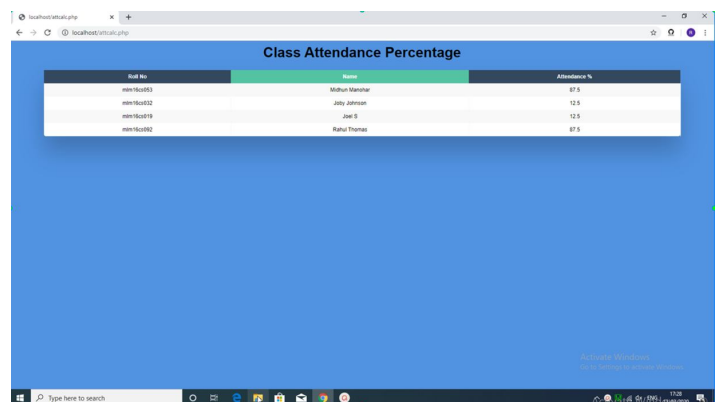


Figure 9: Class attendance percentage

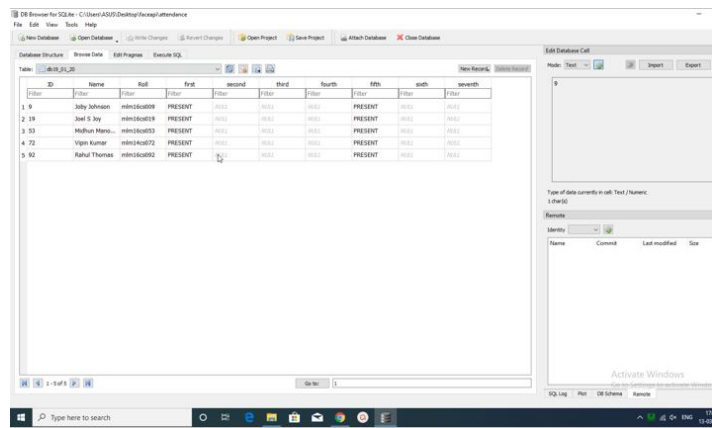


Figure 10: Database with attendance marking

11. CONCLUSION

The main idea of this system is to propose an automated attendance system which captures the video of the students, convert it into frames, compare it with the database to ensure their presence or absence, mark attendance to the particular student to maintain the record. The Real-Time Class Room Attendance Monitoring System Based On Face Recognition helps in increasing the accuracy and speed ultimately achieve high-precision real-time attendance to meet the need for automatic classroom attendance management.

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