IOT BASED RFID ATTENDANCE SYSTEM

Prof. Ch. Ganapathy Reddy[1], Sunkari Bala Harini[2], Abbinenei Pranathi[3], Perumalla Serene[4], Vancha Vidhisha[5]

[1] G. Narayanamma Institute of Technology and Science (for women), India
[2] G. Narayanamma Institute of Technology and Science (for women), India
[3] G. Narayanamma Institute of Technology and Science (for women), India
[4] G. Narayanamma Institute of Technology and Science (for women), India
[5] G. Narayanamma Institute of Technology and Science (for women), India

ABSTRACT

Attendance tracking is a critical process for schools, universities, and businesses to ensure that employees and students are attending classes or meetings regularly. Traditional attendance tracking methods can be time-consuming and prone to errors. The Internet of Things (IoT) provides a platform for the development of innovative solutions that can improve attendance tracking. This project presents an overview of an IoT-based RFID Attendance System (RAS) that utilizes various sensors to collect data on student or employee identification and location. The system uses radio-frequency identification (RFID) technology to automatically record attendance, eliminating the need for manual tracking. The data is then analysed by algorithms to provide insights into attendance patterns and optimize attendance management. The system also incorporates machine learning techniques to continuously improve its attendance tracking algorithms. The use of this technology has the potential to significantly reduce administrative workloads, minimize errors, and improve attendance management efficiency. Additionally, the system is easily scalable, making it ideal for use in both small and large organizations. Overall, the IoT-based RAS presents a promising future for efficient and accurate attendance tracking.

INTRODUCTION

Attendance management plays a crucial role in various environments, such as educational institutions, workplaces, and events. Traditional attendance systems often suffer from inefficiencies, manual errors, and the need for constant supervision. To address these challenges, we propose an IoT-based RFID attendance system that leverages the capabilities of modern technology to streamline the attendance tracking process.

In our project, we utilize a combination of hardware and software components to create an efficient and automated attendance management system. The main hardware components employed include the ESP32 microcontroller, a breadboard for circuit connections, and the EM-18 reader module for RFID tag scanning. The software aspect is implemented using the Arduino platform, which allows for easy programming and integration of the hardware components.

The functioning of our IoT-based RFID attendance system is straightforward. When an RFID tag is scanned by the EM-18 reader module, the corresponding information is transmitted to the ESP32 microcontroller. The microcontroller then processes the data and triggers an action, such as displaying the name of the individual on an LED as "present." This immediate and automated response eliminates the need for manual attendance recording and reduces the chances of errors or fraudulent entries.

The proposed system offers several advantages over traditional attendance management methods. Firstly, it significantly reduces the time and effort required for attendance tracking, enabling more efficient use of resources. Additionally, the use of RFID technology ensures accurate identification of individuals without the need for physical contact, enhancing convenience and hygiene. Moreover, the system provides real-time data, enabling quick and accurate attendance monitoring and generating valuable insights for administrators and stakeholders.

By implementing this IoT-based RFID attendance system, we aim to revolutionize the way attendance is managed in various domains. The project combines the power of IoT, RFID technology, and microcontroller programming to create a robust and user-friendly solution. Through this report, we will explore the design, implementation, and evaluation of our system, demonstrating its potential to enhance attendance management in different settings.

LITERATURE REVIEW

1. Ula, Mutammimul, A New Model of The Student Attendance Monitoring System Using RFID Technology.

The development of information technology has revolutionized work processes by enhancing convenience and efficiency. However, many institutions still rely on manual paper-based attendance systems, which are time-consuming and

lack accuracy. This study proposes a new presence system using RFID technology to improve attendance tracking. RFID sensors read data from student cards, automatically updating the database, ensuring prompt and accurate attendance records. This system encourages punctuality and provides real-time data for both students and lecturers.

2.Nivetha, Student Attendance System Using RFID.

Effective attendance management is crucial for organizations, including educational institutions. Traditional manual methods are error-prone and time-consuming, making it challenging to track student attendance. To address this issue, a web-based attendance management system has been developed using the Model-View-Controller (MVC) architecture and the Laravel Framework. It electronically records attendance, stores data in a MySQL database, and distinguishes between theoretical and practical classes for accurate attendance calculations. The system offers a user-friendly GUI for data management, and it has been successfully tested, making it a valuable tool for efficiently managing student attendance in large departments or institutions. This technology streamlines the attendance process and helps institutions ensure compliance with attendance policies.

3.Unnati Koppikar[1], Shobha Hiremath[2], Akshata Shiralkar[3] , Akshata Rajoor[4] , V. P. Baligar [5], IoT based Smart Attendance Monitoring System using RFID.

