

Enhancing Attendance Recording: Python and Arduino Integration for RFID Data Transmission to MySQL

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Abstract

The suggested attendance system is used to control attendance from a central unit in vast, branching factories or universities. It consists of terminal units and a central unit. A Raspberry Pi, a screen GUI, an RFID reader, a transponder card for each user (such as a student), and a GSM board make up each terminal unit. A PC, a GSM board, and an Arduino make up the main unit. Every unit has a unique program in place to accomplish its goals. The terminal unit is in charge of connecting to a transponder card to retrieve its IDs, compare those IDs with the names stored in the SQL server database to retrieve the names of the absent students, and then use a GSM message to transmit those students' serial numbers. As the hub of the system, the central unit is in charge of gathering all data from the terminal units, presenting it, and doing additional processing to determine which individuals whose absences over the threshold line will be excluded.

Keywords: Attendance system, RFID, GSM, Arduino, MySQL.

INTRODUCTION

One of these technologies that alters our interactions with objects in our environment and other electronic devices is RFID. It is utilized in every industry where a unique identity is needed, including retail and security. It is also paving the way for a number of cutting-edge developments, including RFID-based human implants. RFID is desirable and helpful for many Arduino projects because of its broad range of uses. We'll look at using RFID in Arduino-based projects in today's tutorial. Staff and student absenteeism has major ramifications that impact the community. The traditional method of recording attendance, which involves calling out the names of the kids and staff or writing it down on

paper, is insecure, time-consuming, and ineffective. One tool to address this issue is the attendance system, which uses radio frequency identification technology. Universities, schools, and commercial locations all use this system. Numerous studies in this area have been published with the goal of enhancing and supplanting the traditional approach to attendance tracking using RFID technology [1–4]. RFID relies on item tagging for its fundamental functioning. When compared to the traditional method of taking attendance in class, the RFID technique offers several advantages. First, because each person's RFID tag allows for unique identification, the process of taking attendance is simpler, quicker, and more secure. RFID is a method of gathering data that works by using radio frequency data to identify, categorize, and track mobile tags in communication with readers. RFID systems have many varied applications, such as inventory

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control, Journal of Babylon University/Engineering Sciences, and product monitoring through manufacturing and assembly [5–8].

LITERATURE REVIEW

The use of radio-frequency identification (RFID) technology for object tracking and automated electronic surroundings has been thoroughly investigated by researchers. Numerous firms have integrated RFID technology into their automation systems. The Research and Application of College Student Attendance System based on RFID Technology was proposed by Zhang Yuru, Chen Delong, and Tan Liping in April 2013. The RFID-based student attendance system node design has been presented, together with the real-world circumstances surrounding the class attendance system for college students. This article presents in detail the system's hardware node as well as the development methods of related applications. The system that has been devised has the potential to increase work efficiency while also conserving material and human resources. In January 2013, Tanvi Shah, Romin Parekh, and Sumita Nainan proposed the RFID technology-based attendance management system. The proposed framework can provide an alternative, more accurate, and less cumbersome way to record understudy involvement in class and change the way understudies interpret their address participation checks in the classroom. An inexpensive and simple RFID-based authentication system model has been successfully developed. The framework model has some advantages over the traditional approach to involvement. This framework will support planned participation, and guardians will be notified when a child is absent. This framework's use of the AVR controller ensures rapid operation, financial viability, and low power consumption [3]. Utilizing the Online Attendance Management System, Ankita Agrawal and Ashish Bansal According to Using RFID with Object Counter, the existing manual method of tracking and documenting student attendance will be much improved by the Student Attendance System utilizing Radio Frequency Identification technology along with an object counter, particularly in a university setting. The concept encourages the use of a completely automated method for tracking students on university property and recording their attendance. Accurate and safe attendance is recorded. With switches and communication connectors that are simple to reach, the system is intuitive to use. It is possible to store and recover attendance.

WHAT'S RFID?

