Global Scientific JOURNALS

GSJ: Volume 10, Issue 10, October 2022, Online: ISSN 2320-9186
www.globalscientificjournal.com

Design and implementation of student attendance monitoring system using face recognition

Nwabudike Uju Cynthia, Prof. Ike Mgbeafulike

ABSTRACT

The use of facial recognition as a means of developing a non contact method of attendance taking and notifying the parents of an absentee student each time the student did not attend lecture. The Human face is important for recognition and is widely used in many applications like human monitoring, attention analysis, human-machine interaction. Attendance taking is vey paramount in any academic system as it has a direct correlation with performance of the students. The essence of this work is to mitigate the shortcomings of the manual systems and other automated attendance taking methods. In this COVID-19 era, the physical interaction of humans with common devices for attendance can be life-threatening, also it gives room for distraction during classes, it is also tedious and time-consuming task, prone to errors and manipulations. This work offers a solution to attendance taking in a classroom by using a Face recognition system. The proposed system made used of two algorithms Haar cascade for Face detection and Local Binary Pattern Histogram (LBPH) for Face recognition. Haar cascade algorithm is used to detect the faces from the current frame. This algorithm is used to differentiate the pattern of face and non-face. It will locate the faces in a frame. After detection of face, we used a face recognition concept to recognize the students while the Local Binary Pattern feature descriptor is used to identify the student texture to recognize the ID. Using Face Recognition, the record of student is updated and stored in the database. During class, when the face of the individual student matches with one of the faces stored in the database then the attendance is recorded, else an email is sent to absentee's parent/guardian. The object oriented analysis and design methodology (OOADM) was used in the analysis and design of the proposed system. The system was developed using python as front end and MySQL as back end for storing students' information and attendance records. Results showed that the developed system was able to eliminate the problems associated with manual and other contact-based methods of attendance taking.

Keyword: Attendance, Face Recognition and detection, Haar Cascade, Local Binary Pattern Histogram.

1. INTRODUCTION

Academic attendance is crucial for students since there is a significant relationship between knowledge acquired in class, skills, and grades. This work is centered on the student attendance system, which uses face matching to verify attendance. The main goal of this project is to create an application that uses face recognition technology to track student attendance.

The old attendance system, which still requires students to sign on a piece of paper each time they attend a class throughout the course of the semester, is still used by the majority of universities and colleges today. When using the traditional attendance system, it is clear that there are some issues. For example, there will be no backup for the attendance records if the lecturer accidentally misplaces the attendance sheet, classmates will sign the attendance for absent students, a practice known as buddy-signing, it is difficult to analyse and track student performance based on attendance factor, and students will lack knowledge and skills as a result of their poor attendance in class. It is critical to resolve these issues because doing so would enhance both the learning environment for lecturers and the academic success of the students.

Numerous automatic attendance systems use biometric identification to identify students' presence and preserve the appropriate record, such as palm vein and fingerprint recognition. Similar to how there are numerous other attendance systems that do not rely on biometrics or human interaction. These systems update the presence of student attendance using mobile near field communication (NFC), barcode, RFID, and QRcode technologies. However, given the current Covid-19 epidemic crisis, a face recognition based attendance system is essential because it requires no physical human involvement. It is an efficient system, fast and effective.

2. LITERATURE REVIEW

This system-based biometric and wireless technology addresses the issue of fictitious attendance as well as the difficulty of constructing the necessary network. It can more easily and productively increase user attendance. In this paper, employee identification is accomplished using RF wireless technology. It is overpriced. The main issues with this system are that it is overly expensive, that it is extremely close to the classroom, and that every student must wait in a long queue to have their iris scanned in order to indicate their presence.

They achieved an accuracy of 86 percent with a database of eleven images by extracting frames from a video recording of a student and storing those particular frames in the database. This

system uses DNN to detect the faces of students, PCA and LDA algorithms for image matching, an SVM classifier, and CNN [1].

The authors created a system that connects the database to a web administration server system using a raspberry pi camera module that is mounted on the door. If an image captured by the raspberry pi fulfils the criteria for the Local Binary pattern method, it is a servo motor opens the door for the pupil according to an image stored in the database. Using a dataset of 11 photos, our method is 95 percent accurate [2].

Here, the authors compare two well-known face recognition algorithms, PCA (Eigenface) and LDA (Fisherface), using a ROC curve on their training set. The results show that Eigenface outperformed Fisherface and obtained an accuracy of 70 to 90 percent similarity for genuine faces. The authors' main goal is to develop a face recognition algorithm with Open CV2.4.8 by using an attendance system as their case study [3].

