



## Gen-Next Attendance System Using RFID

<sup>\*1</sup>Shaunak Lothe, <sup>2</sup>Vedant Ralekar and <sup>3(a, b, c)</sup>Dr. Lenina SVB

<sup>\*1, 2</sup>Student, Department of Electronics & Telecommunication Engineering, SGGS Institute of Engineering & Technology, Nanded, Maharashtra, India.

<sup>3(a)</sup>Assistant Professor & Coordinator, Centre of Excellence in Signal and Image Processing, Department of Electronics & Telecommunication Engineering, SGGS Institute of Engineering & Technology, Nanded, Maharashtra, India.

<sup>(b)</sup>Fellow Women Scientist-C, WOSC-07, TIFAC, DST, India & Registered Indian Patent Agent INPA 2625.

<sup>(c)</sup>Founder and Director of DR. LSVBS PATTSOL Multiservices, (Indian Registered Startup: DIPP24849).

### Abstract

In educational institutions like schools, colleges, higher educational institutes and workplaces, traditional attendance systems often involves manual entry, which is more time-consuming and less efficient process. Sometimes it might happens teachers or assistants are not able to manage large amount of data that could be the situation where it consumes large amount of time and need extra efforts. Therefore to reduce the time taking we come up with an RFID-based Smart Attendance System implemented through an Arduino UNO, RFID readers and tags, LCD Display and integration with Excel sheet for automatic and effective attendance. The system applies the use of RFID technology in which every user gets an RFID tag having a distinct identification number. When the tag is scanned by the RFID reader, the Arduino displays the data and the status of attendance on LCD display. Simultaneously, the attendance is logged into an excel spreadsheet for record purposes and analysis. The system enhances accuracy, reduces human interaction and enhances the effectiveness of attendance management.

**Keywords:** Arduino UNO, Smart Attendance System, RFID reader and tag, RFID technology.

### 1. Introduction

We know that in every educational institute or working area, attendance management is one key features to keep records and maintain discipline. Traditional attendance systems, such as manual register methods can be more time consuming and inefficient. To overcome this problem, we design a small attendance system device which is more efficient and less time consuming as compare to the manual methods. An RFID-based smart attendance system is proposed, which automates the attendance process using Arduino UNO, RFID reader and tag, an LCD display, an LCD I2C and excel sheet for data storage <sup>[1]</sup>.

RFID (Radio Frequency Identification) technology enables contactless identification where each individual is assigned an RFID tag containing a unique ID when the tag is scanned by the RFID reader, the Arduino processes the data and updates the attendance record in Excel sheet while displaying conformation on LCD screen <sup>[2]</sup>.

This system not only enhances the accuracy but also reduce the human intervention and making attendance process more efficient, secure and reliable.

Considering the costs of the electronic components, this system is not much costly and it only need invents once for each unique ID's after that we can use it for long time <sup>[4]</sup>.

**\*Corresponding Author:** Shaunak Lothe

### 2. Literature Review

Old human techniques of attendance is been replaced by technology-based attendance solutions for more efficiency. Out of them, solutions based on RFID technology are used on large scale because it is easy to setup and provides accurate output <sup>[2]</sup>.

There are various advantages of using RFID technology for attendance management such as it is cost efficient and compatible as Arduino UNO is used. Various wireless technologies referred for applications too are used in different project to transfer data of attendance from RC522 RFID reader to databases which stores single location.

LCD screens are now attached with RFID-based attendance systems for live output. On scanning of the attendee, details of the attendee are to be displayed on the screen. This technology saves amount of time and gives less errors <sup>[4]</sup>.

### 3. Methodology

The system includes Arduino UNO, RFID Reader, RFID Tags and LCD as major components. The Arduino UNO performs the computing part of the system by the data transferred from RFID reader and display it using LCD Display. The student information is mapped in RFID tags according to which, the data is generated after scanning the tag is stored using excel

sheet file. An RFID reader is used to communicate with tags by transmitting radio waves. When RFID reader is active, it sends electromagnetic energy through radio waves to the RFID tag's antenna, which activate the tags. Then the waves are sent back to the reader's antenna by the triggered tag, allowing the reader's module to fetch information associated with the tag. The tag has an inbuilt memory that stored a unique tag identifier which are not editable <sup>[1]</sup>.

The student information is stored in the user data memory in the tags that helps the system to identify the student. The basic computational task of marking attendance is performed in the excel sheet's database, by verifying student's UID which are unique for every students and mark in the excel sheet. The user need to scan the RFID tag (user ID card) to mark the attendance, after scanning result will be displayed on LCD screen, if the user ID is not present in the stored data, it displays the text ID not found, then scan the another ID <sup>[3]</sup>.

### A) Components

**RFID Tag and Reader:** RFID tags and readers are the basic components of RFID technology. These works together to implement wireless data exchange. RFID tags, as shown in Fig 1, are chips which contains unique information or data. The RC522 RFID Reader, as shown in Fig 1, is designed to create 13.56MHz electromagnetic field which is essential to communicate with RFID tags. The RFID Reader emits radio waves through its antenna, which energizes RFID Tags. Then after, the tag's antenna receives signal and transmits back its UID to the reader. The reader captures data and sends the data to Arduino UNO for processing.



