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RFID Based Attendance & Monitoring System

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***Abstract*— Most of the academic or any otherinstitutions that keep in check of the attendance of their students/employees respectively are troubled with the method of maintaining manual attendance of their students/employees. The manual process of signing on a paper is time consuming and lacks security. An efficient attendance and monitoring system is needed at such places. Radio Frequency Identification (RFID) based attendance system provides us with a solution that will help to reduce the wastage of time during manual collection of attendance and also the monitoring system helps to determine the location of students or faculties. This research paper narrates the design of an RFID based attendance monitoring system which uniquely identifies each employee/student based on the RFID tag which is put togetherwith their ID card. This makes the method of recording the attendance effortless, quicker and secure as compared to conventional methods. This system is designed in such a way that it can be used at different educational institutions, corporate offices, government offices etc. The proposed system consists of both hardware and software components based on IOT technology. The hardware components used in this project consists of RC522 RFID card reader and RFID tags. The software component consists of the Web-based GUI for viewing the student's/employee's attendance and their location, which is hosted on a web server and which stores the data in a database server. The students/employees are needed to place their RFID card on the reader and their attendance will be recorded. Using this system it is also possible to determine the locations of students/employees in the campus.**

***Index Terms*— Radio Frequency Identification (RFID), IOT, Attendance, Location monitoring**

I. INTRODUCTION

RFID or Radio-frequency Identification is a device/technology that utilizes radio waves to transmit data from an electronic tag, called RFID tag, attached with an object, with the help of a reader for identifying and monitoring the object. RFID chips contains a radio transmitter that emits a code or ID when queried by a reader device. Some RFID tags can be detected from various meters away even if they are not in the sight of the user. The reader has utility of bulk reading that allows an almost-parallel processing of tags.

Student attendance is essential for educational institutions to analyse/predict their performance. Traditionally, teacher calls the names of students of a particular class. This consumes a lot of time, and also it is not flexible in generating reports or statistics. To get rid of manual attendance process, which is done on a sheet of paper, various researchers have proposed many methods and technologies that includes face recognition, barcode-based attendance system and fingerprint identification. However, these systems suffer from various difficulties. The most common method of a recording a student's attendance is by calling his/her roll number or signing the attendance sheet which is done manually. For a classroom that has large strength of students, both the methods are not suitable enough. The roll call method can get fake attendances in a classroom of large size and it also takes a longer time duration to call the names of each of the student in the class. The significant problems also arise when it comes to the transformation of paper-based data to an electronic form to be used in student electronic records for calculating the total attendance at various levels (e.g. subject, study program, faculty or university). So, there is a need for a more efficient and effective method for solving this problem.

The "RFID based Attendance & Monitoring System" will lead to elimination or reduction of quality time wasted during manual collection of attendance and also helps in determining a student's location.

It can be useful in different places like schools, Colleges, industries and private organizations to register the attendance of students, teachers, employees, etc.

II. EXISTING SYSTEM

The conventional method includesrecording attendance by calling names or roll numbers of each student on papers which is very time consuming, unsecured, inefficient, difficult and monotonous for faculty. A lot of their valuable

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time goes in wastein taking attendance. Therefore, many times, faculties does not take proper attendance. Also, proxy attendance is always a problem. Government & statutory bodies are also insisting Institutions for a full proof attendance management system.

III. PROPOSED SYSTEM

This research is proposedfor the implementation of RFID technology in educational/Industrial domain to solve the problems of manual attendance method. It is time-effective and reduces the efforts that goes in the documentation as well.

The proposed system has two objectives, the first is to register, record and maintain attendance of students using RFID tag and Website and the second is to monitor a student's location by installing RFID readers at different locations within the campus such as in the canteen, library, college gates etc.

The proposed system provides facilities for both students and staff by reducing time to take the attendance as well as providing a database system that holds all the student's information. This means that there is no need for archiving shelf and paper works. The system introduces facilities for registering new students, updating existing records, in and out time of the students in the class and also monitoring the location of students in the campus.