The main goal of this system is to try and reduce processing time as much as possible. The authors performed experiments on CMU-PIE image database and PCA(Principal Component Analysis) algorithm, with a success rate of 91.7. The authors propose a method of reducing the candidate gallery set and utilising facial component classification, in order to enhance facial recognition [4].

The authors of this article used CNN (Convolutional Neural Networks) to identify and extract features from the photos that were collected that contained the students' faces. They used an SVM (SupportVectorMachine) classifier to categorise the learned images in addition to CNN to train their model. They succeeded in achieving a 95% accuracy rate [5].

The writers of this article have created an application that uses mobile devices as well as students' GPS locations to record attendance and carry out other tasks. Additionally, the app contains a tonne of features that facilitate engagement [6].

The authors of this study investigated how the slope and distance between facial features affect facial recognition. They found that as the number of facial features on a face increases, so does the rate of recognition; the highest accuracy they were able to achieve with the MLP classifier was 94.60 percent, demonstrating this [7].

The faculty member's mobile device must support NFC in order for them to scan a student's NFC card and take pictures of the students in attendance. The authors of this article used an NFC (near field communications) card. After then, the attendance is uploaded to the primary server [8].

In order to address concerns with image quality, image size, and fluctuating light intensities, etc., the authors designed this system using the Eigen face database, Principal Component Analysis, and Matlab GUI [9].

3. ANALYSIS OF THE EXISTING SYSTEM

It seems that Covid-19 is here to stay, and contact-based attendance systems, which are promoted by pen and paper and certain biometric attendance systems, must be eliminated. Regular attendance will not only guarantee that students get a thorough introduction to the range of degrees and possibilities offered by the school, but it will also be taken into consideration when calculating their final grade. Colleges and universities may find it tiresome, time-consuming, and more error-prone to track and monitor student time of attendance utilising manual attendance. Because of impersonation and the possibility of the register being misplaced, the human signature-based attendance method used in classrooms is not very secure.

The most frequent issue with manual attendance signing is that the lecturer must manually register each student's attendance in the attendance sheet or book after taking their daily attendance. The instructor requires the attendance record to conduct analysis and produce an attendance report, thus if the attendance sheet is lost or stolen, this might be a major issue. Another issue is that it takes a lot of time since the lecturer has to look up and refer to previous attendance records in order to assess and prepare the attendance report. In addition, the lecturer's computations to produce the attendance record might result in a mistake. Even if it is difficult for the professor to maintain track of attendance, management reports are still occasionally necessary.

A portable fingerprint device is employed in the current fingerprint-based attendance system. The database contains the student fingerprints that were collected using the fingerprint and saved. The student must register their fingerprint on the set device later, either before or during lecture hours, to confirm their attendance for the day. This method's contact-based nature and potential to divert students' attention during lectures are also problems.

The student must have a Radio Frequency Identity Card on them at all times in the RFID-based existing system in order to register their attendance for the lecture by placing the ID on the card reader. The RFID system has the ability to establish a connection with RS232 and save

attendance data in a database. Students may use another student's ID to indicate attendance for an absent student, which is a possibility for fraudulent actions.

The student taking attendance in the current Iris-based student attendance system stands in front of a camera so that the camera may scan the student's Iris. The scanned iris is compared to the database's data and tagged as present when a match is made; otherwise, it is reported as missing and the database is updated appropriately. This technique lessens the strain for paper and pens, lowers the possibility of proxy attendance in the classroom, and aids in keeping student records. It is a wireless, non-contact method of capturing biometric attendance that both addresses the issue of fake attendance and the challenge of building the necessary network. Due to the iris scan, this method may potentially create allergies in the eyes of the class members.

Of all the methods mentioned above, face recognition is the most distinctive, effective, exact, and affordable.

Multiple student faces are used by the automatic attendance system as objects that may be detected, identified as belonging to a certain individual, and then recorded in a face database.

The primary objective of this proposed work, Design and implementation of student attendance monitoring system using face recognition, is to identify and recognise students' faces, record their attendance in accordance with that identification, and send emails to the parents of missing students. All course participants must register by providing the necessary information, and the admin will take pictures of them and save them in the database. The five steps of this system include dataset compilation, picture capture, face detection, face recognition, and attendance marking.

4. GENERATING DATA SET

The initial database holding the photographs of the students is made by photographing the pupils and recording their faces as images together with their personal data, such as name, mat number, date of birth, parents' email address, etc.

5. IMAGE CAPTURING PHASE

The lecturer will record a live video of the classroom or lecture hall during this phase using their own mobile device and the IP Webcam application, which connects the system running on their laptop to their mobile device and allows them to use their mobile camera to record the students in the class room. The lecturer can access the system by logging into the laptop where all the data is stored.

