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IoT Based Biometric Attendance System for Smart Classroom

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Abstract: - **One of the most used and reliable methods of identification is fingerprint scanning. Our technology compares a student's fingerprint to a database and marks their attendance depending on whether or not the fingerprint matches. Using a fingerprint reader to take attendance eliminates the need for laborious manual recordkeeping and the associated costs. Using a Arduino uno simplifies the procedure and lowers the need for human intervention. Arduino uno is linked to the fingerprint reader. The fingerprint scanner time has been programmed to take attendance. The message is delivered to the appropriate individual by e-mail or text when the student has entered his or her fingerprints. In this project, we utilize a Fingerprint Sensor (R307) to identify a user by fingerprint; when a user rests his finger on the sensor, a buzzer and LED light up. The fingerprint is then assigned a unique identifier and saved in the cloud. Fingerprint data may be stored for several users. The sensor will then compare the new fingerprint with the previous ones to see if there are any matches. The LCD screen will reveal the individual whose fingerprint was checked along with the date and time**.

Keywords: ANPR, Character Segmentation, Convolutional Neural Networks, Edge Detection, License Plate Extraction, Morphology, OCR**.**

I INTRODUCTION

Attendance system plays a very important role in an education system. Irregularity of attendance makes the student's percentage decreases. This will finally make a problem of student life. Attendance indicates the presence of a person in school, college and working place. Nowadays attendance percentage is the major issue in the education system. Based on attendance only others can know other's presence. It only indicates the presence and percentage of attendance. To maintain perfect attendance, we go for an automatic mail processing system. In a day to day life, we are using a biometric sensor (Iris sensor, thumbprint sensor, brain mapping sensor) for the attendance or the presence of a person like in or out. In schools, absent attendance lead to depression and also results in poor quality of education as a result of time lost while being away from school. It could also lead to moral degradation that unruly behaviour. We are using a biometric sensor as a thumbprint sensor. In working place attendance is very important for cooperation and learn the working details. According to the details of the education system if anything happens to the person at the time of working hours that will take it as a crime for that management. It will be cleared by the attendance system. The fingerprint-based attendance management system clearly defines when employees are supposed to show up work, especially with hourly or non-exempt employees. This is important for non-exempt employees, who frequently perform jobs that require a person to be there to serve customers.

In the World of Technology, Biometrics plays an effective role in identifying Human beings. Through this project, you will develop a unique system that can identify students for attendance purpose using their fingerprints.

In this project, we are going to design a Fingerprint Sensor Based Biometric Attendance System using Arduino. Simply we will be interfacing fingerprint sensor with Arduino, LCD Display & RTC Module to design the desired project. In this project, we used the fingerprint Module and Arduino to take and keep attendance data and records. Biometric Attendance systems are commonly used systems to mark the presence in offices and schools. This project has a wide application in school, college, business organization, offices where marking of attendance is required accurately with time. By using the fingerprint sensor, the system will become more secure for the users.

II LITERATURE SURVEY

According to [1] provides facilities to the different institute staff to take attendance easily without the need for any hard copy. It saves time and manages all the records of students, it also detects an unknown person. This system provides a camera that is fitted to the classroom wall which can easily recognize the face of every student. It takes the attendance of students automatically when a lecturer will come into the class and at the time of attendance he will log in a system to take attendance by biometrical identification techniques which has a lot of types but in this system, we will use face recognition. In this system, data will be trained by taking approx. 200 pictures of every enrolled student. The data of every student will be saved in the database. After the login of the lecturer, a camera will start recognizing the face of students and mark their attendance automatically. Every lecturer has his login id and has a record of all enrolled students.

According to [2] the first being able to book a classroom dynamically using Raspberry Pi and toggling lights and fans using NodeMCU and a mobile application which also helps notify a student about the subject of the lecture, the time and the venue related to the commencement of a period. The second section of this project inputs the attendance of a student check in,

using a portable real-time biometric system whose data can further be used to calculate the attendance statistics of each student which can be viewed by the respective student or the teachers can keep a track on their own assigned class using the mobile application. Smart Classroom System, which introduces automated control over electrical components in a classroom for energy saving, and a Portable Electronic Attendance System based on fingerprint identification for efficient use of time and paper, reduce labor work, and even prevent fraudulent attempts to mark the attendance.

