

Face Recognition Based Smart Attendance System

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Abstract- Every organisation needs an attendance system to obtain data about its working hours and also keep track of its employee's punch in and out times. The schools and college universities are also require the attendance system for keeping track of student's classroom attendance. There exists some electronics attendance systems, but with the state-of-art technology, this is becoming even more advanced, such as biometric attendance which mark attendance based on user's finger impression, face, and eye retina. FID card or Tag based attendance systems are also available in the market with Single card reading with close proximity and simultaneous reading with distance up to 3 to 10 meters. This paper describes details about "RFID and Face Recognition-Based Smart Attendance System" using Raspberry Pi and Atmel's Microcontroller such as Arduino Uno or Nano.

This system asks two types of authentication of users, one is through RFID card and second is through face. Then both are matched in the system against preloaded database, and if they are matched then only attendance is marked as presence otherwise attendance is marked as absence. Thus there is less chances of cheating regarding attendance.

Keywords- Raspberry Pi, Arduino, Pi Camera, RTC, RFID Reader, I2C, SPI, OLED, Face Recognition

I. INTRODUCTION

The conventional attendance taking with roll calling in school or colleges classroom or using a register to make signature in offices is a very time consuming and also an unreliable process. As the number of people grow this problem becomes even more prominent. Some universities campuses use Quick Response (QR) codes for short time which mark their attendance upon scanning the QR code but those can also be easily shared to other people with photo.

Biometric attendance using finger print is time consuming especially in the time of monsoon, less reliable, less easy and also unhygienic at times of pandemic period for instance. Iris or eye retina scans attendance is actually good method and is implemented on many airports around the world but it can be very expensive as well as inconvenient for general use case.

This paper aims to review and assist in the development of Smart attendance system using Near Field Communication

(NFC) card such as RFID cards along with Camera for face recognition.

II. LITERATURE REVIEW

[1]S. Bhattacharya, G. S. Nainala, P. Das and A. Routray, "Smart Attendance Monitoring System (SAMS): A Face Recognition Based Attendance System for Classroom Environment," 2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT), 2018, pp. 358 360 In this paper on attendance management presents a system that aimed at solving the issues of manual methods of existing systems. They used the concept of face recognition to implement a system that marks the attendance of a particular person by detecting and recognizing the face. These systems performed satisfactorily with different facial expressions, lighting and pose of the person. There is room for improvement since these systems sometimes fail to recognize every face student present in the classroom. They had made the device portable for easy use even when the sessions are on, without disturbing the class.

[2] M. R, M. D and R. P, "Classroom Attendance Monitoring Using CCTV," 2020 International Conference on System, Computation, Automation and Networking (ICSCAN), 2020, pp. 1-4

This paper proposed a method that is used for extraction of unique characteristic features to automate and update automatic attendance of students in a classroom to improve their attendance percentage. It also helped in tracking, Monitoring and Recording the improved student attendance and overcome the chances of marking a fake attendance. Now days a large number of attendance systems with biometric are in present. However, the face recognizing turned to be very effective since it is provided with high accuracy along and minimum human intervention. This method is also valuable attentive service for both students and teachers. This technique aimed at significant level of security provision. A highly efficient attendance process for classroom is developed which can able to recognize on multiple faces at same instant. Not needed any special requirement for hardware implementation. A high resolution camera, a Personal Computer (PC) and server with database were

enough for developing this automated smart attendance system.

[3] Dwika Hefni Al-Fahsi, Resha & Pardosi, Aleksander & Winanta, Kevin & Kirana, Thea & Suryani, Okta & Ardiyanto, Igi. (2019). Laboratory Attendance Dashboard Website Based on Face Recognition System. 19-23.10.1109/ELECSYM.2019.8901615.