This system outlines the structure of an attendance monitoring system utilizing RFID technology to distinguish each employee or student through their RFID-tagged ID cards. This innovative approach streamlines attendance tracking, making it faster, simpler, and more secure when contrasted with traditional methods.

4.Soumil Nitin Sha[1], Abdelshakour Abuzneid[2], IoT Based Smart Attendance System (SAS) Using.

This work presents an innovative approach to track student attendance by integrating Radio Frequency Identification (RFID) with the Internet of Things (IoT). Student absenteeism is a concern for educational institutions, and traditional attendance methods are cumbersome. The use of RFID and IoT technology offers a solution to this problem, combining two prominent technological trends to streamline attendance management.

5.Balakrishna K, Ganesh Prasad B R, Dhanyashree N D, Balaji V, Kris, IoT based Class Attendance Monitoring System using RFID and GSM.

Many institutions currently rely on time-consuming manual attendance tracking methods, which can be insecure. This paper introduces an innovative attendance monitoring system that leverages Radio Frequency Identification (RFID) and Global System for Mobile (GSM) communication technology within the framework of the Internet of Things (IoT). The system combines hardware components like RFID readers and GSM modules with software including an Application Programming Interface (API) for instant information delivery. It offers efficient attendance management, notifying parents or guardians of students' status and enabling authorized users to access the database remotely.

6.Khawla A. Alnajjar and Omar Hegy, Attendance System Based on Biometrics and RFID.

Biometrics technology, which uses biological characteristics, plays a significant role in security. This paper introduces a system that combines face recognition, fingerprint recognition, and RFID for enhanced attendance tracking in universities. The system offers advanced features and is computerized, with detailed hardware and software design provided. It presents a comprehensive approach to attendance management using multiple biometric features and RFID technology.

7.Tarun Sharma, Mrs. S. L. Aarthy, An Automatic Attendance Monitoring System using RFID and IOT using Cloud.

Despite having access to advanced technologies, the education system still relies on traditional methods, especially in attendance tracking. Lecturers manually record and update attendance, which can be time-consuming. Integrating RFID and the Internet of Things (IoT) offers an automated solution, eliminating the need for manual attendance taking. Cloud storage enhances performance, allowing access from anywhere and anytime, improving efficiency and flexibility in attendance management.

8.Lim, T. S., S. C. Sim, and M. M. Mansor. RFID based attendance system.

University attendance is traditionally paper-based and prone to errors, as manual tracking is time-consuming. This project introduces an RFID-based attendance system using Arduino and an RFID MFRC522 Module. Students receive RFID cards as ID cards, and attendance is recorded by simply touching their cards to an RFID reader, streamlining the process.

9.Meghana, Inturi, J. D. N. V. L. Meghana, and Ramesh Jayaraman. Smart Attendance Management System using Radio Frequency Identification.

Attendance management is essential in educational institutions. An RFID-based system streamlines the process by having students use RFID tags to mark their attendance, improving accuracy and efficiency. Managing daily attendance manually for a large number of students is challenging and error-prone. RFID technology automates attendance tracking, making it easier for teachers and parents to monitor students. Additionally, it can be extended to track faculty or staff attendance, simplifying payroll management.

10.Kovelan, P., N. Thisenthira, and T. Kartheeswaran. Automated attendance monitoring system using IoT.

This paper discusses a smart attendance system designed to automate attendance monitoring in educational institutions, reducing manual work and potential errors. The system, based on Arduino and RFID technology, provides automated analysis and generates comprehensive attendance reports on a weekly, monthly, and annual basis. It incorporates GSM and Wi-Fi communication for convenience and can store data on a microchip in case of communication failure, uploading it when the network is available again. This system aims to significantly simplify attendance management for educators and administrators.

PROPOSED WORK

Current attendance methods waste a lot of time and are inefficient and ineffectual since instructors must take attendance by hand with traditional pen and paper. The goal of obstacle avoidance in a line follower robot is to detect obstacles in its path and take appropriate actions to avoid them while still maintaining its primary objective of following the line.

It isn't a safe option for attendance either. In this project, we created a model that offers a safe choice for attendance. To track students' attendance in this project, we employed RFID tags and readers. Because instructors must collect attendance using a manual pen and paper system that is not only time-consuming but also insecure, the current systems for tracking attendance are very inefficient and ineffectual. This project is a secure solution for attendance that we have developed. To track students' attendance in this project, we employed RFID tags and readers.