According to [3] the academic attendance policy has continually insisted on the 70/30 % benchmark which has also generated a lot of questions at various quarters. This improvement provides for instant print out of attendance after class lectures and after examination periods. In the design, the PIC18F462 microcontroller has been used to achieve adequate results. Also, the PIC16F88 was used for the keyboard decoder to convert scan codes to ASCII character for the microcontroller. Adequate attendance security measures have also been put in place for effective attendance management. The design presented here showed better performance over the previous design.

According to [4] The usual procedure of taking manual attendance and keeping students' attendance is very difficult, inefficient and highly time-consuming task. The IOT based biometric attendance system is supported with biometric identification features which has the capability to automatize whole process. An attendance system with 3 broad features i.e. Internet of Things (IoT), Cloud computing and FPS yields a huge value to various institutions. Due to these considerations, it manifests that it is highly reliable with high security. This system is user friendly due to its lack of complexity.

According to [5] a simple approach to student attendance in the form of an Internet of Things (IOT) based system that records the attendance using fingerprint based biometric scanner and stores them securely over cloud. This process avoids the manually taking and storing student attendance records. It also prevent proxy attendance, thus increasing the reliability of attendance records. The records are securely stored and can be reliably retrieved whenever required by the teacher.

According to [6] the system provides two ways-Fingerprint Module and Facial Recognition Module in order to record attendance uniquely by checking pre-registered data. In case the main method (fingerprint module) fails to work, students can use the facial recognition module. We have used LBPH face recognizer and Haar Cascade method to implement face detection and recognition. The system, after recording attendance, sends data to Real-time database using Firebase and this data can be retrieved on the Web Application. The system is also able to generate customized report of attendance. Our system stands out from other existing biometric attendance management systems as, our system provides a fully- functional backup method to record attendance in case our primary method fails or takes inappropriately long time. Once after all the students have recorded attendance, the data gets sent to the Firebase.

According to [7] an overview of the state of human emotional stress biomarkers and the primary prospective biomarkers for wearable affective system sensors in the future are presented. Emotional stress has been identified as a significant factor in societal issues, including quality of life, crime, health, and the economy. While electroencephalography, physiological parameter techniques, and blood cortisol testing are the gold standards for assessing stress, they are often intrusive or uncomfortable. They are not appropriate for wearable real-time stress monitoring. Instead, cortisol in biofluids and VOCs released from the skin are sensible and helpful signals for sensors to identify emotional stress episodes

According to [8] graph-based technique for recognising emotions that uses facial landmarks. Several pre-processing stages were implemented based on the suggested strategy. Face key points must undergo pre-processing before face expression characteristics can be retrieved. Face detection using the Haar-Cascade method, landmark implementation using a media-pipe face mesh model, and model training on seven emotional classes are the three primary processes in recognising emotions on masked faces. For model training, the FER-2013 dataset was used. For unmasked looks, an emotion detection model was created. The top half of the face was then marked with markers. After retrieving landmark locations and faces, we recorded emotional class landmark coordinates and exported them to a comma-separated values (CSV) file. After that, the dynamic classes received model weights. Last, a web camera application evaluated a landmark-based emotion identification model for the upper face regions on photos and in real time.

According to [9] the FER2013 dataset's single network with the best classification accuracy. Adopting the VGGNet architecture, we carefully adjust its hyperparameters and test several optimisation techniques. Recognising facial expressions that communicate fundamental emotions like fear, pleasure, contempt, etc., is known as facial emotion recognition. It is helpful in human-computer interactions and may be used in customer satisfaction surveys, online gaming, digital advertising, and healthcare.

According to [10] a face expression identification approach based on a convolutional neural network (CNN) and image edge detection is suggested to circumvent the laborious procedure of explicit feature extraction in conventional facial expression recognition. The edge of each picture layer is retrieved during the convolution process after the facial expression image has been normalised. The maintain the edge structure information of the texture picture, the extracted edge information is placed on each feature image. The maximum pooling approach is then used to reduce the dimensionality of the retrieved implicit features. Finally, a Softmax classifier is used to classify and identify the test sample image's expression by carefully combining the Fer-2013 facial expression database with the LFW data set; a simulation experiment is created to test the

resilience of this approach for facial expression identification against a complicated context.

