



Integrated RFID Attendance System using Cloud Storage for Parent Notification

P.V.Omkar, B.Lakshmi Prasanna, J.Mohan, Md.Maaz Jafar, Sk.Abdul Wahid

Department of ECE, Godavari Institute of Engineering and Technology (A), Rajahmundry, Andhra Pradesh, India

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ABSTRACT

Now-a-days students' attendance is becoming more important for any organizations/institutions. The conventional method of taking attendance by calling names or signing on people is very time consuming and insecure, hence inefficient. Here, our project combines Radio-Frequency identification (RFID) technology, biometric attendance verification, cloud-based data storage, and a mobile application to offer a comprehensive solution for attendance management and information dissemination in educational institutions. The key components of the system include RFID tags and readers, biometric recognition devices, a secure cloud database, and a dedicated mobile application. RFID technology is employed to automate attendance tracking and access control, while biometric verification adds a layer of security and accuracy. Data is securely stored in the cloud, ensuring accessibility and data integrity. The mobile application serves as an intuitive interface. To enhance the system's functionality, smart notifications have been incorporated. These notifications monitor attendance patterns and performance. When discrepancies or concerns, such as irregular attendance or academic issues, are detected, the system triggers automated notifications. These notifications are delivered via email, SMS, or the mobile application, fostering improved communication between educational institutions, students, and their parents.

Keywords: RFID Reader, Biometric Authentication, ESP32

1. INTRODUCTION

Traditional methods of tracking attendance are unreliable and slow in the ever evolving context of educational institutions. Knowing that continuity and safety are essential, our subject integrated radio-frequency biometric attendance verification, cloud storage systems with user interfaces, and radio frequency identification (RFID) technologies. RFID, a wireless communication technology that relies on

electromagnetic coupling, is the primary component used in access control and automatic attendance tracking systems. Passive RFID readers with a 125 kHz operating frequency and a roughly 10 cm detection range are located at the heart of our RFID system. This solution eliminates the need for manual name searches by providing a quick and accurate way to identify pupils. By elevating the level of reliability of attendance data, biometric verification makes it possible to further

enhance it. Our method not only improves attendance tracking, but it also addresses privacy concerns and data security problems. We ensure accessibility and information integrity by securely storing data in a cloud-based database and providing real-time attendance tracking for every staff member on campus through a dedicated dashboard. • In addition to enhancing functionality, our system has smart notifications that allow us to track attendance patterns and performance. Automated notifications are issued in the event of irregular attendance or academic matters, facilitating constructive communication between educational institutions, parents, and students. Our project is to provide an integrated solution to attendance management in the era of automatic identification technologies, ensuring the smooth operation of educational establishments.

2 LITERATURE SURVEY

1. In May 2020, Muhammad Haekal Bin Md. Haled presented a "Student Attendance System Using RFID." A new technology in communication networks called frequency identification (RFID) uses radio frequency waves to identify and monitor a unique tag inserted into a living being or an object. Through a variety of modulation and encoding schemes, it is a wireless communication method that uses electrostatic and electromagnetic coupling in the radio frequency region of the spectrum to communicate between reader and tag. These days, the majority of colleges still employ the antiquated, time-consuming approach of recording attendance—calling names or having students sign documents on paper. There are many different ways to transport data on this planet. Using radio frequency electromagnetic fields is one of them. One well-known instrument that employs this technique is radio frequency identification (RFID). These are wireless, non-contact devices designed to track and recognize information contained in programmed tags or cards automatically.

2. Akshata Rajoor and Akshata Shiralkar In 2019, a system called "IoT based Smart Attendance Monitoring System using RFID" was proposed. The majority of the laborious process by which institutional authorities keep track of their staff members' manual attendance troubles them. Manual signatures on paper are time-consuming and unreliable. At these locations, an effective

attendance monitoring system must be implemented. We have a solution for problems like proxy attendance with the Radio Frequency Identification (RFID) based attendance system. This essay outlines the architecture of an RFID-based attendance tracking system that uses an employee's or student's RFID tag, which is fastened to their ID card, to individually identify each individual. Compared to the traditional way, this technology for tracking attendance is easier, faster, and more secure. This system is intended for usage in various corporate settings, government offices, and educational institutions, among others. The suggested system is made up of IoT-based hardware and software components. The RFID tags/cards and RC522 card reader make up the hardware component. The software component consists of a web-based graphical user interface (GUI) that is housed on a web server and allows users to view the attendance of employees or students. A database server is used to store the data.

