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Student Monitoring System Using IoT

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Abstract: *The Student Monitoring System Using IoT is a real-time tracking solution designed to efficiently monitor student attendance and movement within a campus using RFID technology. The system consists of two hardware devices—an RFID Reader and RFID Tags—and a mobile-based Admin Application. The RFID Reader (H/w Device 1) is placed at the college gate, where it scans student RFID tags upon entry and exit, recording their in-time and out-time. The RFID Tags (H/w Device 2) carry student-specific information such as branch, name, and roll number. This data is automatically captured and sent to the Admin Application. The Admin Application allows authorized users to log in and access real-time reports, displaying the number of students entering the campus. Administrators can also filter and sort student data by branch, name, and roll number, providing an organized view of attendance records. The system improves attendance tracking, enhances security, and simplifies student management for college administrators.*

Keywords: RFID Technology, Real-Time Tracking, Attendance Monitoring, Campus Security, Admin Application, Student Management

I. INTRODUCTION

The Student Monitoring System Using IoT is an innovative real-time solution designed to streamline student attendance and movement tracking on campus using RFID technology. The system comprises two key hardware components: RFID Readers, strategically placed at the campus entrance, and RFID Tags assigned to each student. These tags contain vital information such as the student's name, branch, and roll number, which is automatically captured upon entering and exiting the campus. This data is sent to a mobile-based Admin Application, enabling administrators to monitor student attendance in real-time. The application allows for easy sorting and filtering of student data by branch, name, or roll number, providing a well-organized and efficient system for attendance management. This technology not only enhances campus security by tracking student movement but also simplifies administrative tasks, making student management more effective and transparent.

The RFID Reader, placed at the main gate of the college, serves as the primary point of data collection. As students pass through the gate, their RFID tags are scanned, automatically logging their entry and exit times. This process eliminates the need for manual attendance and ensures that the data is accurately recorded without human error. Each RFID tag is uniquely assigned to a student, containing essential details like the student's name, roll number, and branch. This automated system speeds up attendance tracking while maintaining data accuracy and integrity, ensuring that the student's in-and-out times are precisely documented.

The heart of the system lies in the Admin Application, which provides a user-friendly interface for college administrators. Authorized users can log in and access real-time reports, offering a comprehensive overview of the number of students currently on campus. Administrators can filter and sort student data by specific fields such as name, branch, or roll number, allowing for quick identification and analysis. This functionality helps streamline reporting, giving administrators the ability to generate attendance reports with ease and monitor the overall campus population efficiently.

Beyond attendance tracking, the system also enhances campus security by monitoring student movement throughout the day. With real-time tracking in place, unauthorized or suspicious activities can be quickly identified, ensuring the safety of students within the campus premises. Additionally, this IoT-based solution provides an efficient way for college administrators to manage large volumes of student data, making it easier to maintain accurate attendance records and offering a more organized approach to student management.

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II. METHODOLOGY

The methodology for the Student Monitoring System Using IoT is centered around integrating RFID technology with IoT for seamless and automated student attendance tracking. The system's architecture includes RFID Readers placed at strategic entry and exit points, such as the campus gates, and RFID Tags assigned to each student. When a student passes by the RFID Reader, the tag is scanned, and the in-time or out-time is automatically recorded. This data is then transmitted to a cloud-based server using IoT protocols for real-time processing. The system is designed to capture accurate attendance information without manual intervention, reducing errors and delays typically associated with traditional methods.

The next layer of the methodology involves data management and processing through a mobile-based Admin Application. The application is connected to the cloud, where real-time data from the RFID Readers is aggregated and organized. Administrators can log in to the system, view reports, and monitor student movement in real-time. The application features robust data filtering options, allowing users to sort attendance records by branch, student name, or roll number. This organized data storage simplifies student management and enables quick retrieval of attendance reports. The system also generates automatic alerts for any irregularities or unauthorized movements, contributing to enhanced campus security.

Lastly, the system incorporates a user-friendly interface for administrators, designed with features such as secure login, real-time notifications, and customizable reporting. The system architecture is built on a scalable IoT framework to accommodate large numbers of students and multiple RFID Readers across campus. Furthermore, the system ensures data security by encrypting the student attendance records both during transmission and storage. The use of cloud storage allows for scalability and easy integration with additional campus management systems, making the methodology robust, efficient, and adaptable to various educational environments.

