Automatic Portable RFID Based Attendance Device

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ABSTRACT: The main purpose of this project is to ensure accurate attendance, educational institutions need to leave the time-consuming traditional paper-pen method & switch to Automatic Portable RFID Based Attendance Device to register daily attendance. This system is ineffective as our valuable time and work get wasted in organizing attendance on pen and paper. Hence to overcome this problem we have used a relational database system to store the real-time data of the students. For this project, we used RFID tags and readers to record the attendance of the students. To manipulate and represent the data based on the unique RFID tags, which get fast and easily scanned on the RFID reader. RFID technology is an automatic wireless identification system. This particular system works with RFID cards and a reader. In this work, we have tried to erase the problem of manually taking attendance with the use of RFID technology. This system is used to help the authority manage the attendance of students in a more organized, efficient, and time-saving manner. This particular system has been implemented in a prototype system that uses RFID tags and a reader to calculate attendance which proves its effectiveness over the normal attendance approach and ESP8266 Wi-Fi module which is connected to the google sheets cloud-based web app and also use LCD display to show attendance is marked. The design of the system is simple, not expensive, and portable to use which makes it good for candidates and also for commercial and academic purposes.

Keywords: Attendance, RFID, Google Sheet, Node MCU, IoT.

INTRODUCTION: This study examines the deployment of a smart attendance management system utilizing Radio Frequency Identification (RFID). Contemporary technologies have significantly reduced the time-consuming nature of processes, enhancing responsiveness and reliability. Consequently, RFID technology has emerged to fulfil the need for automation in real-time applications. Traditional methods, still prevalent in many institutions and schools, exhibit various drawbacks, such as the potential for students to falsely record attendance for peers. Moreover, the inconvenience of re-taking attendance when lists are misplaced signifies an inefficient process. Presently, much research is directed towards RFID systems due to their inherent advantages, particularly in access control and their adaptability to diverse environments. Engineers developing innovative products for real-time applications prioritize RFID technology. Furthermore, conventional methods, involving the passing of paper sheets during academic lectures, conferences, or workshops, can lead to disruptions in both students' and teachers' focus and attentiveness, diminishing the effectiveness of such sessions.

LITRATURE SURVEY: In recent years, there has been a growing interest in utilizing RFID (Radio Frequency Identification) integrated with the Internet of Things (IoT) to monitor student attendance. Educational institutions are increasingly concerned about student absences and the potential impact on academic performance.
Traditional methods of taking attendance, such as calling out names or signing on paper, are time-consuming and inefficient. One solution to this issue is the implementation of an RFID-based attendance system coupled with IoT technology, which represents two prominent trends in technological research.

Despite the availability of various technologies, many educational institutions still rely on manual attendance-taking methods. Professors manually handle attendance records and update databases

accordingly. However, integrating technology solutions like RFID can streamline this process, reducing the burden on lecturers.

By combining RFID and IoT, attendance tracking can be automated without the need for manual intervention. Utilizing cloud storage enhances the efficiency of data management, allowing access to attendance records from anywhere and at any time.

Attendance monitoring is crucial for evaluating student participation and engagement in lectures. Yet, the current paper-based attendance system poses challenges, including excessive paper usage and difficulties in summarizing attendance data for administrative purposes. This is primarily due to the large volume of attendance records that need to be reviewed and managed by the administration.

Hence, the aim of this endeavor is to develop a student attendance tracking system capable of efficiently collecting and managing attendance data. The objective is to streamline the attendance process, making it easier for lecturers and administrative staff to monitor attendance effectively.

This paper primarily focuses on detailing the implementation of an RFID-based intelligent attendance monitoring system. The system utilizes RFID cards (tags) to identify student IDs, facilitating the attendance tracking process.

The proposed system employs a combination of hardware and software, leveraging the Internet of Things (IoT). Hardware components include an RC555 RFID reader and RFID tags, while software components encompass Google Sheets for viewing attendance data, which is hosted on a server.

PROPOSED WORK: The proposed research aims to develop and implement a portable student attendance tracking system utilizing Radio Frequency Identification (RFID) technology integrated with the Internet of Things (IoT). The primary objective is to design a comprehensive system that automates the attendance monitoring process, providing real-time data for educators. The proposed work will involve the following key steps:

Requirement Analysis: Conducting a thorough analysis of the requirements and challenges associated with current student attendance tracking methods in educational institutions, focusing on portability and ease of use.

Identifying the key features and functionalities needed in a portable RFID-based attendance tracking system that can be carried by teachers.