IV. SYSTEM DESIGN

RFID based automated student attendance and monitoring system is a highly specialized system that automate the whole system of recording attendance of students using RFID technology. The major factors in designing this system includes: choosing the hardware and software components and integrating both to work together. The system is divided into three parts: Hardware part, Software part, Attendance management and report generation. These parts are explained as follows:

A. HARDWARE MODULES

1) NodeMCU ESP8266: NodeMCU ESP8266 module is used as the controller this smart attendance system. It is an open source IoT platform. It containshardware based on the ESP-12 module and firmware that runs on the ESP8266 Wi-Fi SoC.NodeMCU has 4MB of flash memory and128 kb RAMthat may be used tokeep records/data and programs. It has enough processing power with in-built Wi-Fi/Bluetooth wireless connectivity and Deep Sleep Operating features that makes it ideal for IoT projects.

Fig. 1. NodeMCU Board

2) RFID Reader: It is a radio frequency transmitter and receiver, which is controlled by a microprocessor. The readercaptures data from tags using an antenna and transmits the data to the controller for processing. The reader acts as a decoderof the data that was encoded in the tags IC and the data is sent to the microcontroller for processing.

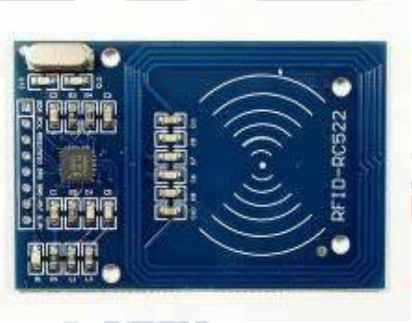

Fig. 2. RFID Reader

3) RFID Tag: An **RFID tag**has two parts – an RFID chip or ICand an antenna for transmitting andreceiving.RFID tags are attachedwith items in order to track them using an RFID reader and antenna. RFID tags transmit data using radio waves to the reader.

4)

Fig. 3. RFID tag

5) Breadboard: A **breadboard** is a solderless prototype for temporarily designing electronic circuits.Electronic components areconnected with each other by inserting theirterminals into the holes and then making connections through wires appropriately.

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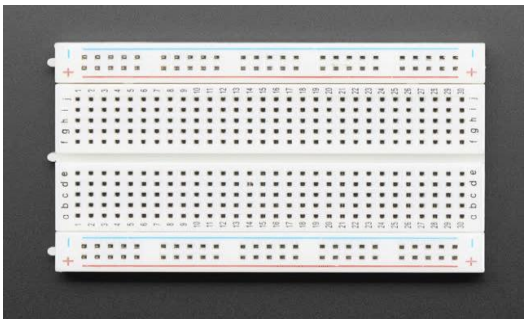

Fig. 4. Breadboard

6) Buzzer: It is an electrical device that makes a sharp buzzing sound. It hasof two pins that areused to attach it with power and ground. It consists of a piezo element, that has a central ceramic disc enclosed by a metal vibration disc. The ceramic disc inside the buzzer contracts or expandswhen current is applied to it, which in turn causes the surrounding disc to vibrate and thus producing sound. The speed of the vibrations changes by changing the frequency of buzzer, which changes the pitch of the resulting sound. In our project we are using to check the validity of the RFID tag. The buzzer will produce different sound based on the cards validity.

Fig. 5. Buzzer

B. SOFTWARE MODULES

1) ARDUINO IDE: It is a cross-platform application which is written/coded in functions from programming languages such as C and C++.It is used to write and compile code, and later upload it to a development board such as Arduino or NodeMCU.In our project, we are using NodeMCU board and the code to be uploaded on this board is written in the Arduino IDE.

2) *XAMPP SERVER:* It iscross-platform application which helps developers to create and test their programs on a local webserver. XAMPP provides local host to test its website and clients through computers before it is released to the main server.

In this project, the Apache and MYSQL modules of the XAMPP server is used to create the local database server to record the student's data.