3. In March 2021, RKAR. KARIAPP suggested a system titled "ATTENDANCE SYSTEM USING RFID, IOT, AND MACHINE LEARNING." In the present day, RFIDs make significant and vital contributions. RFID is a prominent feature in nearly every industry [3]–[4]. RFID offers a practical and efficient fix for a number of problems. RFID can manage applications with ease. Clinical waste management concerns [6], healthcare challenges, attendance issues, and many more categories are classified as highly-paid attention problems. Additionally, the Internet of Things (IoT) offers effective solutions for the majority of modern problems. IoT applications are used differently by several industries to solve problems quickly [7]–[10]. Numerous researchers and writers have demonstrated the connection between RFID and IoT in various contexts, including throughputs. IoT and RFID are also very well suited for educational purposes. These days, RFID and Internet of Things technologies are used for the majority of blended learning and e-learning [11]. An RFID card can be used by students to track their attendance. The RFID tag of every student is read by an RFID reader that is positioned within the classroom. Students receive their attendance when they punch the tag in front of the reader. This strategy leaves a lot of room for fraudulent activity. Someone else's card can be used by another person to record attendance. To get around this problem, it is preferable to have a second verification technique.

3 Overview of Existing System

The current attendance management system uses radio-frequency identification, or RFID, as its sole technological component. RFID tags are distributed to students, and classroom setup takes passive RFID readers into consideration. Students have to line up. As soon as students go into the classroom, they scan their RFID tags using the RFID reader. After reading the distinctive ID, the scanner reports the attendance. However, this method has shortcomings, such as not providing an additional security layer on top of RFID and being vulnerable to tag sharing-based proxy attendance.

4 Overview of Proposed System

Our suggested attendance management system builds upon the RFID foundation by utilizing biometric verification and auto-generated Excel to address its shortcomings. Each student in the new system receives an RFID tag in addition to their biometric data, including fingerprints. Students' RFID tags must be placed close to the reader as they enter the classroom so that it may record their individual IDs. Concurrently, a biometric verification procedure is initiated, confirming that the physical presence corresponds with the registered biometric information and offering a robust safeguard against proxy attendance.

Block Diagram:

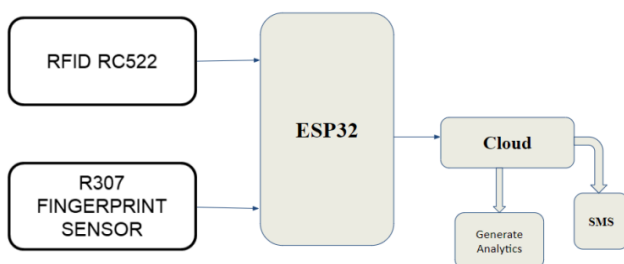


Fig. 1: Block Diagram

ESP32: One type of microcontroller board created by the Arduino team is the ESP32 board. Based on the Atmega168 or Atmega328p microcontroller. It is somewhat similar to the Arduino Uno board, but because of its compact size, this nano board has taken the place of the Arduino Uno in terms of pin arrangement and functions. Small size components are preferred for constructing embedded systems, as is well known.

Embedded systems, robotics, and other electronic projects are the principal uses for Arduino boards. However, the nano boards are primarily meant for novices without any prior technical experience.

RFID: Integrated circuit products consisting of particular chips and related components make up RFID labels. RFID label chips are made up of four parts: the digital control, resonant circuit, data storage, and radio frequency (RF) interface circuitry. The resonant circuit serves as the electronic label's communication interface with the outside world. It transfers the energy and information from the reader antenna's magnetic field signal to the electronic label. Energy, time, and data are supplied to the internal circuit by the RF interface circuit, which receives the reader signal coupled to the antenna. Additionally, it links the E2PROM data store and internal digital control circuit to the external antenna.

Fingerprint Sensors: A high-precision, high-performance matching algorithm and a high-capacity memory chip make up the R305 biometric fingerprint module. It operates by matching, processing fingerprint images, searching memory, and carrying out requested tasks. R305 communicates with the microcontroller through serial communication. The R307 Fingerprint Module consists of an optical fingerprint sensor, a high-speed DSP processor, a high-performance fingerprint alignment algorithm, high-capacity FLASH chips, and other hardware and software compositions with stable performance, a simple structure, fingerprint entry, image processing, fingerprint matching, search and template storage, and other functions.