**Fig 1:** RFID Tag and Reader

**Arduino UNO:** Arduino UNO is a small microcontroller board which is widely used for number of electronic projects because it is easy to use, affordable and functionable which is based on ATmega328 chip. It has 14 digital input/output pins and 6 analog input pins. This board is programmed using Arduino IDE software where users can write the code, compile it, and upload directly to the board. The hardware image of Arduino UNO is shown in Fig 2.



**Fig 2:** Arduino UNO

**LCD Display:** We used a 16x2 LCD module having two lines and can display 16 characters in each line, as shown in Fig 3. Each character in this module is displayed in matrix of 5x7 pixels. It contains registers namely Data and Command. Command register is for storing the command instruction provided to LCD screen. Command is a direction given to LCD to carry out a specific task which includes initialization, setting the position of the cursor, screen clearing and controlling the display. Whereas, the data register is in charge of maintaining the information. That is to be shown on the screen. It stores the data in ASCII value of character.



**Fig 3:** LCD Screen Display

**LCD I2C:** LCD I2C refers to Liquid Crystal Display with Inter Integrated Circuit. It has in total 20 pins among which 16 pins are to be connected with LCD 16X2 Display and 4 pins are Ground, VCC, SDA and SCL, as shown in Fig 4. SDA is the data line which is used as a transmitter and receiver between devices connected. SCL is functioning about timing of transfer of data between devices. I2C contains inbuilt Potentiometer which adjusts the contrast of LCD Display which is used to display instructions of the device.