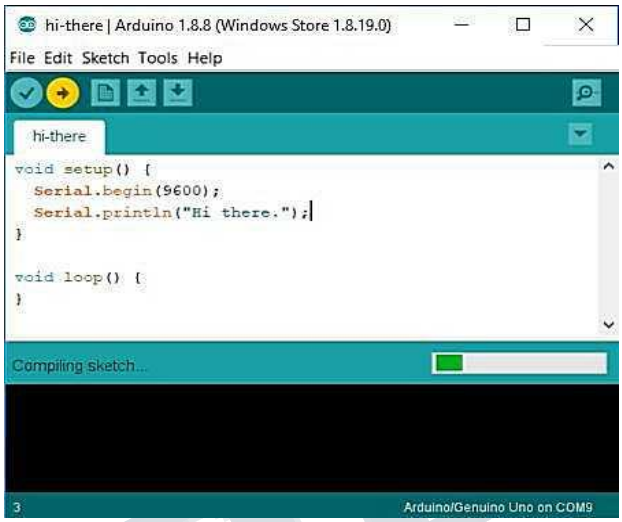

Fig. 6. Arduino IDE

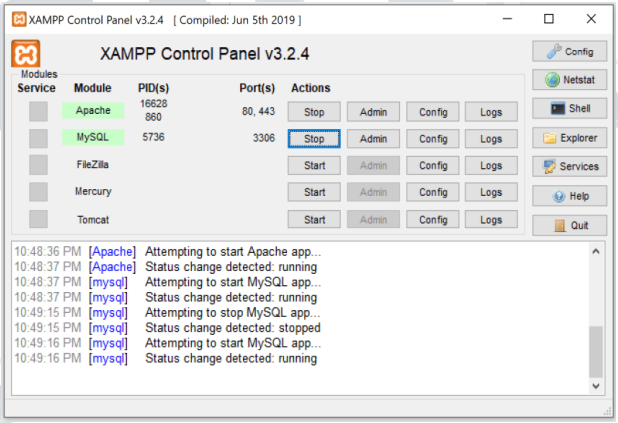

Fig.7. XAMPP Server

V. METHODOLOGY

The RFID based Attendance and Monitoring System is designed using NodeMcu ESP8266 module and RFID MFRC522 module. In this system, RFID readers are installed at different locations within the college campus such as in the classroom for recording attendance and at places like canteen, library, college gates, laboratories etc. for determining the locations of students.

Each student is provided with an RFID card as their ID card and the presence of them is marked when they touch their card to the RFID reader. When the person with the correct RFID card touches the reader with it, his/her arrival time will be stored in system Log. When the same person swipes his/her RFID tag again, the system will record it as his/her leaving time.

The RFID readers installed at different places reads the data from the RFID tags and then send it to the NodeMCU board. NodeMCU ESP8266 development board with MF-RC522

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Module is used to send the card UID to the PHP page and store data into the website database.

Using MySQL two tables are created in the database – **Registered Users table** and **Location Logs table**. The "**Registered Users table**" will show the records of the students such as their name, roll number, ID number, email-Id, branch, mobile number and an extra "Action" column which has two options "**Edit**" and "**Delete**" so that a faculty can update or edit the information about the students and also delete a student's record if required.

The "**Location logs table**" will show the student's record along with their locations, date , time and status. The location column will show the student's location and the status column will show the status like "IN" and "OUT" when a student enters or leaves the classroom.