System Design: Designing the architecture of the portable RFID-based attendance tracking system, emphasizing compactness and mobility.

Selecting appropriate RFID readers, tags, and IoT platforms suitable for a portable device.

Hardware Implementation: Procuring and configuring the necessary hardware components, such as an ESP8266 module for data transfer and a portable RFID reader.

Designing the physical enclosure for the portable device to ensure ease of handling and durability.

Data Transfer Setup: Setting up the ESP8266 module for data transfer from the portable device to Google Sheets. Configuring the communication protocols and data transmission methods for seamless integration with Google Sheets.

Google Sheets Integration: Developing a workflow to fetch attendance data from the portable device and store it in Google Sheets.

Implementing real-time data synchronization with Google Sheets for accessibility and backup.

Testing and Validation: Integrating the hardware components and data transfer setup to ensure seamless functionality. Conducting rigorous testing to validate the accuracy, reliability, and performance of the portable RFID-based attendance tracking system.

Deployment and Evaluation: Deploying the portable system for field testing in educational settings, allowing teachers to carry it among students during classes.

Collecting feedback from teachers and students on usability, effectiveness, and user experience.

Analysis and Optimization: Analysing the collected data and feedback to identify areas for optimization and improvement. Iteratively refining the system based on user input and testing results to enhance performance and usability.

Documentation and Reporting: Documenting the entire development process, including system design, hardware setup, and integration details. Preparing a comprehensive report outlining the proposed work, methodologies employed, and outcomes achieved, focusing on the effectiveness and efficiency of the portable RFID-based attendance tracking system with Google Sheets integration.

COMPONENT USED: The component which we are used in Automatic Portable RFID Based Attendance device are given below:

1. ESP8266 Microcontroller
2. RFID Reader
3. LCD Display
4. RFID Tag

These components work together to create a reliable and effective safety system that helps ensure the wearer's safety through quick communication and precise location tracking in emergency situations.
To explain the components used in the project for Automatic Portable RFID Based Attendance Device, we can describe each part in detail.

1. **ESP8266 MICROCONTROLLER:** The ESP8266 microcontroller is a highly versatile and widely popular system-on-chip (SoC) developed by Espressif Systems. Since its introduction in 2014, the ESP8266 has become a cornerstone in the Internet of Things (IoT) ecosystem due to its affordability, ease of use, and robust feature set. In this detailed overview, we'll delve into the features and capabilities of the ESP8266, along with a comprehensive description of its pins and their functionalities.

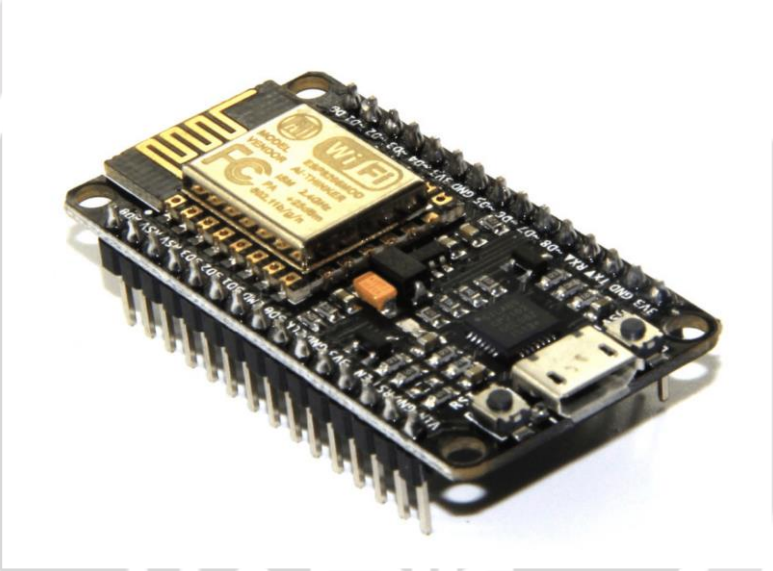


Fig. 1. ESP8266 MICROCONTROLLER

2. **RDIF MODULE:** RFID stands for Radio Frequency Identification. It is a technology allowing devices to automatically identify information stored in a tag through radio waves. An RFID tag consists of an antenna and a microchip in order to transmit and receive. This technology is generally characterized by the use of three important and essential components: the chip, the antenna and the reader. This explains the basic of a RFID Module.

