An Automated Students Attendance System with SMS Notification

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Abstract

This study aims to develop an automated student attendance system that integrates RFID authentication with SMS notifications sent to respective parents or guardians, ensuring improved monitoring of student attendance. The system employs an Arduino Uno, RC522 RFID scanner, and SIM800L GSM module to capture attendance, store data, and send notifications. The RFID scanner records attendance, and the GSM module sends real-time SMS alerts. The system demonstrates high accuracy in attendance logging, quick SMS delivery, and ease of access control. It improves parental awareness regarding student attendance and reduces manual tracking efforts. The system enhances traditional attendance methods by incorporating RFID authentication and real-time SMS notifications, making it a reliable solution for educational institutions.

Keywords

Automated Attendance, RFID Authentication, RFID Scanner, Facial Recognition, SMS Notification, Real-time Tracking, Proxy Prevention, GSM-based Alerts, Student Monitoring, IoT in Education.

Introduction

Educational institutions often struggle with inefficient manual attendance tracking, leading to errors and unauthorized absences. Students may also exploit loopholes in traditional methods to bunk classes. An automated attendance system ensures accurate attendance records, eliminates proxy attendance, and keeps parents informed about their child's attendance status through real-time SMS alerts. This research focuses on designing an RFID-based attendance system with SMS integration to improve accuracy, prevent absenteeism, and provide real-time updates to parents. Previous research has explored RFID-based attendance systems, barcode scanning, and manual entry-based electronic registers. Some systems integrate SMS but lack robust authentication security. Many existing solutions are prone to manipulation, require manual intervention, or fail to provide real-time parental notifications. Our system integrates RFID authentication with GSM-based SMS notifications, ensuring accuracy, security, and real-time communication with parents.

System Design/Methodology

The system comprises an RFID scanner (RC522) for authentication, an Arduino Uno as the microcontroller, a SIM800L GSM module for SMS notifications, an LCD Display (16x2) for attendance confirmation, a 5V DC power supply for stable operation, and jumper cables and a breadboard for circuit connections. The programming is done in C++ (Arduino-based programming), and data is stored internally in the RFID system. The SIM800L GSM module is used as the SMS gateway. Students register their RFID cards, linking them with parent or guardian phone numbers. Upon scanning, attendance is recorded digitally, and the GSM module sends an SMS notification to the linked phone number. Teachers and HODs have access control, ensuring no student can manipulate records.

Components:

The Arduino Uno is an open-source microcontroller based on the ATmega328P. It is widely used for embedded systems due to its ease of programming and hardware compatibility. The board features 14 digital I/O pins, six analog inputs, a 16 MHz quartz crystal, USB connection, and power jack. Operating at 5V, it supports UART, SPI, and I2C communication. In this project, it handles RFID authentication, communicates with the SIM800L GSM module, and controls the LCD display, making it ideal for automation projects like attendance tracking.

RC522 RFID Scanner is a contactless radio-frequency identification (RFID) module operating at 13.56 MHz. It uses SPI communication to interface with the Arduino, enabling students to scan RFID cards for attendance marking. The system assigns unique IDs to each card, ensuring accurate student identification and preventing unauthorized access.

SIM800L GSM/GPRS module for mobile communication, supporting SMS, phone calls, and internet access via a GSM network. It operates within 3.7V to 4.2V and uses UART with AT commands for microcontroller communication. In this project, it sends SMS notifications to parents or guardians whenever a student's attendance is recorded, ensuring real-time updates. Performance depends on GSM network availability and the SIM card's validity.

Implementation

The system setup involves connecting the RFID scanner to the Arduino, which is powered by a 5V DC adapter, linking the GSM module (SIM800L) for SMS functionality, and programming the microcontroller for RFID processing and SMS automation. The SIM800L module communicates via AT commands, using an active SIM card to send attendance notifications. Challenges faced during implementation included network issues affecting SMS delivery, SIM compatibility and carrier support limitations, RFID reader range constraints, and ensuring secure access control to prevent tampering.