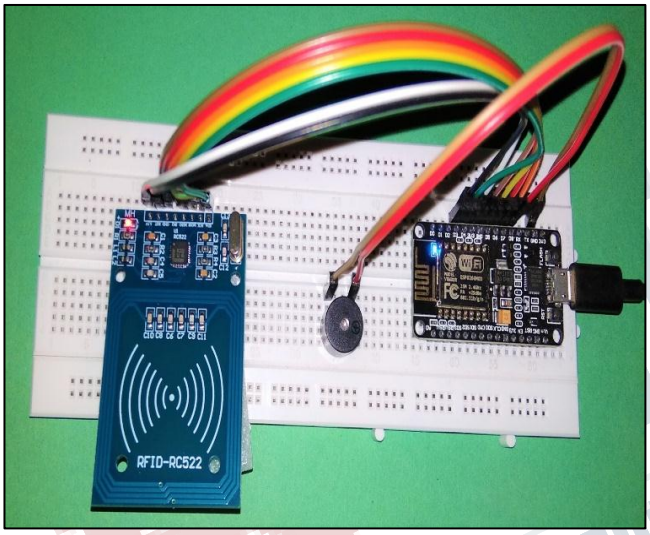

Fig. 8. Block Diagram

For the **attendance** purposes, we have used the **location logs** data. By using SQL query on the this table in accordance with location of the students i.e., if they are in the classroom or not, they will be marked as present or absent, or simply only those data that matches the above criterion will only be fetched by the query and saved or downloaded into an excel spreadsheet.

From the pages shown below, it is clear that the proposed system is achieving both the objectives- recording student's attendance, date and time and also monitoring their location as shown in the excel sheet. The traditional method for taking student absence report is usually done by using paper-work and handwriting on the advertisement wall. Hence, paperwork method consumes workforce requirements, duplication of the efforts, and imposes time-consuming and inefficiency. While, the proposed system based on RFID technology can achieve several advantages such as user-friendliness, affordability, security, flexibility, high resources and data accuracy, automatic and tag identification without human interference, indicating work status and generating the attendance report automatically, and it does not need to spend extra time and efforts.