5 RESULTS

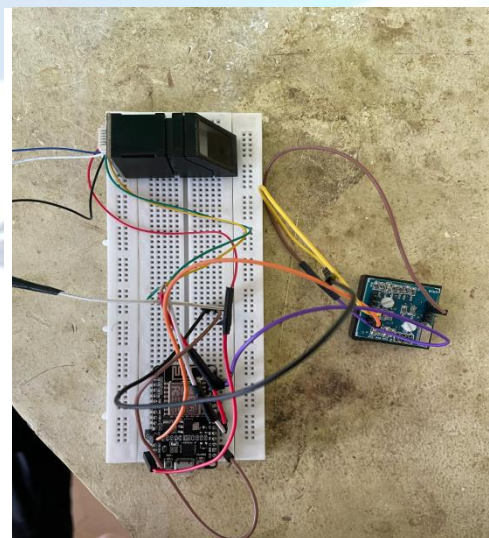


Fig. 2: Circuit Diagram

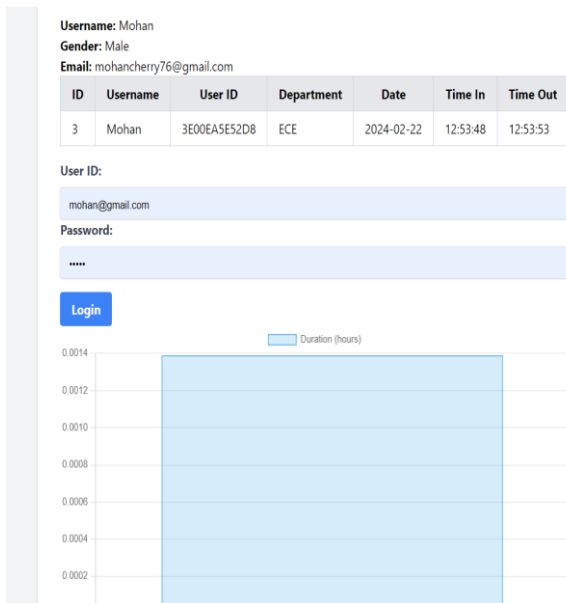


Fig. 3:User Attendance

CARD ID	NAME	GENDER	S.NO	DATE	DEPARTMENT
3E00EA5C8BA	kiran	Male	400	2024-02-22	ECE
3E00EA738621	Abdul	Male	446	2024-02-22	ECE
3E00EA2E619B	Jafar	Male	408	2024-02-22	ECE
3E00EA5E52D8	Mohan	Male	426	2024-02-22	ECE

Fig. 4:Card ID Details

ID	NAME	SERIAL NUMBER	GENDER	CARD RFID	DATE	DEVICE
4	kiran	400	Male	3E00EA5C8BA	2024-02-22	ECE
3	Abdul	446	Male	3E00EA738621	2024-02-22	ECE
2	Jafar	408	Male	3E00EA2E619B	2024-02-22	ECE
1	Mohan	426	Male	3E00EA5E52D8	2024-02-22	ECE

Fig. 5: List Of All Users

6 CONCLUSION

To sum up, this project offers a lot more functionality than conventional attendance tracking solutions. Attendance tracking is automated with RFID technology, which reduces errors and saves time. Biometric verification strengthens the accuracy of student identification and attendance records. Secure storage and convenient access to attendance data for analysis are offered by the cloud database. The most significant way that smart notifications contribute to improved student outcomes is by encouraging proactive communication between the school, parents, and students. With the help of this comprehensive solution, attendance management issues at educational institutions are successfully addressed, improving process efficiency, security, and transparency.

7 FUTURE SCOPE

The integrated RFID attendance system's future plans call for tighter integration with learning management systems to enable more efficient administrative procedures and individualized interventions. To ensure accuracy and user approval, biometric technology must be continuously improved. Similarly, enhancing smart notification capabilities can help to improve communication between the school, parents, and kids. The effectiveness of operations and campus administration can be improved by integrating IoT devices into the system. It is crucial to guarantee inclusivity and accessibility by including features for students with disabilities. Furthermore, investigating blockchain technology for data security can improve attendance records' credibility. All things considered, the goal of upcoming updates is to enhance the user experience, optimize system performance, and promote successful student results.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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