BlockDiagram
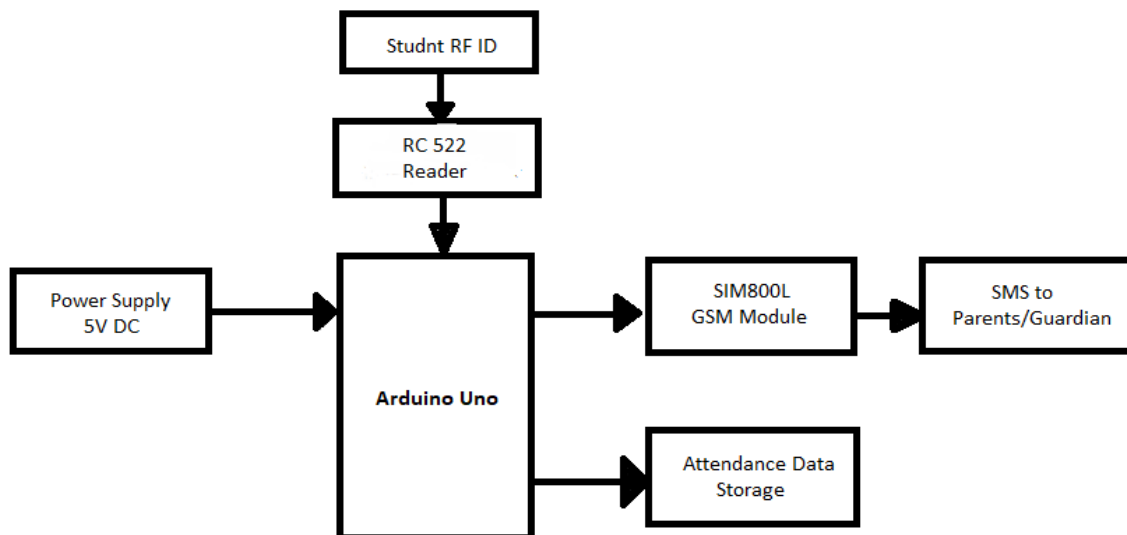
Circuit Diagram
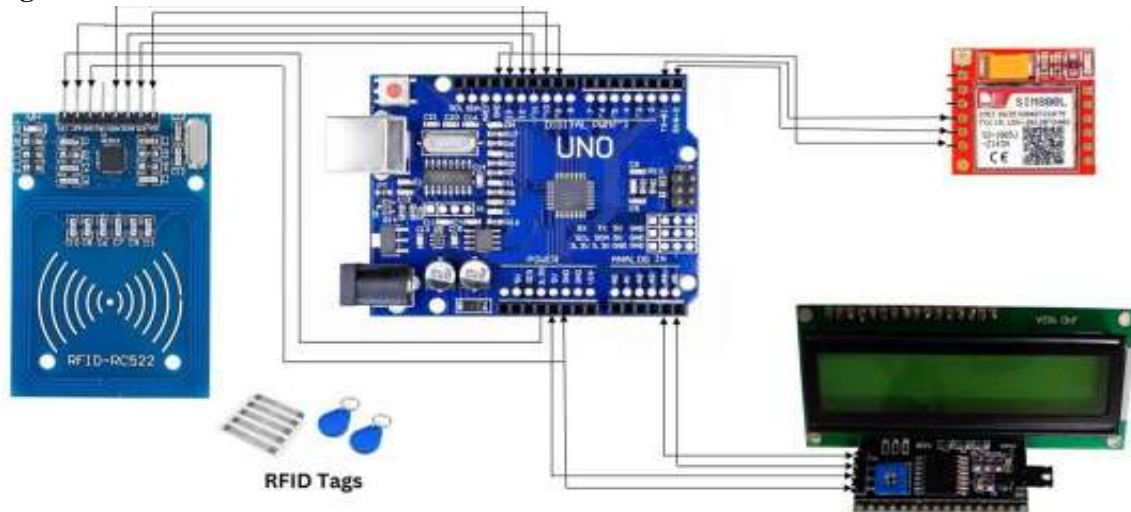
Advantage

1. Saves Time – Reduces manual attendance work.
2. More Accurate – Lowers errors in records.
3. Instant Alerts – Sends SMS to parents if a student is absent.
4. Better Security – Prevents fake attendance.
5. Easy Monitoring – Helps track attendance easily.