COMPONENT USED

ESP32: The ESP32 microcontroller board is a key component in our IoT-based RFID attendance system. It serves as the central processing unit, providing the necessary computing power and connectivity options. With its dual-core processor and clock frequencies of up to 240 MHz, the ESP32 efficiently handles attendance tracking tasks. It features built-in Wi-Fi and Bluetooth capabilities, enabling real-time data transmission and seamless communication with other devices. The ESP32's GPIO pins facilitate interfacing with components like the EM-18 reader module and the LED for displaying attendance status. Additionally, the Arduino programming language support simplifies code development and integration. Overall, the ESP32 empowers our system with processing power, connectivity, and versatility, ensuring accurate and efficient attendance tracking in various settings

Figure 1:ESP32

EM-18 Reader Module: The EM-18 reader module interfaces with the ESP32 microcontroller, establishing communication between the RFID tags and the attendance system. When an RFID tag is brought within range of the EM-18 reader module, it emits an electromagnetic field that powers the tag and allows it to transmit its identification data. The module then captures this data and forwards it to the ESP32 microcontroller for further processing.

Figure 2:EM-18 Reader Module

Jumper Wires: Jumper wires are essential for establishing electrical connections between components, ensuring reliable circuit connections on the breadboard.
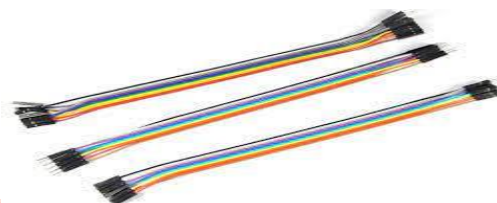

Figure 3:Jumper Wires

Bread Board: The breadboard serves as a platform for organizing and connecting the various hardware components, enabling easy prototyping without the need for soldering.
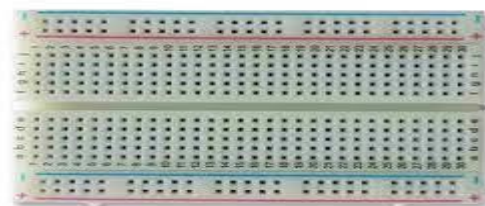

Figure 4:Bread Board

Rfid Tags: RFID tags are small devices that store unique identification information. In our project, these tags associate individuals with their attendance records when scanned by the EM-18 reader module.

Figure 5:Rfid Tags

Lcd display module: The LCD display module is connected to the ESP32 microcontroller. It serves as an output device, showing important information such as attendance status, messages, or system prompts. For example, when an RFID tag is successfully scanned, the LCD display can indicate the name of the person with a "Present" message.


Figure 6:16X2 Lcd display module

SOFTWARE IMPLEMENTATION

Arduino IDE: It is simple to write code and upload it to the board using the free and open-source Arduino Software (IDE). It functions on Linux, Mac OS X, and Windows. The environment is created using Processing and other open-source. Any Arduino board can be used with this software. A text editor for writing code, a message area, a text console, a toolbar with buttons for basic operations, and a number of menus are all included in the Arduino development environment. It provides tools for text searching and replacement as well as text cutting and pasting. When saving and exporting, the message section provides feedback and shows errors. The console shows text output from the Arduino environment together with detailed error warnings and other details.

Working of the system: The student attendance system marks each student's attendance. Colleges and schools use it to track students' attendance. RFID cards are white and the same size as credit cards. An RFID card will be supplied to each student, and an RFID reader will be installed on the entrance gate or door to the school or college. Every time a student wants to enter a school or institution, he or she must bring their RFID card close to the RFID reader and present it to the scanner. By retrieving the RFID card number and quickly swiping it, an RFID reader will record attendance.