This paper showed a dashboard website successfully showing the analytical data. These analytical data are important for attendance information of laboratory member. With this face recognition technology, the laboratory member attendance can be recorded in a real time. However, there is some problem in the face recognition system, such as failed to find unique feature of face when a person heading perpendicular to CCTV camera. It is future work to develop the model to a more robust model that can encounter the problem. It is also necessary to enrich the training dataset by giving variation from a single image such as skew, crop and rotate. These modification have to be done due to dataset constrain from the institution. Create more features to the dashboard website such as historical graph of laboratory member attendance also added into future work to do list by authors.

[4] Mr. Rajvardhan Shendge, Mr. Aditya Patil, Mrs. Tejashree Shendge, "A Web-based Attendance System Using Face Recognition," International Research Journal of Engineering and Technology (IRJET), March 2022, vol 9 issue 3

This project created web-based application (Be There!), offers a variety of extensive features. A comprehensive automated experience is provided by the smooth integration of face recognition and custom APIs and the interaction between students and instructors through the web application. Because this is an open - source project, the open source community will give more development iterations to improve the application's usability and usefulness. Various experiments, such as User Interface (UI) changes, modular advancements for preventing spoofing when registering attendance, and performance increases, have been deferred for the time being. The application was created in the hopes of providing a safe, educational atmosphere in this corona virus pandemic, according to the regulatory authorities' safety standards and requirements. The technology has been implemented open source by Team Be There! Anyone may download and install the system, contribute to developing new features by filing a pull request, and report defects.

[5] Khaled Mohammed, A.S. Tolba, Mohammed Elmogy, Multimodal student attendance management system

(MSAMS), Ain Shams Engineering Journal, Volume 9, Issue 4, 2018, Pages 2917-2929, ISSN2090-4479, <https://doi.org/10.1016/j.asej.2018.08.002>.

This paper presents a novel approach for multi-modal student identification and attendance management using both Radio-Frequency Identification (RFID) and face recognition. The selection of the modality is driven by the need for a system for attendance management, which should be robust against spoofing and variability for facial features. To avoid giving tags to somebody other than the authorized person, a real - time face recognition system has been implemented using the multi-scale structural similarity index, which is traditionally used for image quality assessment. The proposed approach has been compared with the state of the art approaches and an enhanced version of it. Both the multi-scale structural similarity (MS-SSIM) approach and the enhanced Haar -cascade approach have shown promising results. The strength of the new approach lies in its innovative idea for capturing of authentic face variability (real - variability) through different frames in a video sequence in contrary to the Haar -cascade approach, which tries to capture virtual variability from a single image. Authentic variability has been acquired for face recognition and has shown excellent results. Future work will integrate the current system with the Bluetooth Low Energy 4 (BLE 4) based Beacon System. The problem of RFID reader collision will also be solved in the future by authors.

[6]O. Shoewu and O. Idowu, "Development of attendance management system using biometrics," Biometrics and Embedded systems, 05 2012.

In this paper, authors proposed and developed an automatic attendance system using fingerprint verification but the time period of the attendance checking was not observed properly during the development phase.

[7] P. Taxila, "Development of academic attendance monitoring system using fingerprint identification," IJCSNS, vol. 9, no. 5, p. 164, 2009

In this study paper author developed an attendance monitoring system using fingerprint identification where timing to take attendance was maintained properly but still the data security, handling of class bunk were ignored.

[8] Nafiz Imtiaz Khan, Sumaiya Nuha Mustafina, Farzana Faruk Jhumu, A.H.M Zobyer, Masrur Hasan Mahin, Md. Ariful Islam Tarek, Raiyan Rahman, Muhammad Nazrul Islam, "Towards Developing an Automated Attendance Management System using Fingerprint Sensor," 2020

Emerging Technology in Computing, Communication and Electronics (ETCCE)