Disadvantages

1. Setup Cost – Needs money for software and devices.
2. Technical Problems – System or network issues may occur.
3. Data Privacy – Storing student records need
4. Security.

Results

 The RFID-based attendance system was tested by enrolling four team members for RFID authentication and restricting access control to a single authorized administrator. Performance evaluation showed that SMS notifications were dispatched within 10 seconds, RFID recognition achieved a 98% accuracy rate, and system uptime remained stable. Case studies confirmed the system's effectiveness in real-time attendance tracking, successfully recording attendance and instantly sending SMS alerts. Additionally, the RFID authentication mechanism reliably prevented proxy attendance, ensuring accurate monitoring and enhancing security.
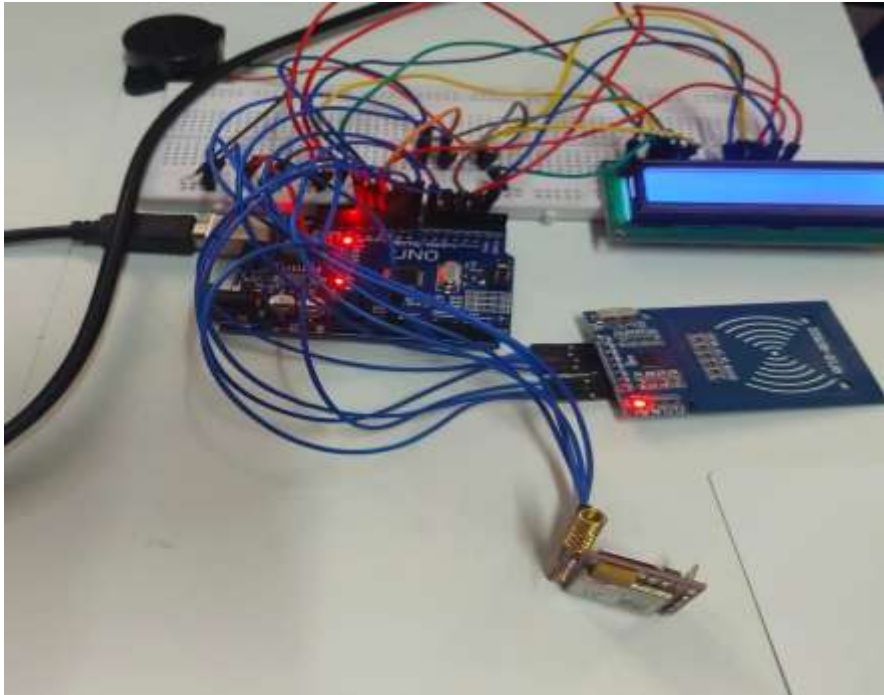
Conclusion

The system performs as expected, improving attendance tracking accuracy and enabling real-time parental notifications. It offers secure, automated, and efficient monitoring, significantly reducing manual efforts and preventing fraud. However, its dependency on GSM network availability and SIM card validity remains a limitation. Future improvements include integrating cloud-based storage for centralized access, adding facial recognition for dual-layer authentication, and expanding support for multiple educational institutions. With its ability to enhance attendance management, the system has potential applications in schools, universities, employee attendance tracking, and residential entry logs.

Future Scope

The future scope of an automated student attendance system with SMS notifications is vast, with potential for significant improvements in both functionality and efficiency. In the coming years, such systems could integrate advanced technologies such as Artificial Intelligence (AI) and Machine Learning (ML) to analyze attendance patterns and predict student behavior, potentially identifying trends such as irregular attendance or early signs of academic disengagement. Additionally, incorporating biometric recognition methods like facial recognition and voice authentication can enhance security and accuracy. The integration of cloud-based platforms could facilitate real-time updates and scalability, allowing educational institutions to easily manage large numbers of students across multiple campuses. Furthermore, future systems could expand beyond SMS notifications to include integration with mobile applications, email alerts, and even social media platforms, enabling more interactive and personalized communication with students, parents, and faculty. This system can also be linked with other academic management tools, creating a holistic approach to student data management, thereby streamlining administrative tasks and improving the overall learning environment.

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