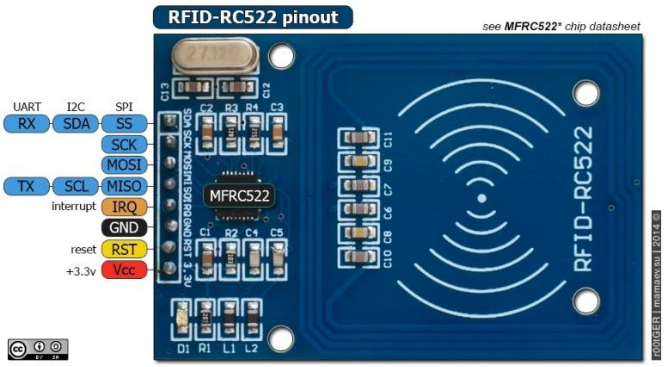


Fig. 2. RFID MODULE

3. **LCD DISPLAY:** Liquid Crystal Displays (LCDs) are a prevalent choice in numerous applications ranging from simple digital watches to sophisticated industrial instruments. They provide a user-friendly means of displaying text, numbers, and other symbols with clarity and minimal power consumption. In this detailed explanation, we will explore the pin configuration and features of character-based LCDs.

Fig. 3. LCD DISPLAY

4. **RFID TAG:** The RFID tags are differentiated as passive and active tags. If the device doesn't have its power supply it is called a passive RFID tag. Thus, The passive tags have to be in very close range of an RFID reader and make use of the radio waves which are broadcasted by the reader to power the response alternatively if the device has its battery power to perform entire operations which are called active RFID tags.

Fig. 4. RFID TAG

HOW THE ATTENDANCE WILL RECORD: In the proposed attendance recording system, students tap their RFID cards or tags on a portable device carried by the teacher to register their presence, with each card or tag containing a unique identifier linked to their student ID. The device, equipped with an RFID reader and an ESP8266 module for internet connectivity, securely transfers the attendance data to Google Sheets in real-time. In Google Sheets, attendance records are automatically populated, with columns representing student IDs and attendance status, enabling educators to monitor attendance in real-time and track student participation throughout the class session. Automatic updates and notifications can be configured to alert educators of attendance status changes or discrepancies, facilitating prompt intervention. The recorded attendance data in Google Sheets allows for comprehensive data analysis, providing insights into attendance patterns and class engagement, and enabling educators to generate reports for administrative or academic purposes. This streamlined process ensures convenience, accuracy, and real-time monitoring capabilities, benefiting both educators and students in educational settings.

METHODOLOGY: The diagram illustrates the block diagram for our Smart Attendance System utilizing RFID technology. The system comprises essential components including Node-MCU (ESP-8266), RFID Cards, RFID readers, a breadboard, and a 16 x 2 LCD display. The Node-MCU serves as the central processing unit (CPU), responsible for controlling all input and output components. Power is supplied to the Node-MCU and other components via a 5V power supply. The RFID reader module interfaces with the Node-MCU to extract data from RFID cards/tags. A 16 x 2 LCD display is utilized to showcase real-time attendance of students/employees, while permanent attendance records are stored on a Google Sheet using IoT. In operation, a student or employee places their card on the RFID reader.

Once the RFID reader captures the data, it is transmitted directly to the Node-MCU. Subsequently, the real-time attendance status is showcased on the 16 x 2 LCD display, and simultaneously, the permanent attendance records are stored on a Google Sheet for future reference.