6. FACE DETECTION PHASE

In this second phase, after the video has started recording, the Haar Cascade algorithm is simultaneously applied to the video to get individual faces of the students. By using line features and edge features, the algorithm essentially works by giving us the parts of the face that are needed most for detection, i.e., the ROI (Region of Interest), and processing and cropping out other parts. The faces are removed and saved after being found. Any undetected face is stored in the secondary database for manual verification by the lecturer and appropriate action taken.

7. IMAGE MATCHING PHASE

The LBPH algorithm (Local Binary Pattern Histogram) is used in the third and most important stage of student identification, which compares the captured image to the stored images in the database. Each image stored in the database has its histogram value calculated, and this value is cross-checked against the calculated Histogram value of the images extracted from the captured video feed. The system may identify several students or faces in addition to simply one student's face. We may infer from the fact that the system operates for three faces at once that it will operate for at least 15 faces simultaneously.

8. ATTENDANCE MARKING PHASE

If the submitted picture matches the image in the database, the attendance is declared present for that lecture and preserved. An email is then sent to the parents of any students who missed the lecture in this step. The system creates an attendance table that contains the name, information, day, and time, after which the data is automatically recorded in a database.

9. SYSTEM ARCHITECTURE

The architecture of the suggested system has been kept as simple and uncomplicated as possible. Anyone may readily use the system, which allows the department to simply verify and manage student attendance as needed. The IP Webcam software makes it simple to record live video feeds from the classroom while also automatically identifying the pupils. The access to the libraries and methods for the Haar Cascade and LBPH algorithms that are necessary for training, recognition, and matching of the taken pictures against the stored images included in the previously obtained datasets will be made possible by OpenCV Python.

