

RFID & Face ID Secure Attendance Tracker

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Abstract— This paper introduces an RFID and Face ID Secure Attendance Tracker. Its purpose is to enhance automation, accuracy, and security in tracking attendance. The system uses RFID technology for speedy identification and face recognition for added security. This provides accurate tracking of attendance and prevents one person from signing another in. A microcontroller efficiently processes RFID reader and facial recognition camera data, thoroughly authenticating identities through machine learning algorithmic applications. A cloud-based attendance database securely stores records, which can be viewed by managers in real time and analyzed through comprehensive reports. Automatic attendance reports are generated and sent to parents via email or SMS for easy tracking and transparent timely information on student attendance. The system features a user-friendly interface, such as LCD displays and smartphone alerts, to improve communication. Evaluations of academic performance revealed a 97.5% accuracy rate thanks to efficient facial recognition and RFID scanning technologies. Future advancements include blockchain technology for data security, smartphone connectivity for remote monitoring, and artificial intelligence upgrades for improved low-light detection. For companies and educational institutions seeking a dependable attendance tracking system, the suggested approach offers a scalable and effective solution.

Keywords —RFID, Face Recognition, Attendance System, Automation, Biometric Security, Machine Learning.

I. INTRODUCTION

It is extremely essential to monitor attendance for discipline, tracking participation, and implementing rules in schools, offices, and other workplaces. Due to the RFID-based attendance system, school teachers and staff members have less paperwork to handle. Conventional techniques, such calling names aloud or utilizing sign-in papers, take a lot of time and are prone to manipulation and error [1]. The conventional method of recording student attendance frequently has several issues. By doing away with traditional methods of recording student attendance, including calling names or examining individual identity cards, the facial recognition technology highlights its simplicity[2].

Manual roll calls, being one of the most ancient methods of attendance, are labor-intensive, vulnerable to manipulation, and are not scalable for large organizations [3]. Biometric systems, including fingerprint scanning, provide better security but have drawbacks such as hygiene issues, vulnerability to environmental conditions, and

periodic failure due to sensor wear and tear. Parents and the school administration will be informed about automated and dependable attendance thanks to this method. A distinct RFID card will be issued to each professor and student in order to execute this system[4].

A modern smart attendance system combines wireless networks with several widely used controlling devices. Automating the attendance system has become more difficult as a result of the new, complex technology items[5]. An Automated Attendance Verification System is shown here with RFID and Face ID that is aimed at increasing accuracy, security, and convenience in attendance tracking. This system's self-created face database and efficient face database training enable it to perform face detection and improve detection rate and speed[6].

The RFID module enables the user to tap their RFID card on a reader, instantaneously recalling their ID information from a database. The administrator keeps track of each student's daily attendance, broken down by subject. By identifying a person's face and comparing it to those in the database, our system assists with taking attendance[7]. With the use of these technologies, the proposed system has enhanced security, averted impersonation, and minimized administrative tasks while boosting efficiency.

Also, real-time monitoring and cloud storage enable administrators to access attendance data easily and in real-time [8,9]. This enables them to make data-driven decisions, track trends, and prepare reports. The system can be implemented in a variety of industries, such as educational institutions, corporate offices, healthcare centers, and industrial units, providing a flexible and expandable solution for tracking attendance.

This paper provides an in-depth analysis of the system's architecture, functionality, and performance assessment and showcases its efficiency as compared to conventional attendance systems. The results of this research indicate the system's potential to set a standard for future attendance management solutions.

II. SYSTEM ARCHITECTURE AND COMPONENTS

The proposed system integrates multiple hardware and software components to facilitate efficient attendance tracking. The primary components include:

1. **RFID Reader & Tags** – Each user is assigned a unique RFID card, linked to a centralized database for identification.
2. **Face Recognition Module** – A camera captures facial images for verification, utilizing deep learning-based recognition algorithms.
3. **Microcontroller (Raspberry Pi/Arduino)** – Processes RFID inputs and communicates with the facial recognition system.
4. **Database Management System** – Stores attendance records, user details, and authentication logs in a secure cloud-based system.
5. **User Interface (LCD Display & Mobile Notification System)** – Displays real-time attendance status and sends alerts Via SMS or email.