III. WORKING SYSTEM

1. RFID Technology Setup

RFID Tags: Each student is assigned a unique RFID tag that contains their personal details, including:

- Name
- Branch
- Roll Number

RFID Readers: These are installed at strategic locations such as campus entrances/exits. They are responsible for reading the data from the RFID tags when students pass through.

2. RFID Data Capture

Step 1: When a student enters or exits the campus, the RFID reader detects the tag.

Step 2: The reader extracts the unique RFID tag ID and associated student data.

Step 3: The data is timestamped to record the exact time of entry/exit.

3. Data Transmission

The RFID reader sends the data wirelessly to the IoT-enabled Admin Application via:

Wi-Fi Module (e.g., ESP8266 or ESP32): Transmits data to the server.

IoT Server (e.g., Firebase or MQTT Broker): Stores and processes the data in real-time.

4. Admin Application Functionality

The mobile-based Admin Application performs the following tasks:

Real-Time Monitoring:

- Displays the list of students entering and exiting the campus.
- Updates attendance status instantly.

-Data Sorting and Filtering

- Search by Branch, Name, or Roll Number for quick lookup.
- Allows admins to organize and view data in a user-friendly interface.
- Attendance Reports
- Generates daily, weekly, or monthly attendance reports.
- Can export reports in formats like PDF or Excel for administrative purposes.

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5. Notification System

- The system can send alerts to administrators or parents in specific scenarios:
- If a student exits the campus during restricted hours.
- If a student fails to enter the campus for a prolonged period.

6. Database Management

- The IoT system integrates with a centralized database to:
- Store all student entry/exit records securely.
- Enable seamless retrieval of historical attendance data for audits.

7. Benefits

Campus Security: Tracks student movement, ensuring no unauthorized exits.
Transparency: Provides accurate attendance data in real-time.
Administrative Ease: Reduces the manual effort of tracking attendance.
Scalability: Can accommodate more RFID readers and tags for larger campuses.

Hardware and Software Overview

Hardware Components:

- RFID Readers and Tags
- ESP32 or NodeMCU for wireless communication
- Power supply units

Software Tools

- IoT platform (e.g., Firebase, AWS IoT, or MQTT Broker)
- Admin Application (developed using Flutter, React Native, or native Android/iOS frameworks)
- Database (e.g., MySQL, Firebase Realtime Database)

Workflow Summary

1. Student enters/exits campus: RFID Reader detects the tag.
2. Data transmission: Data is sent to the server through IoT modules.
3. Processing: Server timestamps and updates attendance records.
4. Admin View: Data is displayed on the Admin Application for monitoring and management.

Proposed system

The proposed Student Monitoring System using IoT leverages RFID technology to automate and streamline attendance tracking and student movement within a campus. The system comprises RFID Readers at key locations like the college gate, which scan RFID Tags assigned to each student, capturing in-time and out-time data in real-time. This information is transmitted to a mobile-based Admin Application, where authorized users can access live reports of student attendance. The system allows administrators to filter, sort, and manage student data by branch, name, and roll number, offering a more efficient, secure, and organized approach to attendance management.

COMPONENT USED

- Esp32
- RFID Reader
- RFID Tag
- Buzzer
- PCB

TECHNOLOGY USED

- Android
- Embedded system

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IV. EXISTSING SYSTSEM

existing student attendance tracking system relies primarily on manual methods, where attendance is marked by faculty during classes, often leading to inaccuracies, time consumption, and administrative burden. Manual processes also make it difficult to track real-time student movement within the campus, reducing overall security and control. Additionally, retrieving and organizing student attendance data for reports is cumbersome, making management less efficient.