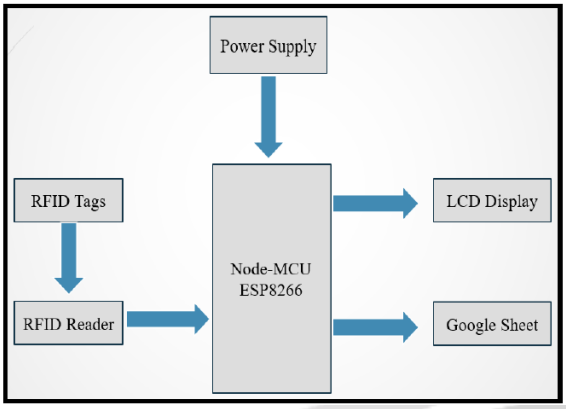


Fig. 5. BLOCK DIAGRAM

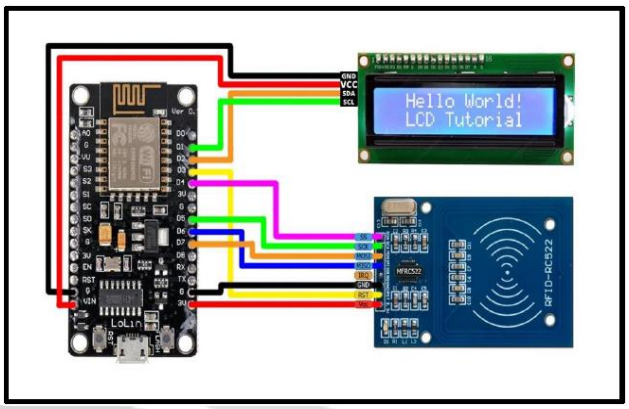


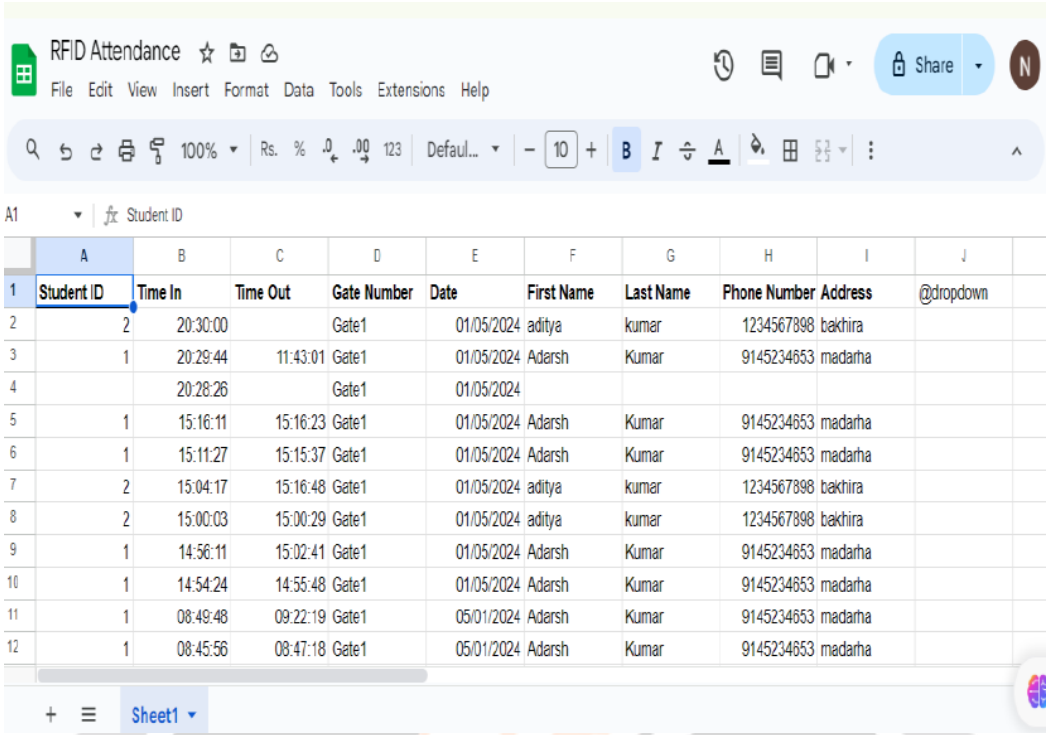
Fig. 6. CIRCUIT DIAGRAM

RESULT AND DISCUSSION: The result of our Automatic Portable RFID Based Attendance Device is the real-time display of students' names along with the status "Present" on the LCD display module. Upon successful scanning of a student's RFID tag, the system processes the data and matches it with the corresponding student entry in the database. Subsequently, the LCD display promptly updates to show the student's name accompanied by the "Present" status, effectively indicating their attendance for the session.

Fig. 7.

Fig. 8.

Fig. 9.



RFID Attendance

File Edit View Insert Format Data Tools Extensions Help

Share

A1 Student ID

	A	B	C	D	E	F	G	H	I	J
1	Student ID	Time In	Time Out	Gate Number	Date	First Name	Last Name	Phone Number	Address	@dropdown
2	2	20:30:00		Gate1	01/05/2024	aditya	kumar	1234567898	bakhira	
3	1	20:29:44	11:43:01	Gate1	01/05/2024	Adarsh	Kumar	9145234653	madarha	
4		20:28:26		Gate1	01/05/2024					
5	1	15:16:11	15:16:23	Gate1	01/05/2024	Adarsh	Kumar	9145234653	madarha	
6	1	15:11:27	15:15:37	Gate1	01/05/2024	Adarsh	Kumar	9145234653	madarha	
7	2	15:04:17	15:16:48	Gate1	01/05/2024	aditya	kumar	1234567898	bakhira	
8	2	15:00:03	15:00:29	Gate1	01/05/2024	aditya	kumar	1234567898	bakhira	
9	1	14:56:11	15:02:41	Gate1	01/05/2024	Adarsh	Kumar	9145234653	madarha	
10	1	14:54:24	14:55:48	Gate1	01/05/2024	Adarsh	Kumar	9145234653	madarha	
11	1	08:49:48	09:22:19	Gate1	05/01/2024	Adarsh	Kumar	9145234653	madarha	
12	1	08:45:56	08:47:18	Gate1	05/01/2024	Adarsh	Kumar	9145234653	madarha	