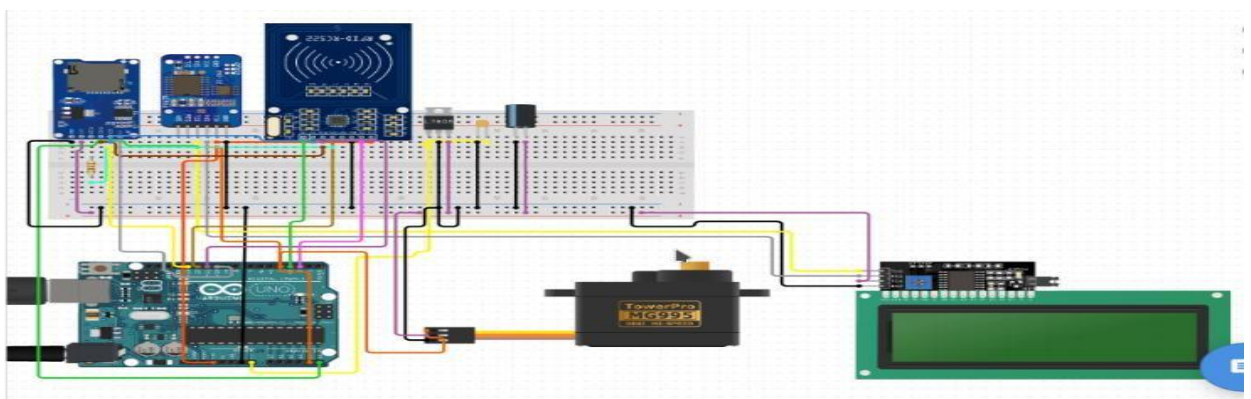


Fig.1–Schematic of designed module

III. WORKING

In brief, the working of the module can be divided in three stages.

A. RFID-Based Identification

A RFID tags carry individual identifiers assigned to every user. Scanning an RFID card makes the system read user

information from the database and begin the verification process.

B. Face Recognition Authentication

The system then asks for face recognition verification via a camera after RFID identification. The captured face is matched against saved facial information via machine learning algorithms (e.g., OpenCV, TensorFlow). Upon finding a match, attendance is registered successfully.

C. System Operation

The system operates through a structured process to ensure seamless and secure attendance tracking:

1. The user taps their RFID card on the scanner.
2. The system retrieves user details and initiates facial recognition verification.
3. A camera captures the user's facial image and matches it with stored records.
4. If the RFID and facial recognition both match, attendance is marked successfully.
5. If verification fails, access is denied, and an alert is sent to the administrator.
6. Attendance records are updated in real-time and stored securely in the cloud.

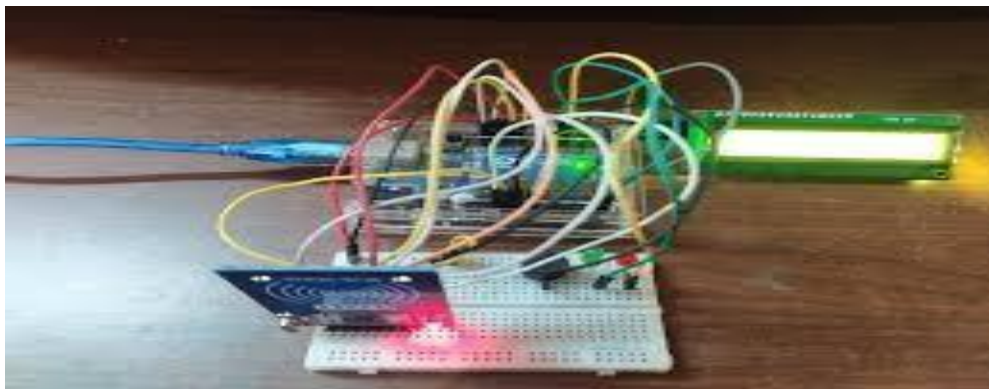


Fig.2–Working module

The flow chart represents the pictorial presentation of the above working of this module.