DIAGRAMS

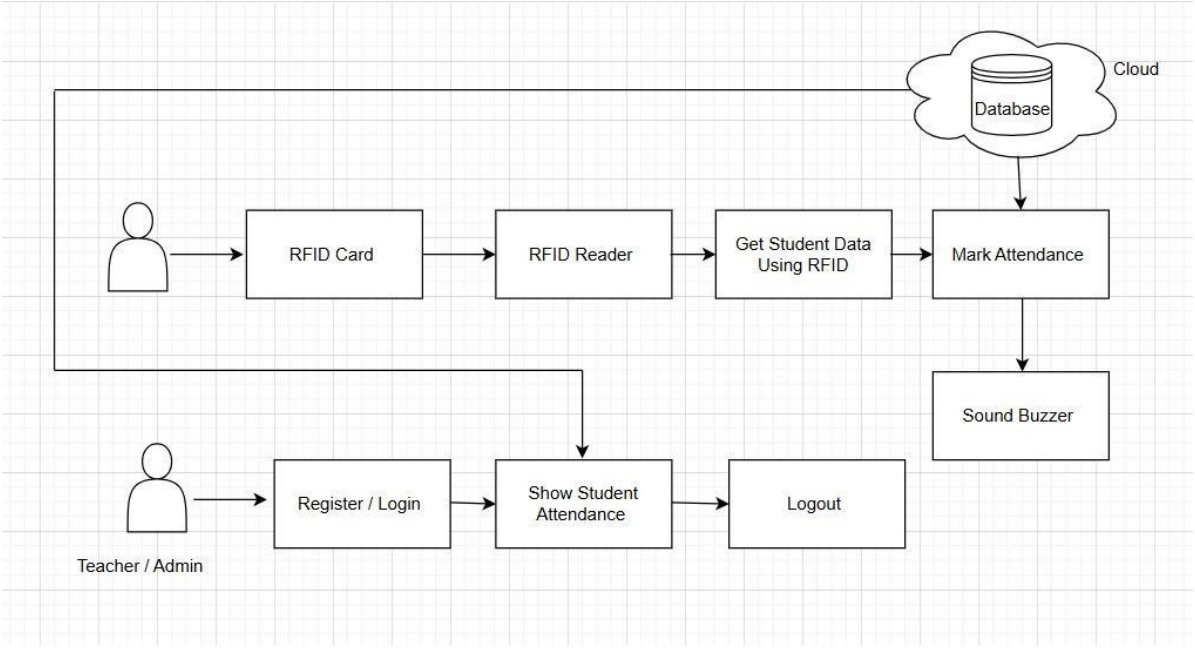

Fig (a): Block Diagram

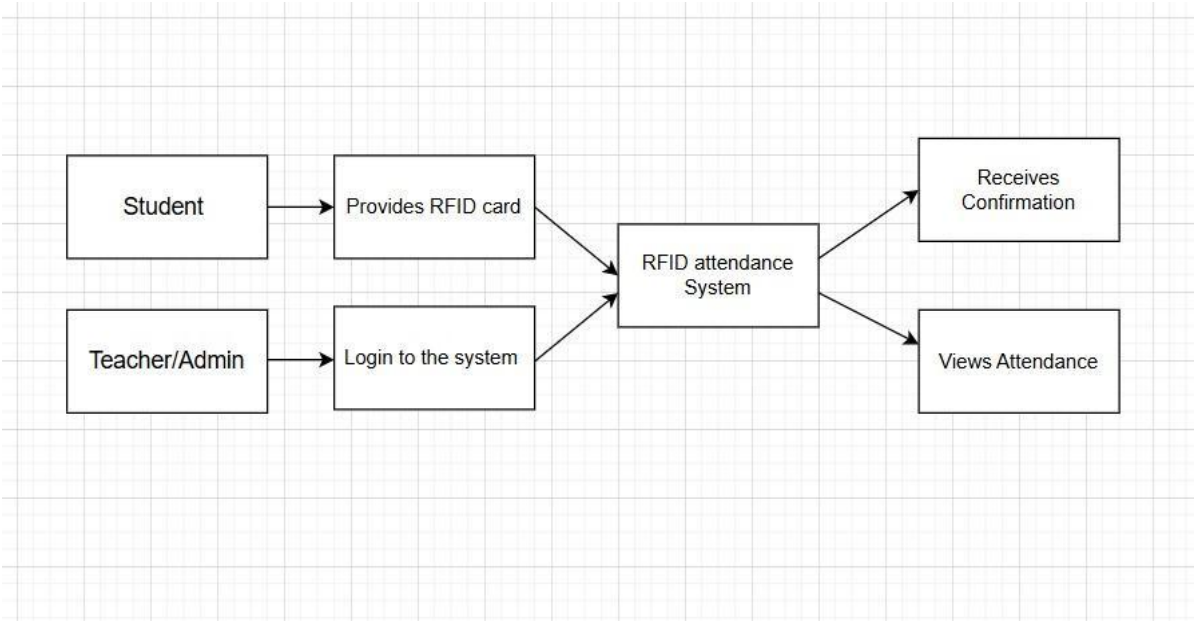

Fig (b): DFD level 0

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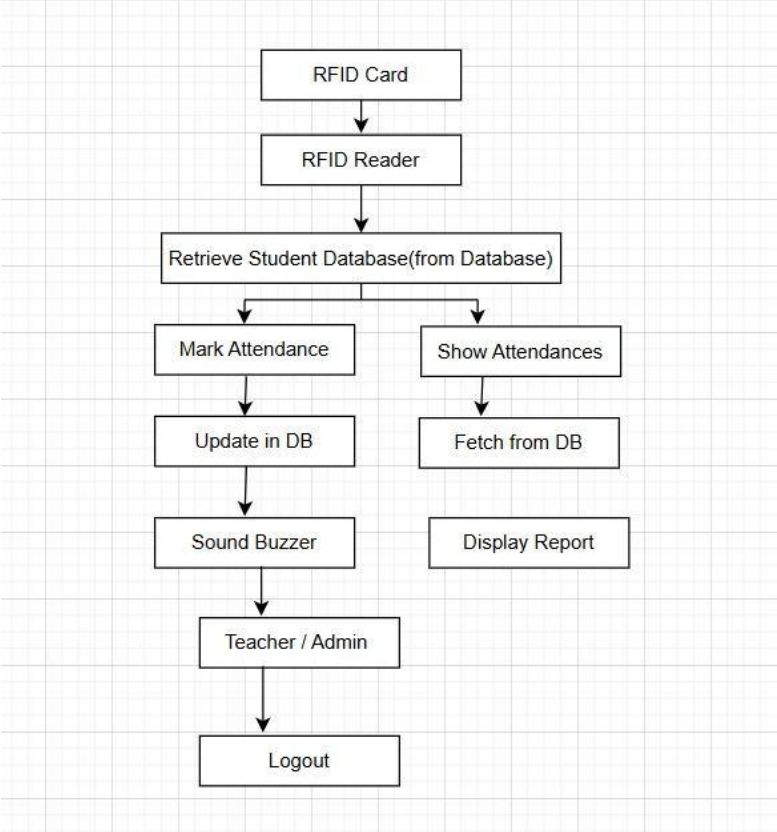

Fig (c): DFD level 1

V. CONCLUSION

In conclusion, the Student Monitoring System Using IoT offers a robust and efficient solution for automating attendance tracking and enhancing campus security using RFID technology. By eliminating manual processes, the system significantly improves accuracy and reliability in student attendance records while providing real-time data access for administrators. The