This paper proposed system that uses the Firebase database which is more secure and authenticated. While storing the sensitive information, a data encryption algorithm was used which increases the security of the data. In order to decrease the time complexity, at the time of fingerprint matching all the fingerprint related data of students of a particular classroom was stored in the local storage before starting of a class. In order to prevent late attendance the attendance checking duration was fixed. Moreover Light Dependent Resistors (LDR) sensors were used to prevent leaving the classroom without following proper permission which increases the reliability of the proposed system. Despite having multiple features this system may fail to detect a particular student who leaves the classroom without permission. Power failure will shut down the whole system. Again, unstable network connection may lead the system to failure and the system may not work as per desire. Future work will focus on overcoming these limitations and on detecting the identity of a particular student using facial recognition systems. Each time when a student enters into the classroom or leaves the classroom it will match the student with the stored data to identify his/her information and mark the students attendance accordingly, hopefully that will lead to even better ease of use and time -efficiency, provided that minimal delay in facial recognition can be achieved.

[9] S. Chowdhury, S. Nath, A. Dey and A. Das, "Development of an Automatic Class Attendance System using CNN-based Face Recognition," 2020 Emerging Technology in Computing, Communication and Electronics (ETCCE), 2020, pp. 1-5

This paper referred was about a system for automatically marking and storing the attendance of a class. Implementation process included entering data of the students, training dataset, recognizing faces and marking attendance automatically. The CNN model used in this study can detect and recognize a person by their facial features even if they are not staring exactly straight into the camera. The proposed system could detect and recognize the students of the class with maximum accuracy of about 92% and saves the teachers' time and hassle by automatically marking and storing the attendance of the present students. For the system to be most effective, it has to contain a satisfactory and consistent amount of images of each person during the training stage. Also, the camera has to be positioned in a way that it has clear view of all the students.

[10] M. D. Rahmatya and M. F. Wicaksono, "Design of student attendance information system with fingerprints," IOP

Conference Series: Materials Science and Engineering, vol. 662, p. 022039, Nov 2019.

This system has the capability to avoid the proxy attendance. Additionally it facilitates the teachers by calculating fines for missed class, counting attendance, generating and showing reports of a course automatically. Students also get the opportunity to apply for leave of absence using this online platform. Multiple research works were conducted to build an automated attendance system using fingerprint verification.

III. PROPOSED SYSTEM.

Basically, in this project we are trying to avoid cheating that can be happened in conventional attendance system.

This Smart attendance system reliably checks the punch in and punches out times.

It follows two steps to confirm attendance:

1. First it checks the face of the person.
2. Then it checks the RFID tag to mark attendance.

Block Diagram

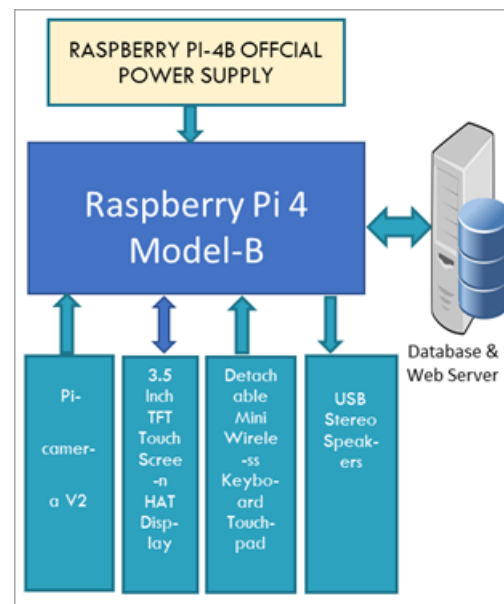


Figure.1 face recognition smart attendance system, block diagram

The person identification is checked against the preloaded data on the SD Card. We are planning to enhance this system for reading and writing data on the database server like MySQL/ server.

If the person's face and RFID tag both get matched with preloaded entry in the database, in/out time of that person

is marked and written on the SD card with Date and Time stamp and display on the OLED display.