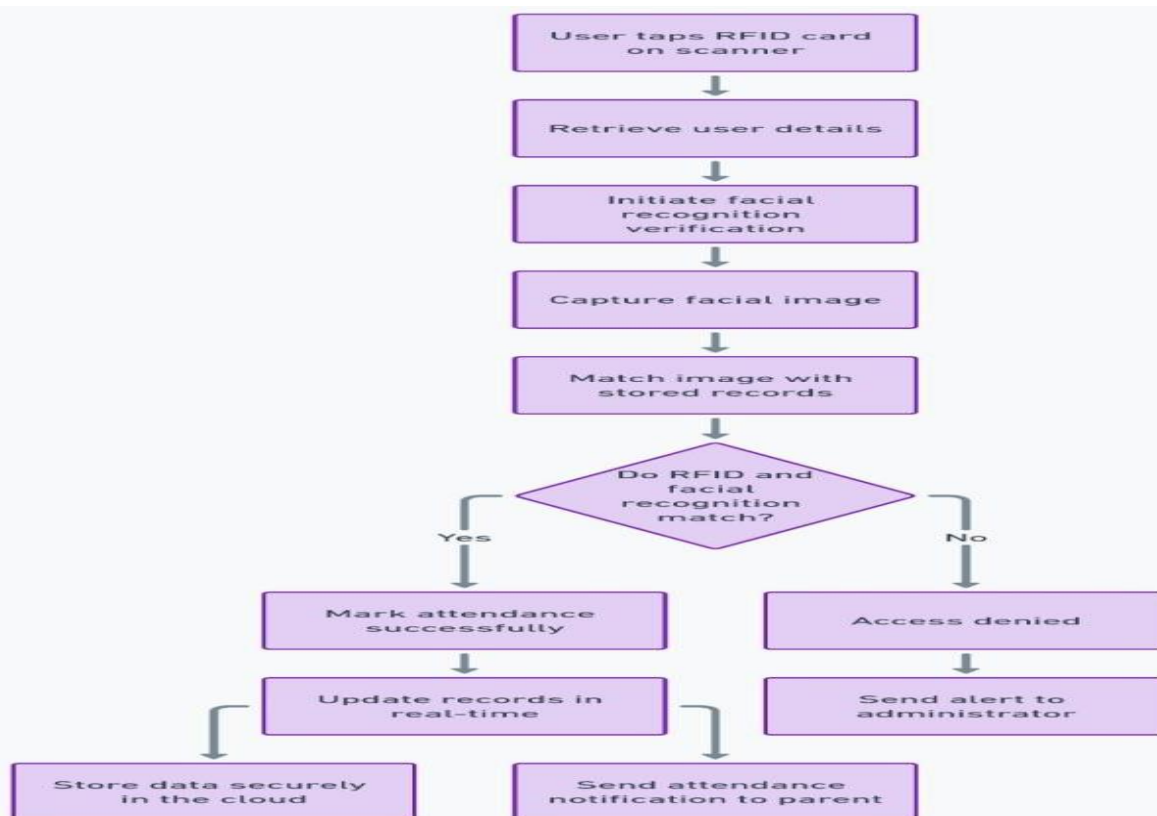


Fig.3–Flow chart for designed module

IV. RESULT&ANALYSIS

The proposed system was tested in an academic setting with 100 participants to evaluate processing speed, accuracy, and reliability. The following results were observed:

- **RFID scanning time:** 1-2 seconds per user.
- **Facial recognition verification:** 1-3 seconds additional processing time.
- **Overall accuracy:** 97.5% in identifying and verifying users.
- **Proxy attendance prevention:** 100% success in eliminating fraudulent attendance.
- **Cloud-based monitoring:** Enabled real-time attendance tracking and easy report generation.
- **System performance:** Maintained stability across various lighting conditions and facial orientations.

A comparison of different attendance tracking systems is provided below:

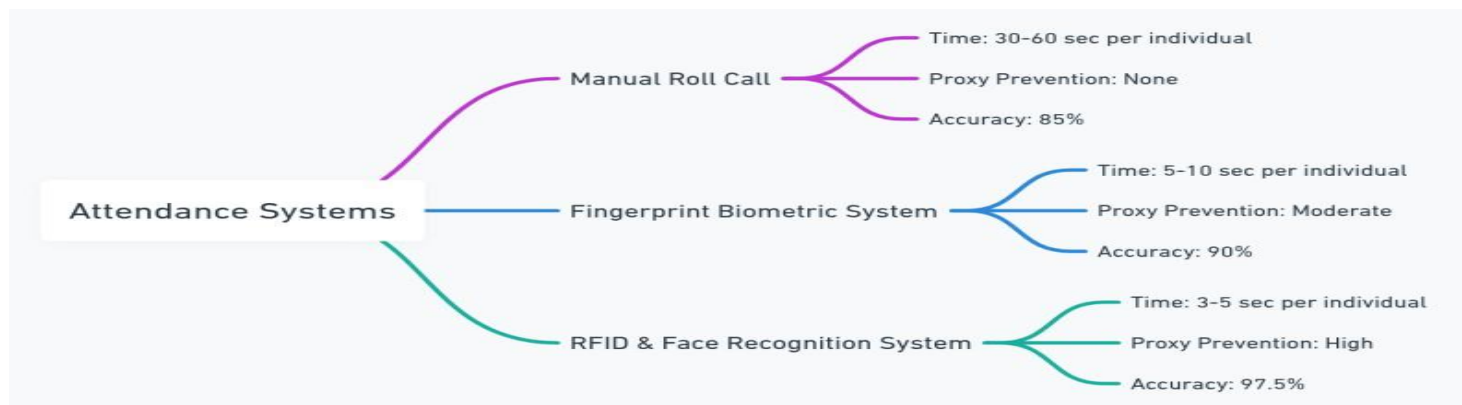


Fig.4–Comparison of different attendance tracking systems

V. CONCLUSION

RFID and Face Recognition-Based Smart Attendance System introduces an efficient, secure, and automated solution for attendance management. By integrating RFID for fast identification and face recognition for authentication, the system significantly enhances security, prevents fraud, and reduces manual workload. Its contactless operation also makes it suitable for hygiene-conscious environments.

Future enhancements include:

- **Enhanced AI-driven** facial recognition for improved accuracy in low-light conditions.
- **Mobile application integration** for remote attendance tracking.
- **Scalability** to support multi-location organizations and educational institutions.
- **Edge computing** to reduce cloud dependency and improve response time.
- **Blockchain technology** to enhance security and prevent data tampering.

By addressing these future advancements, the system can become a benchmark for attendance management solutions across multiple sectors.

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