Table 1: Benefits and Features [11]

Aspect	Key Components	Features	Benefits	Contribution
Hardware Components	RFID Readers, Biometric Scanners, etc.	Automated Data Capture	Accurate and Real-time Attendance Recording	Reduces Paper Usage and Waste
Software Functionality	Cloud-based Database, Analytics Tools	Cloud Storage and Management	Centralized Data Access and Storage	Minimizes Physical Storage Requirements
Integration and Scalability	API, Integration with LMS	Integration with Existing Systems	Seamless Incorporation with Educational Infrastructure	Maximize the Use of Existing Recourses
Environmental Impact	Energy Efficient Hardware	Low Power Consumption	Reduced Energy Usage and Carbon Footprint	Contribution to Sustainability Goals of the Institution

III Existing System

The Existing system is a manual entry for the students. Here the attendance will be carried out in the hand written registers. It will be a tedious job to maintain the record for the user. The human effort is more here. The retrieval of the information is not as easy as the records are maintained in the hand written registers. This application requires correct feed on input into the respective field. Suppose the wrong inputs are entered, the application resist to work. So the user find it difficult to use. Camera captures the images in the video streaming, while the face detection resizes the captured image up to certain point. The segmented image is compared with the present data sets and faces are recognized. Admin records the attendance if the particular student and generates the report. The result is displayed in the monitor. Raspberry Pi is the main component in the project. We will be using USB webcam to capture photos. We can access Raspberry Pi's console either by using SSH in laptop or by using Keyboard and mouse with the display device like TV connected to Pi. Firstly, the algorithm needs a lot of positive images and negative images to train the Haar cascades classifier. Positive images are images with clear faces where negative images are those without any faces. Each feature is represented as a single value obtained from the difference of the sums of pixels in white rectangle from the sum of all pixels in the black rectangle. All different possible sizes and locations of classifier is used for calculating of plenty of features.

Table 2: Usage of IoT Devices and Technologies in Educational Institutes [11]

Sr.	Educational institute	IOT technologies in Use	Purpose of IoT implementation
1.	University	RFID reader, LED, Buzzer, LCD, Network, microcontroller.	Enhance Class-room Experience
2.		RFID reader, Computer, Graphical user interface, database	Improve Security and Safety
3.		RFID Tag/key, RFID Reader, GSM Module, database	Improve Security and Safety
4.		RFID Card, RFID Reader, Camera, PC, Database	uniqueness, stability, permanency and easily taking
5.		RFID reader, microcontroller, database, GSM.	save time and Streamline Attendance Tracking
6.		RFID tags, RFID card reader, Cloud, Camera,	Improve Security and Safety
7.	College	Microcontroller ZigBee module. Raspberry Pi.	Enhance Classroom Experience and Improve Security and Safety
8.		RFID reader, microcontroller, Arduino Uno, LCD, cloud database	Enhance Classroom Experience
9.	University	RFID reader, Camera, microcontroller, LCD, Database	Streamline Attendance Tracking
10.		RFID tags, RFID reader, Database	Enhance Classroom Experience

11.		RFID tag, RFID reader, microcontroller, pc, buzzer, LCD	Improve Security and Safety
12.		Smart card, RF reader, database, Arduino, LCD, RTC module, solenoid Lock	Streamline Attendance Tracking and Improve Security and Safety

IV PROPOSED SYSTEM

The fingerprint attendance system aims to automate the attendance procedure of an educational institution using biometric technology. This will save time wasted on calling out names and it gives a fool-proof method of attendance marking. A hand-held device is used to mark the attendance without the intervention of the teacher. The device can be passed and students can mark attendance during the lecture time. Students would be made to place their fingers over the sensor so as to mark their presence in the class. It can communicate with a host computer using its USB interface. This device operates from a power supply. GUI application in the host computer helps the teacher to manage the device and attendance. Fingerprint authentication is one of the most popular and accurate technology. The fingerprint system is connected to the Arduino uno. The timing is set for fingerprint for student attendance. Arduino uno compares the thumbprint information with the present thumbprint. If the time is out for the attendance it considered as late attendance or not accepting the thumbprint. After five minutes, the document will send to the authorized person's.