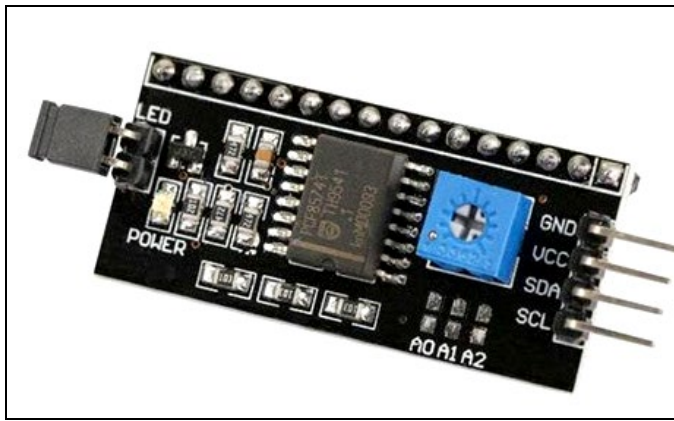


Fig 4: LCD I2C

## B) System Architecture

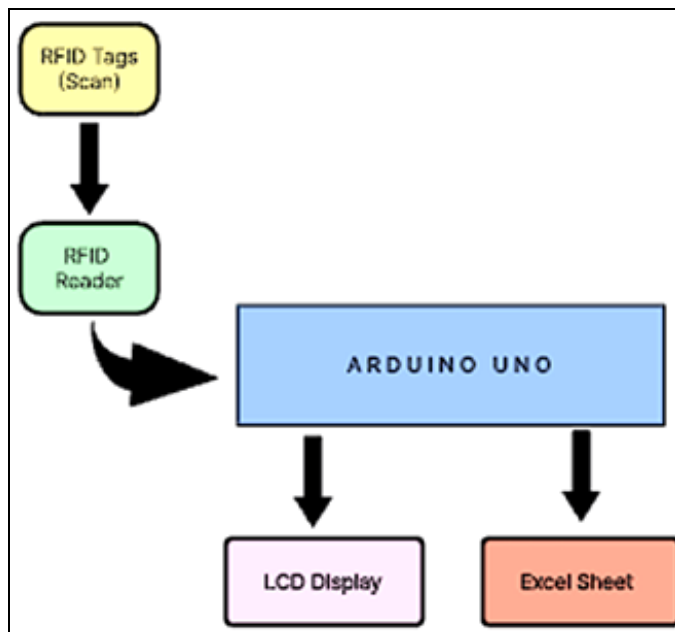


Fig 5: System architecture of the Project

## C) Flowchart

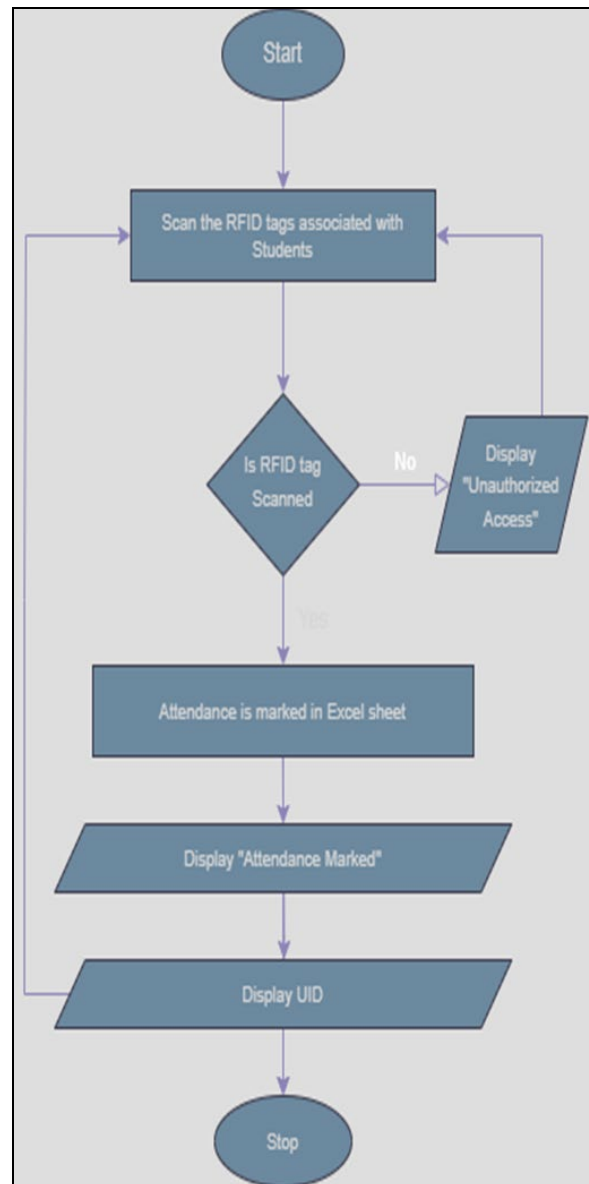


Fig 6: Flowchart of the system

## D) Hardware Setup

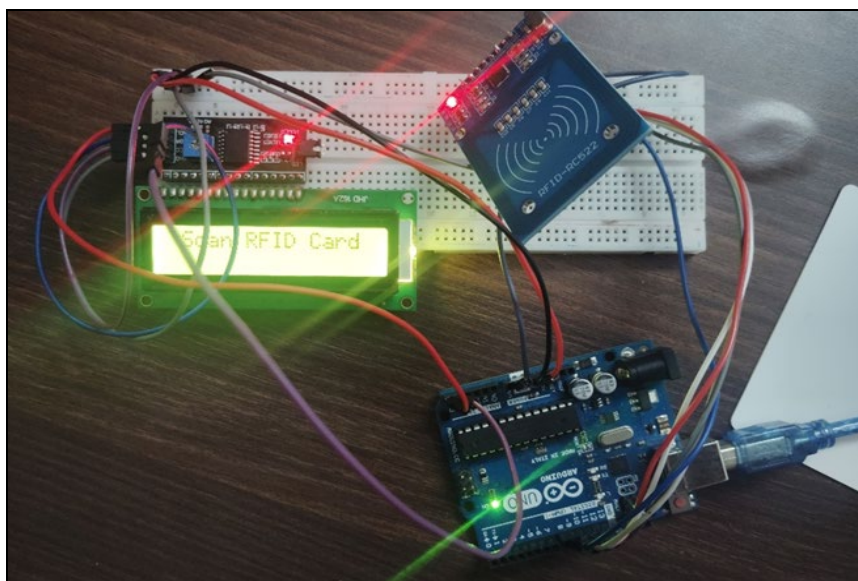


Fig 7: Hardware of the system



#### 4. Results and Discussion

The smart attendance system made by Arduino UNO, RFID Tags and Reader, LCD 16X2 Display and LCD I2C gives an effective way to make attendance recording automated and technical. Each student or user has a personal RFID tag, and the attendance system is installed with an RC522 RFID reader read the information or data associated with tag. This makes the recording of attendance automatic without human intervention, boosting use of technology in day-to-day activities without any errors.

This system not only increases efficiency in tracking attendance, but also saves time. With the help of this system, one can scan his or her RFID tag, which will be sensed by the RFID reader as shown in Fig 7. The details in the tag, such as the person's ID and the scanning time, are reflected instantaneously on the LCD display. In addition, the record is calculated accurately and instantly.

When RFID tag is scanned, the information about the individual gets registered and marked as attended into the system. Connections between components are made with the use of RC522 RFID reader module, LCD I2C and LCD display with other electronic components (such as jumper wires and breadboard) connected with Arduino UNO microcontroller board. If one has to edit their entry, then one can simply rescan the tag to the reader to update the record of attendance. This functionality provides flexibility and ease to the users.

#### 5. Conclusion

The intelligent attendance system thus developed can be applied in schools, offices and other institutions requiring attendance management. It is time-saving as the administrators are no longer required to mark attendance manually. Attendance is automatically recorded when members scan their RFID tags, becoming efficient and easy.

#### 6. Future Scope

In future implementation of this project, we can use biometric verification for enhanced security and also we can integrate this device with image processing for face recognition system. We can add mobile connectivity for convenience of operations and addition of device for data storage, to use this store data for future uses. If we have to make this device more energy-efficient and environmentally friendly, we can connect this project with solar powered options. To make this device digitalize and more task performing on data like calculating the percentage of attendance, we can integrate the system with Artificial Intelligence (AI) and Machine Learning.

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