integration of a mobile-based Admin Application allows for easy monitoring, sorting, and reporting of student data, streamlining overall campus management. Furthermore, the system's scalability, real-time processing, and security features ensure that it can be effectively deployed in various educational institutions. This innovative approach not only optimizes administrative operations but also strengthens safety measures, creating a more organized and secure learning environment.

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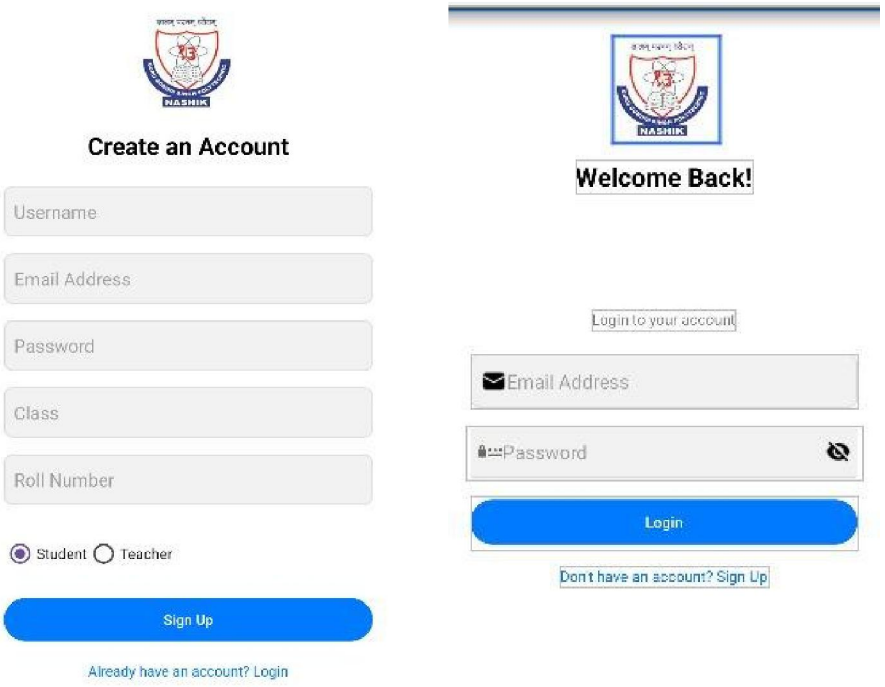
VI. RESULTS



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