Because it offers a cheap, efficient approach to link IT systems with the resources, personnel, and locations of enterprises, the usage of radio frequency devices to tag and identify goods is expanding. additional firms are finding RFID to be an appealing option due to its increased standardization and lower costs, which has enabled additional applications both technically and financially possible. There are methods for electrically identifying persons, places, and objects with RFID and NFC. Computer systems are able to learn about objects in the real world by gathering data on their location, usage patterns, and need for maintenance. These technologies reduce the overall expenditure of data collection while improving data accuracy. They can aid in the automation of procedures that now need human data entry or pencil and paper. RFID can appear complex at times due to its vast array of options and multifunctional devices. Experts in both choosing and supplying RFID systems, Core RFID is also capable of developing applications that leverage the technology. Any company preparing to implement RFID technology can benefit from our assistance. The newest technologies available for asset management are NFC and RFID. Some of the functions made available by RFID are carried out by barcodes. So what functional differences exist between RFID and barcodes? Watch the animated animation above [8–12] to see more about the differences between the two techniques.

Arduino

It's an open-source platform for making electronic creations. A customisable circuit board, also referred to as a microcontroller, and an IDE (Integrated Development Environment) program that is installed on the machine where you work and used to create and upload software for computers to the board make up the Arduino technology. The Arduino platform has becoming more and more popular among those who are new to electronics, and for good reason. Unlike most previous programmable

circuit boards, the Arduino may be updated with new code using a USB cable rather than a separate device called a programmer. Additionally, learning to program is made easier by the Arduino IDE's usage of a condensed version of C++. Ultimately, Arduino offers a common form factor that deconstructs the micro-controller's functionality into a more understandable packaging. Arduino hardware and software was developed for those who wanted to build interactive objects or environments, such as artists, designers, hobbyists, hackers, and beginners. Button, LED, motor, speaker, GPS, camera, internet, and even your TV or smartphone can all communicate with Arduino! This adaptability, along with the fact that the hardware boards are reasonably priced, the Arduino software is free, and both the hardware and software are simple to learn, has attracted a sizable user base that has released instructions and contributed code for an enormous range of Arduino-based projects

[12–17]. Arduino is shown in Figure 1.

The Arduino pins are where you attach wires to build a circuit (usually with the help of a breadboard and some wire). Typically, they feature headers made of black plastic that let you simply insert a wire into the board. The Arduino features multiple types of pins, each with a label on the board and a distinct purpose.

- *GND (3)*: Abbreviation for Ground. The Arduino has multiple GND pins that you can utilize to ground your circuit.
- *3.3V (5) & 5V (4)*: As one might anticipate, the 5V pin supplies 5 volts of electricity, while the 3.3V pin supplies 3.3 volts. The majority of the basic parts that are used with the Arduino gladly operate on 3.3 or 5 volts.

(6) *Analog In* pins are those found in the region designated by the label Analog In on the UNO (A0 through A5). These pins have the ability to read an analog sensor signal (such as a temperature sensor) and translate it into a readable digital value.

- *Digital (7)*: On the UNO, the digital pins (0–13) are situated on the other side of the analogue pins. Digital output, such as illuminating an LED, and digital input, such as determining whether a button is pressed, are both possible with these pins.
- *PWM (8)*: It's possible that the tilde (~) was placed adjacent to some of the UNO's digital pins (3, 5, 6, 9, 10, and 11). These pins can be used for pulse-width modulation, or PWM, in addition to being standard digital pins. For the time being, consider these pins as having the ability to replicate analog output (e.g., fading an LED in and out). We have a tutorial on PWM.

AREF (9): Analog Reference is what it stands for. For the most part, you may ignore this pin. Occasionally, it is employed to establish an external reference voltage (ranging from 0 to 5 volts) as the maximum value for the analog input pins.

RFID Module

Radio-frequency identification (RFID) (as shown in Figure 2) automatically detects and tracks tags affixed to items using electromagnetic fields. The tags hold information that has been electronically stored. An RFID reader nearby can gather energy from passive tags by using its radio waves for interrogation. Active tags can function hundreds of meters away from the RFID reader and have a local power supply (such as a battery). The tags may be implanted in the monitored object since, unlike barcodes, they do not need to be in the reader's direct line of sight. One technique for automatic identification and data collection (AIDC) is RFID. Numerous businesses make use of RFID tags. For instance, following an automobile as it moves through the assembly line is possible with an RFID tag placed to it during manufacture; RFID-tagged

PROCEDURE

Here, we are just receiving the serial data that comes from the Arduino and pushing it to

phpMyAdmin using Python code. In this project, we have interfaced the RFID-RC522 with the Arduino. After that, we are sending data from the Arduino to the phpMyAdmin database. In order for our gadget to transfer data serially, it is linked to a PC in this instance.