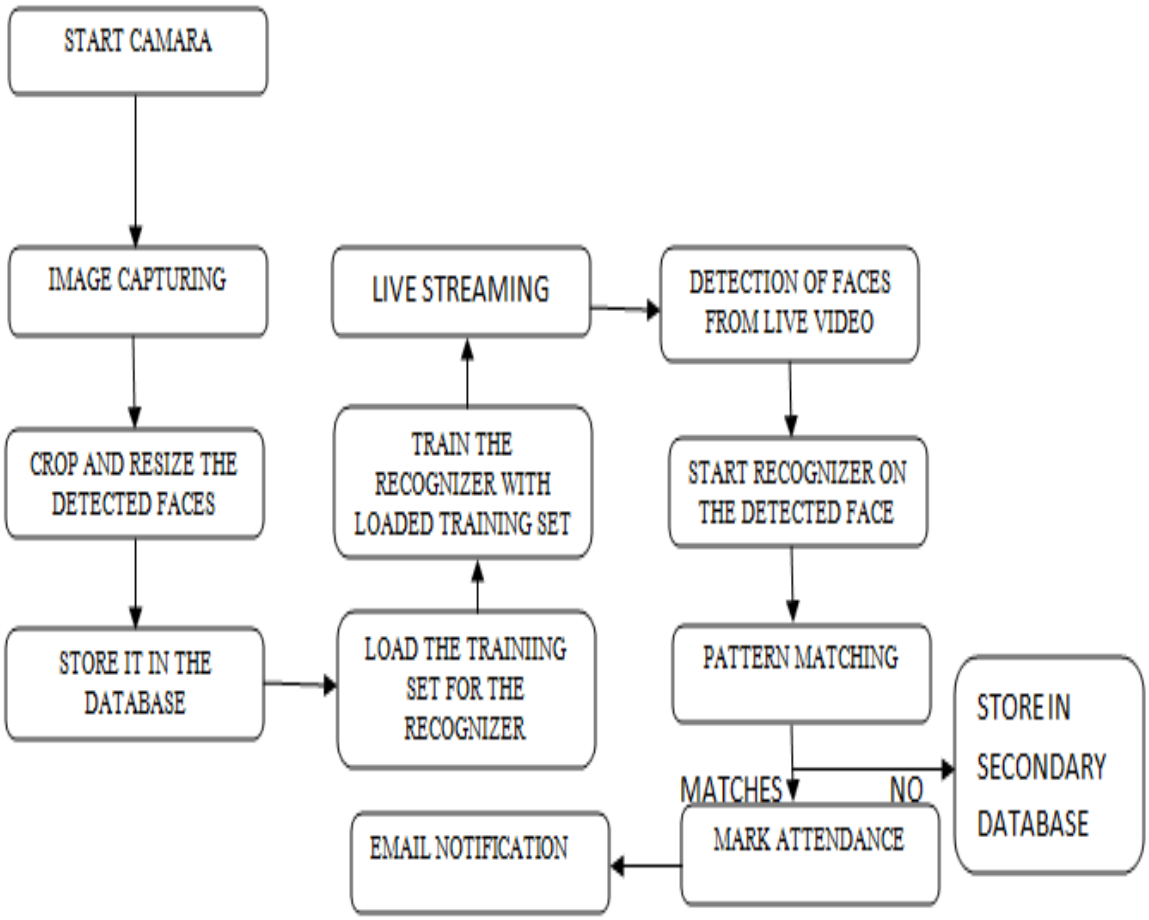

Figure 1 System Architecture

10. CONCLUSION

In this approach, a face recognition based automated student attendance system is thoroughly described. The proposed system gives a technique for identifying individuals by comparing their input image obtained from recording video frame with respect to image stored in the database. This proposed technique was able to detect and localize face from an input facial image, which is derived from the recording video frame. Besides, it gives a technique in pre-processing stage to improve the image contrast and reduce the illumination effect. Extraction of the features from the facial image is performed by applying both LBP and haar cascade. The algorithm so designed is made to combine both LBP and haar cascade to be able to stabilize the system by giving consistent results.

11. RECOMMENDATION

The system can be made more scalable, flexible and robust by using these recommendations:

1. An extra layer can be introduced using deep neural networks (DNN) to enhance the image identification.
2. The system will have to store separately both recognized and unrecognized faces, faces that go unrecognized can stored in a secondary database.

12. SUGGESTION FOR FUTURE RESEARCH

The system can provide a high accuracy result in a lighting condition but won't be able to perform optimal in a low to no light condition. In the future an algorithm to effectively handle limited light condition should be employed.

As the system is based on facial recognition, dataset should be updated regularly because if a bearded student attends a class after shaving then the machine won't be able to recognize him. In the future, an algorithm to handle such situation should be looked at.

References

[1] Radhika C. Damale, Prof. Bageshree. V. Pathak. "Face Recognition Based Attendance System Using Machine Learning Algorithms."Proceedings of the Second International Conference on Intelligent Computing and Control Systems (ICICCS2018) IEEE Xplore Compliant Part Number: CFP18K74-ART;ISBN:978-1-5386-2842-3.IEEE2018

[2] Omar Abdul, Rhman Salim, Rashidah Funke Olanrewaju, Wasiu Adebayo Balogun. "Class Attendance Management System Using Face Recognition. "2018 7th International Conference on Computer and Communication Engineering (ICCCE) IEEE 2018.

[3] Adrian Rhesa Septian Siswanto, Anto Satriyo Nugroho, Maulahikmah Galinium. "Implementation of Face Recognition Algorithm for Biometrics Based Time Attendance System "Center for Information Communication Technology Agency for the Assessment Application of Technology (PTIKBPPT) Teknologi 3 BId., 3F, PUSPIPTEK Serpong, Tangerang, INDONESIA, 15314.

[4] Jinsu Kim, Usman Cheema, Seungbin Moon. "Face Recognition Enhancement by Employing Facial Component Classification and Reducing the Candidate Gallery Set. Department of Computer Engineering, Sejong University, Seoul, 143747, Korea.

[5] Nusrat Mubin Ara, Nishikanto Sarkar Simul, Md. Saiful Islam."Convolutional Neural Network (CNN) Approach for Vision Based Student Recognition System. "2017 20th International Conference of Computer and Information Technology (ICCIT), 22-24 December, 2017.

[6] Xinxiong Liu, Wanru Wang “User Centered Design of Attendance Record System Based on Mobile Terminals "2017 International Symposium on Computer Science and Intelligent Controls.

[7] Turgut Özseven, Muharrem Düenci “FaceRecognition by Distance and Slope between Facial Landmarks "Gaziosmanpaúa University Turkey, Tokat; Karabuk University, Turkey, Karabük.

[8] Savitra Paharekari, Chaitali Jadhav, Surabhi Nilangekar, Jitesh Padwal “Automated Attendance System in College Using Face Recognition and NFC "International Journal of Computer Science and Mobile Computing A Monthly Journal of Computer Science and Information Technology ISSN2320-088X IMPACT FACTOR: 6.017IJCSMC, Vol. 6, Issue. 6, June 2017, pg.14–21.

[9] Rekha. E, Dr. Ramaprasad .P “An Efficient Automated Attendance Management System based on Eigen Face Recognition "Department of Electrical Engineering, Amity University, Dubai UAE.