RC522 and EM-18 Based Attendance Management System

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Abstract- Maintaining the attendance of every individual in any organization like an educational institution or corporate workplace is an essential component. Traditionally, attendance systems relied on manual methods such as paper-based sign-in sheets or manual entry into spreadsheets, which were time-consuming, and prone to errors. Our prototype provides a practical approach to solving this problem with modern technology by using the method of Radio Frequency Identification (RFID) as it is a reliable, efficient, simple design, and low cost.

Keywords – manual entry, Radio Frequency Identification (RFID), reliable, efficient, simple design, low cost.

I. INTRODUCTION

The RC522 and EM-18-based Attendance Management System represents an innovative approach to effectively managing attendance in various settings, such as schools, offices, and organizations. This system utilizes two key components: the RC522 RFID reader module and the EM-18 RFID reader module. The RC522 module is responsible for reading RFID tags, while the EM-18 module is designed specifically for reading RFID cards at a distance. By combining these modules, the Attendance Management System offers a seamless and reliable method for tracking attendance, enhancing efficiency, and eliminating manual processes.

With the RC522 and EM-18-based Attendance Management System, users can effortlessly record attendance by simply swiping RFID cards within the range of the EM-18 module. Each RFID card or tag is unique to an individual, allowing for accurate identification and record-keeping. Additionally, the system can generate comprehensive reports, providing valuable insights into attendance patterns and trends. By automating the attendance management process, this system minimizes errors, saves time, and streamlines administrative tasks, ultimately contributing to a more efficient and productive environment.

II. LITERATURE PAPER

[1] Ankita Agrawal and Ashish Bansal's proposal of RFID based attendance system proposes the idea of using middleware for processing the read data and storing it in the database. This idea highlights the fast counting of RFID Tags/Cards. But this is a tedious process as multiple-read data takes lots of time for storing. There is a possibility that the data might get lost due to this action. Hence this system proves unstable in the long term.

[2] Aditi S. Tiwari and the team proposed a variety of approaches to developing an attendance system. The different approaches were of using a "Bar code Attendance system" where each employee is given an RFID card which has 12-digit Universal Product Code (UPC) that can be identified by the computer and attendance is counted. This system is simple and reliable. The second approach is the "Biometric Attendance System" which uses facial recognition or fingerprint scanner for detection. This approach has a complex design and is of high-cost design. Though the different approaches seem to be useful in their own ways but lack to have a reliable system in the long term.

[3] M. Kamaraju's approach is a two-step verification system as it enhances the security of the system. The first step is to scan the RFID tag/card held by the employee and the second stage is to enter the unique 4-digit pin assigned to the employee and attendance will be given to that employee if the code is correct else an error message is displayed on LCD. This is a unique way of design, but this system is valid if the person can recognize the pin correctly else the employee will not be able to give the attendance.

[4] Anil Kumar Shukla's approach is by use of multiple microcontrollers for assigning work rather than dumping all the inputs into one microcontroller. This approach is useful in its own way as each microcontroller has a specific task, the first controller scans and identifies the card's unique ID, the second controller helps in storing the data, and the third

controller is interfaced with the GSM module to share the notification to the child's parent through SMS and all the microcontrollers are in sync with each other. This system is reliable in the long term but using multiple microcontrollers means high cost and if the communication is prone to error then this system fails.

[5] RKAR. Kariapper's approach is a Two-step verification system where the employee needs to scan the RFID card and then this face is recognized by the computer. The face recognition system basically is the image processing algorithm. Though this approach adds better security, the problem is that the image processing algorithm is not efficient enough to be used effectively.

III. METHODOLOGY

A. BLOCK DIAGRAM
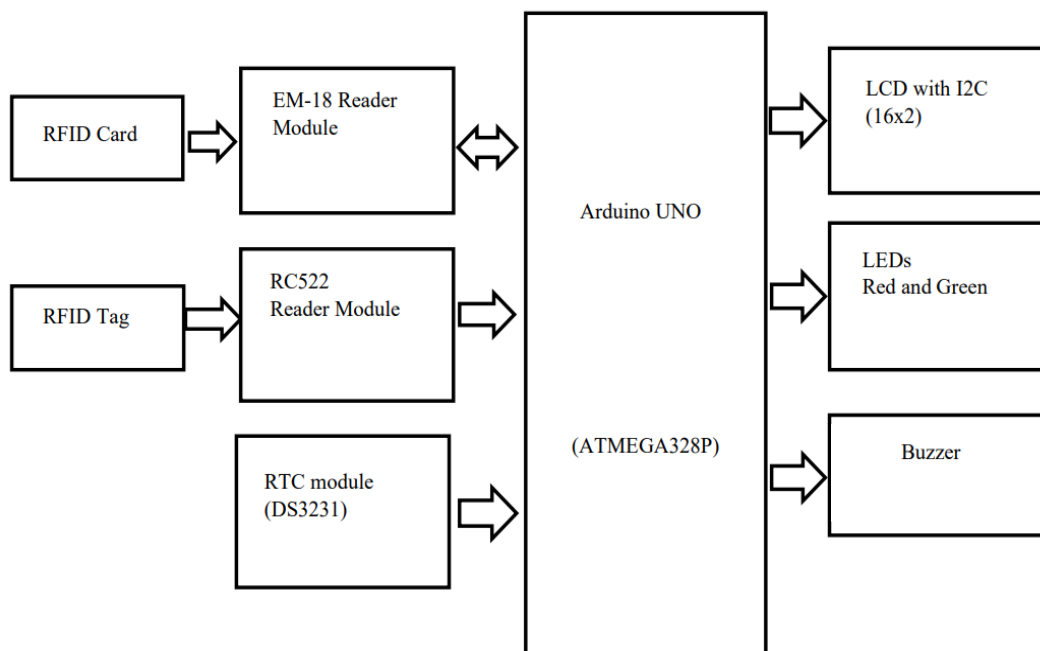
Figure 1: Block diagram of the system

Figure 1 represents the block diagram of the attendance system. EM-18 reader module is bidirectional as it acknowledges the Arduino board when to initialize the RC522 reader module. RC522 reader module is unidirectional as it reads the card only once. The RTC module is just to monitor the date and time and share the data with Arduino. LCD, LEDs, and Buzzer are devices that output the system performance.