The software that we have utilized for this project is as follows:

1. Arduino IDE:
2. XAMPP host

Python IDLE

In addition to using Python code to submit data to phpMyAdmin, we also use several libraries, including PySerial and MySQLdb, to enable the upload of data through a URL. Online RFID Attendance System is shown in Figure 3. Circuit Diagram is shown in Figure 4.

Buzzer

Beeper and buzzers are examples of audio signaling devices that might be mechanical, piezoelectric, or electromechanical in nature. The audio signal is mostly converted to sound using this method. Computers, printers, alarm clocks, timers, and other gadgets frequently use DC electricity to power them. Depending on the different designs, it can make a range of sounds, such as siren, melody, alarm, and bell. In Figure 5, the buzzer model is displayed.

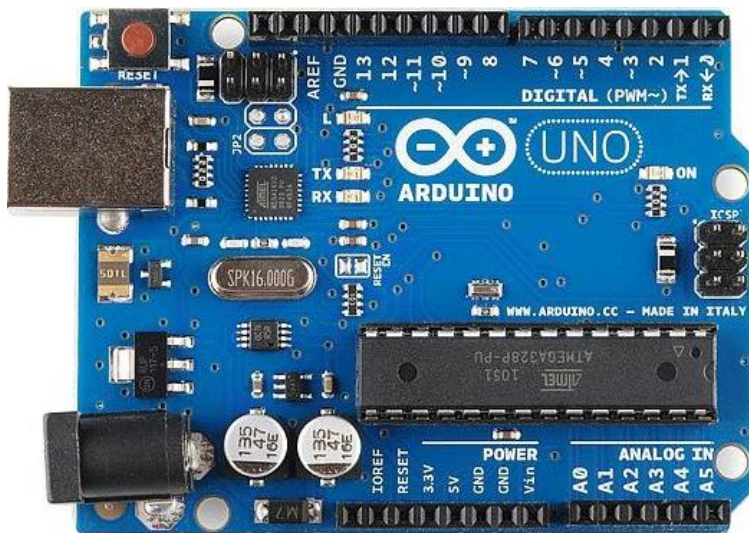


Figure 1. Arduino model.



Figure 2. RFID Module.

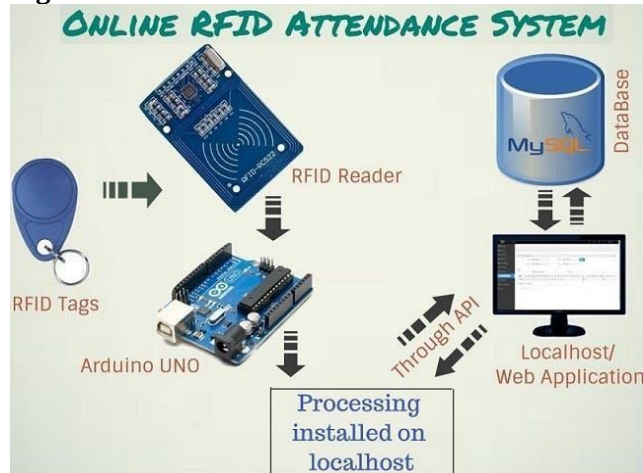


Figure 3. Online RFID Attendance system

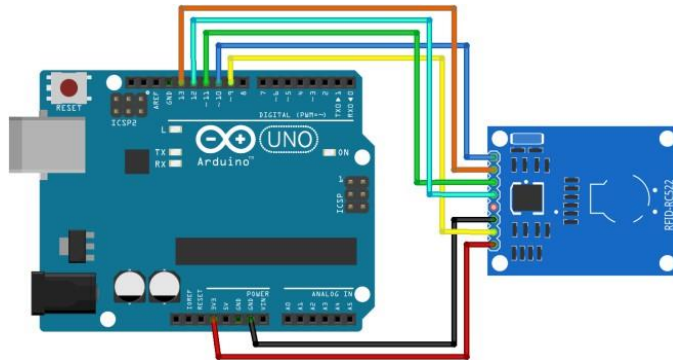


Figure 4. Circuit Diagram.



Figure 5. Buzzer Model.

CONCLUSION

The goal of creating an attendance system based on RFID technology was accomplished. Compared to the conventional method of attendance system, this project has offered a more convenient way of marking attendance in terms of both performance and efficiency. The data is better organized when databases are used. Because data editing and retrieval can be done through the interface, this system is also user-friendly and suitable for use with any kind of attendance system. As a result, it might be

used in businesses or academic institutions.

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