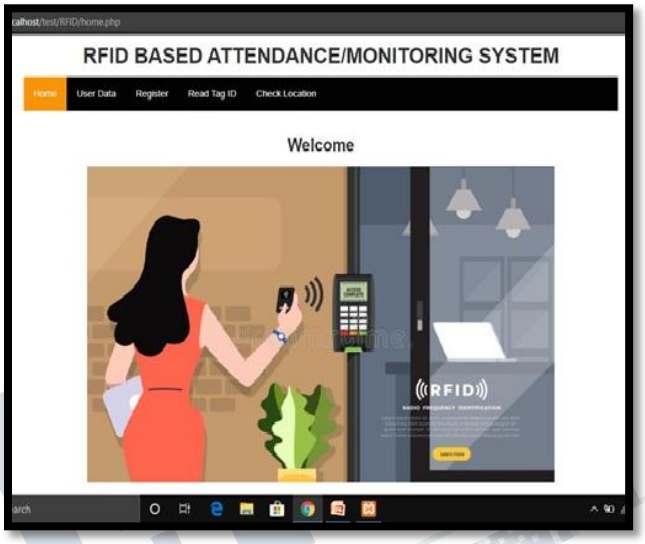

Fig. 9. Hardware module

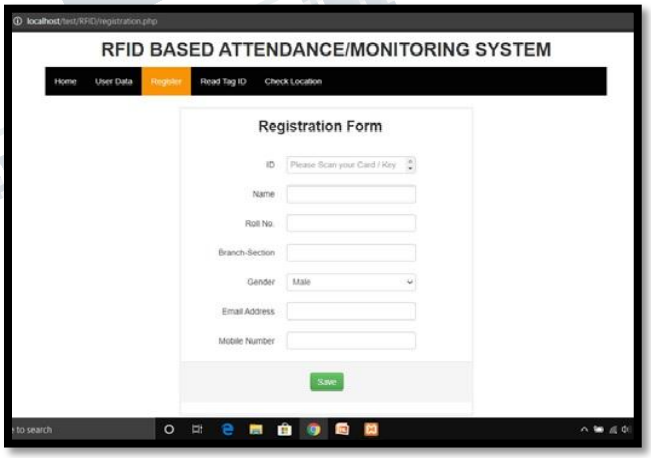

Fig. 10. Website's Home page

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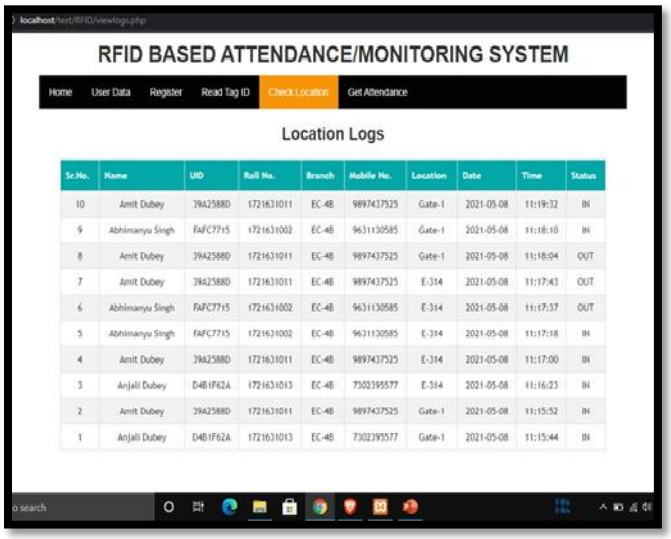
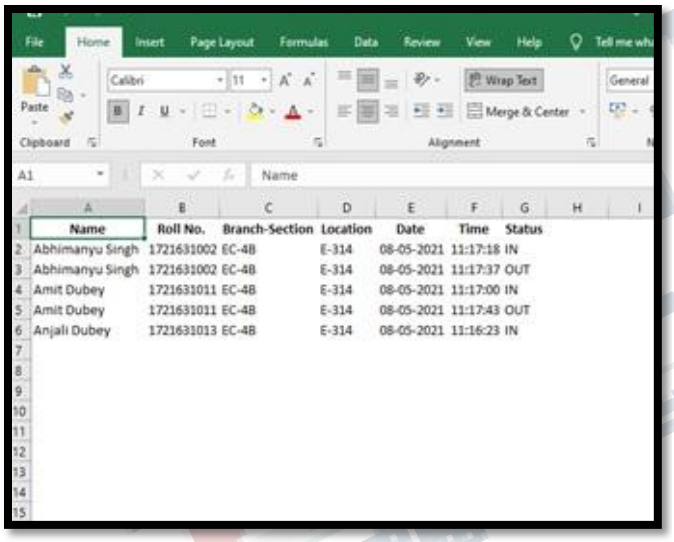


Fig. 11. Page for registering students



Name	Roll No.	Branch-Section	Location	Date	Time	Status
Abhimanyu Singh	1721631002	EC-4B	E-314	08-05-2021	11:17:18	IN
Abhimanyu Singh	1721631002	EC-4B	E-314	08-05-2021	11:17:37	OUT
Amit Dubey	1721631011	EC-4B	E-314	08-05-2021	11:17:00	IN
Amit Dubey	1721631011	EC-4B	E-314	08-05-2021	11:17:43	OUT
Anjali Dubey	1721631013	EC-4B	E-314	08-05-2021	11:16:23	IN

Fig. 12. Location logs table

VI. APPLICATIONS

1) This project can prove to be useful in various software companies, productionindustries and many other industries to record the attendance of employees.
2) It can be utilized in shopping malls ,shops for the attendance of workers.
3) It can also be used to note down the in and out time of vehicles. By doing few modifications, this project can be used in vehicle/car parking systems. If parking charges are hour based, we can use this project to note the exact in and out time of car to calculate its parking fare.

VII. CONCLUSION

From the test results it can be concluded that with RFID based attendance and monitoring system we can record student's attendance and determine their locations much faster and accurately than the traditional methods for attendance which involves calling names or roll numbers which takes a lot of time, inefficient, difficult for the faculty.

As the RFID technology evolves, more sophisticated applications will use the capability of RFID to receive, store and forward data to a remote sink source.In this paper, we have utilized the versatility of RFID in implementingautomatic student attendance recording system that allows students to simply record their attendance just by touching their ID cards over the RFID reader at the entrance of lecture halls with a great amount of success. We hope that this system can change the paradigm of student's attendance in classroom and provide a new, efficient and accurate way of recording student attendance in college, schools or any other organization.

The RFID based system provides an effective and efficient method to record students attendance with real time data for example student's entry time and leaving time can be recorded instantly as the students enters or leaves the classroom and also helps in finding locations of students in the campus in case they are not present in the class as the readers installed at different locations within the campus can sense the rfid tags embedded in student's ID card and determine their locations.

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