- Pi Camera & Raspberry Pi4: Used for capturing person photo and face recognition. Both are connected through MIPI CSI.
- RTC Module: For keeping accurate time track, connected to Arduino through I2C protocol.
- Micro SD Card Module: For R/W operation of records, connected to Arduino through SPI protocol.
- RFID Reader Module: For reading RFID Tags/Card, connected to Arduino through SPI protocol.
- OLED: To show name and attendance confirmation, connected to Arduino through I2C protocol.

Both Arduino Board and Raspberry Pi Board are connected to each other using USB 2.0 port.

IV. RESULT



Figure.2 face recognition smart attendance system hardware model



Figure.3 Attendance Marking of Person 1

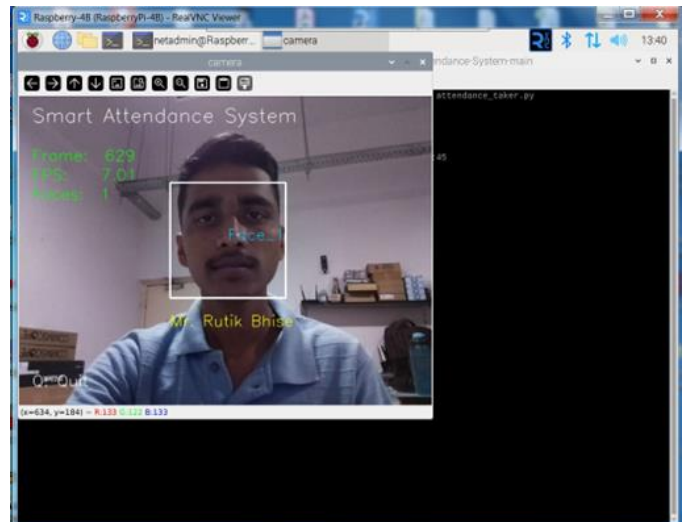


Figure.4 Attendance Marking of Person 2

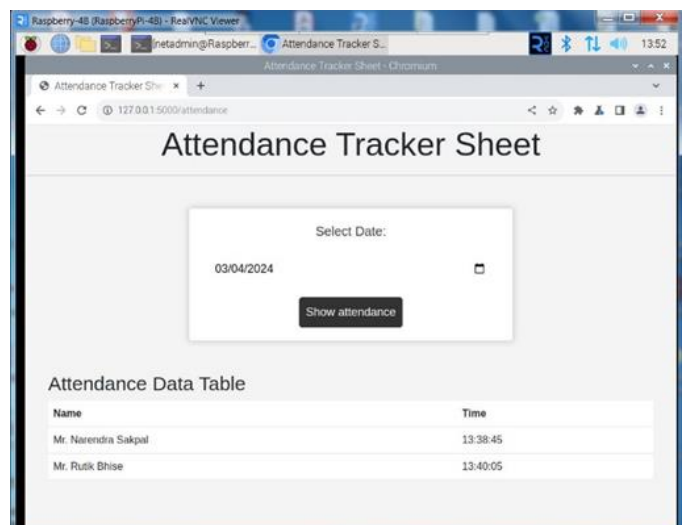


Figure.5 Attendance display on Sheet

V. CONCLUSION

In conclusion, this smart attendance system offers two step confirmations to avoid cheating. It is an efficient system to keep track of person attendance and in/out timing during schedule hours in any organization or institute. It helps in keeping time track and thus can improve productivity in any organization.

VI. FUTURE SCOPE.

The following enhancement can be done to this project in case of attendance system is designed for class room:

- Attendance of student and faculty inside of classroom only.
- Attendance marking only for in time entry.
- Use of simultaneous RFID tags scanner.
- Use of database software like SQL for data management.

- Use of cloud server for storing and retrieving attendance data.
- Lecture wise attendance.
- Parents/ Guardians can see attendance of his son/daughter online.
- For absent student, system can send SMS to parent about it.
- Use of GPS for location tracking.

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