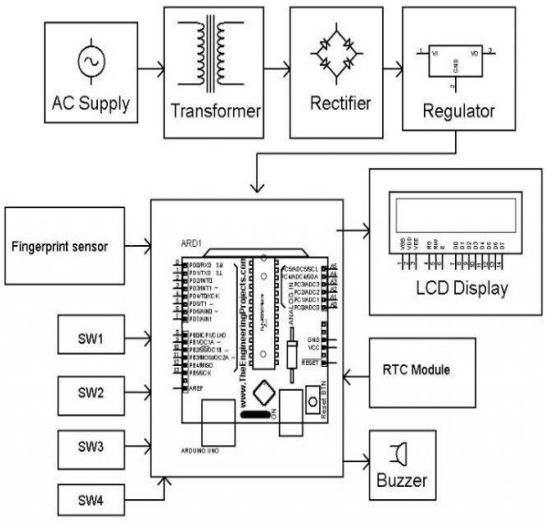

Figure 1: Proposed System

V METHODOLOGY

Module 1: Data Collection: We created various student attendance using fingerprints sensor and store into hard drive.

Module 2: Data Training: We collect artificial as well as real using students fingerprints Train with time and any in-depth classification.

Module 3: Testing with machine learning: Using any machine learning classifier we achieved weight system recommend the actual student id system automatically update the attendance for respective student.

Module 4: Analysis: We demonstrate the accuracy of proposed system and evaluate with other existing systems**.**

VI CONCLUSION

The traditional process of manually taking and maintaining student attendance could be more efficient and efficient. The attendance monitoring system based on fingerprint authentication could streamline the whole process. An Internet of Things (IoT) based portable fingerprint attendance system can be of great value to educational institutions as it proves to be highly efficient and secure. The cost involved in making this system is much less when compared to the conventional fingerprint attendance system. Cloud computing to store attendance records makes all the data easy to access and retrieve when required by the teachers. The use of a fingerprint scanner ensures the reliability of the attendance record. The system, due to its lack of complexity, proves to be easy to use and user-friendly.

REFERENCES

[1] Raza, Hafiz Wahab. "IoT–based Automatic Attendance Management System using Middleware." (2022).

[2] Kadepurkar, Prajas, Prim Rochelle Dsouza, and Nivya Jomichan. "IoT based smart classroom." International Journal of Applied Sciences and Smart Technologies 3.1 (2021): 35-54.

[3] Shoewu, Oluwagbemiga O., et al. "Enhanced Smart Biometric Based Attendance (ES2BASYS) System Interfaced with POS Facility for a Smart Academic Institution." the Pacific Journal of Science and Technology 21.2 (2020): 1-12.

[4] Jain, Tripti, et al. "IoT based biometric attendance system." International Journal of Electrical Engineering & Technology 11.2 (2020).

[5] NS, Mr Gore, et al. "Fingerprint based attendance system using IoT." International Journal of Computer Science Trends and Technology (IJCST) 7.2 (2019): 64-68.

[6] Panditpautra, Varun, et al. "Biometric Attendance Management System Using Raspberry Pi." 2nd International Conference on Advances in Science & Technology (ICAST). 2019.

[7] Zamkah, Abdulaziz, et al. "Identification of suitable biomarkers for stress and emotion detection for future personal affective wearable sensors." Biosensors 10.4 (2020): 40.

[8] Farkhod, Akhmedov, et al. "Development of Real-Time Landmark-Based Emotion Recognition CNN for Masked Faces." Sensors 22.22 (2022): 8704.

[9] Khaireddin, Yousif, and Zhuofa Chen. "Facial emotion recognition: State of the art performance on FER2013." arXiv preprint arXiv:2105.03588 (2021).

[10] Zhang, Hongli, Alireza Jolfaei, and Mamoun Alazab. "A face emotion recognition method using convolutional neural network and image edge computing." IEEE Access 7 (2019): 159081-159089.

[11] Ishaq, Kashif, and Samra Bibi. "IoT Based Smart Attendance System Using Rfid: A Systematic Literature Review." arXiv preprint arXiv:2308.02591 (2023).