Sheet1

Fig. 10. GOOGLE SHEET

CONCLUSION: In summary, the Automatic Portable RFID Based Attendance Device revolutionizes attendance tracking with RFID technology. Its real-time display of student names and "Present" status on an LCD module streamlines attendance management. This portable device offers efficiency for educators and valuable insights for administrators. With further enhancements, it promises to transform attendance tracking across educational and organizational settings, boosting efficiency and engagement.

FUTURE SCOPE:

- **Advanced Features:** Future iterations may incorporate enhanced capabilities like cloud-based data synchronization and real-time notifications for educators.
- **Biometric Integration:** Integration with biometric authentication systems could bolster security and accuracy in attendance tracking.
- **Versatility:** Its portability and scalability render it adaptable to various settings beyond education, including corporate offices, events, and conferences.
- **Collaboration:** Partnerships with educational technology firms and research institutions could drive innovation and standardization in RFID-based attendance tracking solutions.
- **Continuous Evolution:** The device's future holds potential for ongoing refinement and expansion, poised to transform attendance management practices across sectors.

REFERENCES:

[1] Ula, Mutammimul, et al. "A New Model of The Student Attendance Monitoring System Using RFID Technology." Journal of Physics: Conference Series. Vol. 1807. No. 1. IOP Publishing, 2021.

[2] Nivetha, R., et al. "Student Attendance System Using RFID." International Journal of Research in Engineering, Science and Management 3.10 (2020): 16-19.

[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." 2019 1st International Conference on Advances in Information Technology.

[4] Soumil Nitin Sha[1], Abdelshakour Abuzneid[2], "IoT Based Smart Attendance System (SAS) Using." 2019 1st International Conference on Advances in Information Technology RFID.

[5] Balakrishna K, Ganesh Prasad B R, Dhanyashree N D, Balaji V, Kris, "IoT based Class Attendance Monitoring System using RFID and GSM." 2021 IEEE International Conference on Mobile Networks and Wireless Communications (ICMNWC) | 978-1-6654-3883-4/21/$31.00 ©2021 IEEE | DOI: 10.1109/ICMNWC52512.2021.9688482.

[6] Khawla A. Alnajjar and Omar Hegy, "Attendance System Based on Biometrics and RFID." 2019 Fifth International Conference on Image Information Processing (ICIIP).

[7] Tarun Sharma, Mrs. S. L. Aarthy, "An Automatic Attendance Monitoring System using RFID and IOT using Cloud." 2016 Online International Conference on Green Engineering and Technologies (IC-GET).

[8] Lim, T. S., S. C. Sim, and M. M. Mansor. ”RFID based attendance system.” In 2009 IEEE Symposium on Industrial Electronics & Applications, vol. 2, pp. 778-782. IEEE, 2009.

[9] Meghana, Inturi, J. D. N. V. L. Meghana, and Ramesh Jayaraman. ”Smart Attendance Management System using Radio Frequency Identification.” In 2020 International Conference on Communication and Signal Processing (ICCSP), pp. 1045-1049. IEEE, 2020.

[10] Bhagat, Rinku. ”An MQTT based IoT-RFID Attendance System using NodeMCU Firmware: A Review.” International Research Journal of Engineering and Technology (IRJET) 7, no. 06 (2020): 1255-1259.

[11] Hidayat, Muhammad Ayat, and Holong Marisi Simalango. ”Students attendance system and notification of college subject schedule based on classroom using iBeacon.” In 2018 3rd International Conference on Information Technology, Information System and Electrical Engineering (ICITISEE), pp. 253-258. IEEE, 2018.

[12] Arunraja, A., G. M. Rajathi, and S. Mathumitha. ”Smart attendance system using esp8266.” International Journal of Scientific and Technology Research 8, no. 9 (2019): 1051-1056.

[13] Bharathy, Ms GT, Ms S. Bhavanisankari, and T. Tamilselvi. ”Smart Attendance Monitoring System using IoT and RFID.”