FLOW CHART
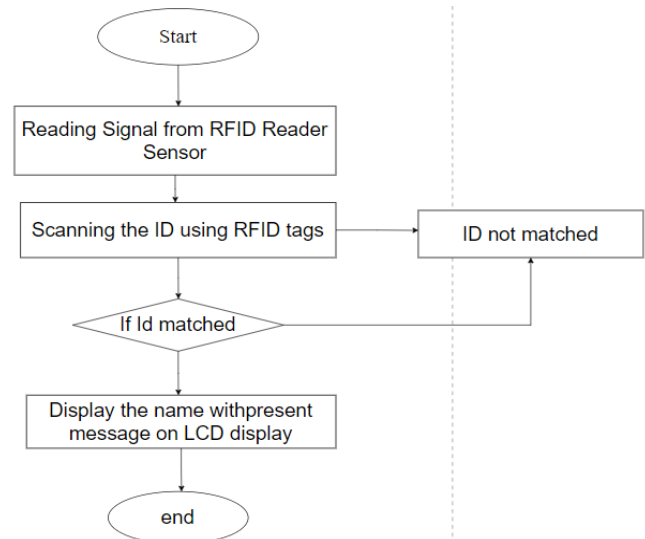
DATAFLOW DIAGRAM

A data-flow diagram is a way of representing a flow of data through a process or a system (usually an information system). The DFD also provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow — there are no decision rules and no loops.
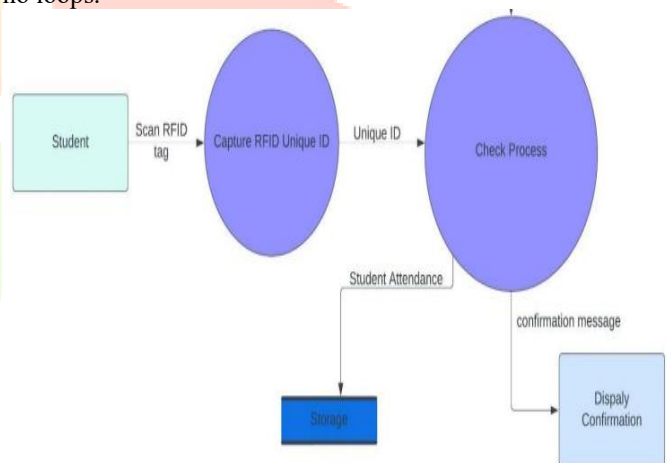

Figure 7:Data Flow Diagram

RESULTS AND DISCUSSIONS

The outcome of our IoT-based RFID attendance system is the display of the student's name with the word "Present" on the LCD display module. When a student's RFID tag is successfully scanned, the system processes the data and matches it with the corresponding student in the database. The LCD display then shows the student's name along with the status "Present" to indicate their attendance.
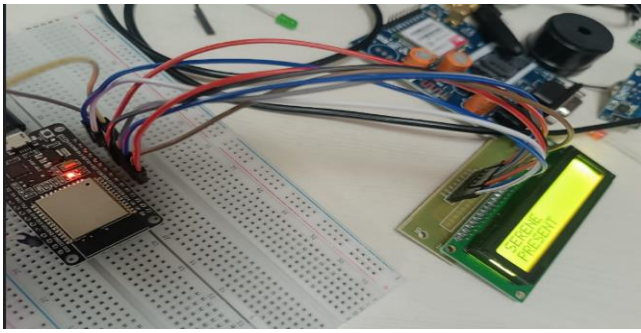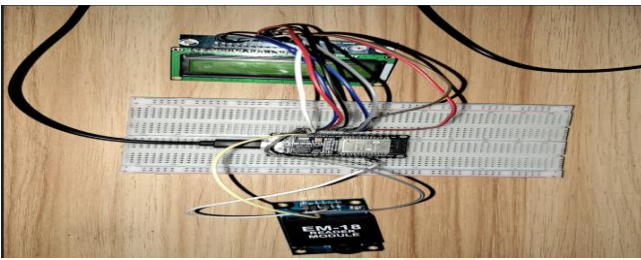
Figure 8:Output on LCD

Figure 9:Connections

CONCLUSION

IoT-based RFID attendance system has successfully achieved its objectives of streamlining attendance tracking and improving accuracy through the utilization of RFID technology and an LCD display module. By implementing this system, we have overcome the limitations of traditional manual methods, reducing administrative burden and enhancing the overall efficiency of attendance management.

The system's functionality has been validated through testing, which confirmed high performance, accurac, and reliability. Real-time data transmission capabilities enable immediate attendance updates, enhancing data accuracy and accessibility for administrators. User feedback has been positive, with users appreciating the system's ease of use, convenience, and contactless operation.

Moreover, the system offers scalability and adaptability, making it suitable for implementation in various educational institutions, workplaces, and events. The integration of IoT technologies, RFID technology, and the LCD display module ensures efficient attendance tracking, reducing errors and providing valuable real-time attendance data.

While the system has demonstrated significant improvements over traditional attendance methods, it is important to acknowledge some limitations. For instance, occasional misreads of RFID tags may occur due to interference or improper tag placement. These limitations provide opportunities for future enhancements, such as incorporating error detection and correction mechanisms.

IoT-based RFID attendance system presents a valuable solution for efficient and accurate attendance tracking. The successful implementation of this system showcases its potential to revolutionize attendance management practices in various domains. By addressing limitations and exploring future enhancements, we can further refine the system and contribute to advancements in attendance management, ultimately benefiting educational institutions, workplaces, and events.

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