B. WORKING

The attendance system operates by constantly monitoring the date and time using the RTC DS3231 module, with the RC522 module active during college hours. The process begins by scanning the teacher's RFID card at the EM-18 reader module, which sends the data to the Arduino for verification against registered ids. If an invalid card is initially detected, the red LED blinks, and the LCD shows the message "Invalid card!".

Once a valid card is read, the LCD screen displays the teacher's name and class. Students then scan their RFID tags, and their information appears on the LCD screen with a blinking green LED indicating successful entry. In case of an invalid tag, a red LED blinks, and the LCD shows the message "Invalid card!" After all students have scanned their tags, the teacher scans their RFID card to finalize the count, and the total number of students is displayed. The system incorporates a delay until the next day after college hours to prevent further data recording.
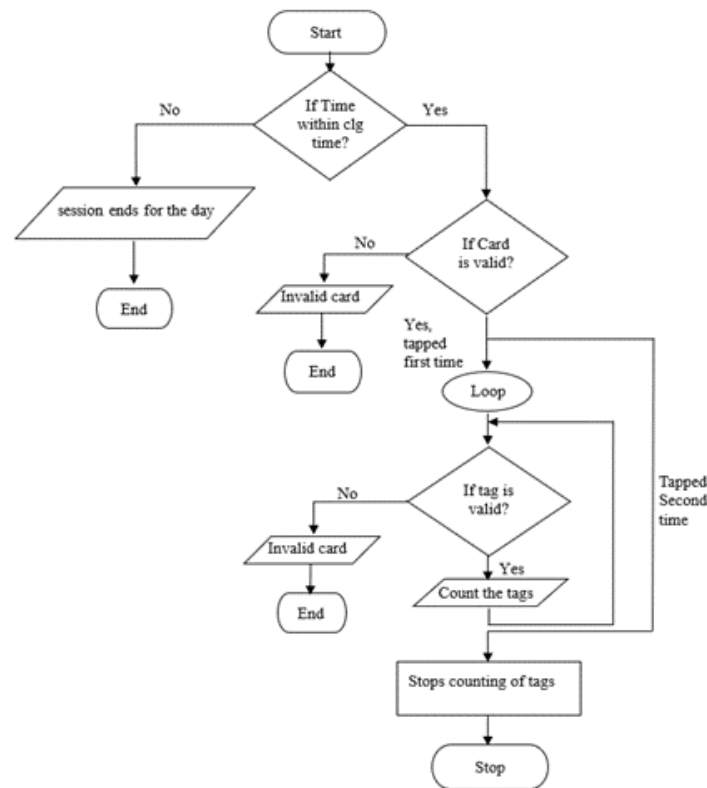
C. FLOWCHART

Figure 2: Flowchart of the system

Figure 2 represents the flowchart of the system. The RTC module shares the Time details with Arduino on powering up the system. If the current hour is not equal to the working hour, then the LCD screen displays the text "Session ended for the day". Else, the RFID Card is detected by the EM-18 reader module and confirms the teacher's identity, and displays relative information on the LCD screen. At this stage, the system enters the loop where the counting of the students tag takes place. This loop iterates until the RFID card is scanned again. The counted value of the tag is displayed at the end of the LCD screen.

IV. RESULTS

The prototype of the proposed system is shown in Figure 3.

Figure 3: Prototype of the proposed system

Case 1: During Off college time.

When the system is powered during the off-college time, a long delay is set until the college working hour starts. During this period, Both Reader modules are disabled.

Figure 4: Output during off-college time

Case 2: When the read tag is valid.

During the college working hour, when the teacher scans the RFID card against the EM-18 reader module, then the students scan the RFID tags one after the other against the RC522 reader module. Once the tag unique ID is identified by the Arduino, it considers that ID and student information such as the Student's Name and USN on the LCD display with a blink of a Green LED confirming it.

Figure 5: Output when a valid tag is read

Case 3: When the read tag is invalid.

During the counting process, if an invalid tag is read, LCD displays the message "Invalid Tag" and the Red LED blinks.

Figure 5: Output when an invalid tag is read

V. APPLICATIONS

1. Educational institutions: The system can be used by schools, colleges, and universities to manage student attendance efficiently.
2. Corporate offices: The system can be used by companies to manage employee attendance, monitor absenteeism, and generate attendance reports.
3. Hospitals: The system can be used in hospitals to track the attendance of doctors, nurses, and other staff members.
4. Government organizations: The system can be used by government organizations to track the attendance of employees and ensure accountability.
5. Libraries: The system can be used in libraries to manage the attendance of librarians and track the usage of library resources.
6. Fitness centers: The system can be used in fitness centers to manage the attendance of members, track the usage of facilities, and monitor the performance of trainers.

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