RFID Technology Based Attendance Management System

Priyanka Sahare, Pranali Gaikwad, Snehal Narule, Nutan Thakre, Puja Chandekar
RTMNU Nagpur

1. Abstract

Attendance plays a vital role in evaluating a student. The traditional method of taking attendance manually is very time consuming and often leads to human error.

Also there are many challenges that are faced while one adopts a manual method of taking attendance such as, difficulty in keeping the attendance list over a long period of time, lecturers forgetting the attendance register in the classroom, students illegally marking the attendance of their friends while the roll number is being called out and many more.

This paper elaborates the implementation of Radio Frequency Identification based Student Attendance Management System using Open Source Software in a multi-user environment.

This would eradicate the deficiencies associated with the manual attendance system since an automated approach is being adopted

2. Introduction

An RFID system consists of a tag and a reader.Radio Frequency Identification technology uses radio waves to transfer data from an RFID tag through a reader for the purpose of uniquely identifying a person.

EM18 RFID Reader Module

Different RFID Tags

The reader is usually ON and continuously senses its range of operation and whenever a tag enters its field of operation, the RFID reader transmits electromagnetic waves to communicate with the tag. The tag receives data from the reader, activates it and then reflects back the incident electromagnetic waves with RFID tag information. In our case the information is a unique ID code of 12 digits which has been assigned to identify a specific person only. Now the transceiver in the reader receives the data and passes them on to the controllers.

The system uses a set of software such as Java, MS Access, NetBeans to record, store and extract student's attendance.

Java is used for developing a desktop application for marking the attendance.

MS Access is used to create database environment.

NetBeans IDE 8.0.2 is used for developing the web portal for accessing attendance.

RFID based Student Attendance Management System was built using Open Source Software which reduces the overall cost of development process.

Specifications of EM18 RFID Reader Module

- 5VDC through USB(External 5V supply will boost range of the module)
- Current: <50mA
- Operating Frequency: 125KHz
- Read Distance: 10cm
- Size of RFID reader module: 32mm*32mm*8mm

Other Features:

- Data baud rate: 9600 bps
- Data bit: 8 bits
- Parity Check: None
- Stop bit

3. Related Works

Automatic Access Control Using ID Card based on RFID Technology, the control system prevents illegal entry of people into a building and sometimes even from gaining access to certain organization resources.

Inotified: An SMS and RFID Based Notification System which enables parents to monitor the presence of their children at a specific time. The time in and out of every student is generated through scanning of their ID card at the gate followed by sending the SMS notification to their parents. Limitation of the system is that there is no acknowledgement between the sender and the receiver.

RFID Based Exam Hall Maintenance System resolves the problem of students searching for their examination halls and seating arrangements. The card reader is provided at the entrance of the building. The student needs to swipe his tag in front of the reader at any hall and his hall and seat number would be displayed on the LCD.

Factors that motivated towards adopting RFID based automatic attendance system are challenges that usually occur during manually taking attendance i.e. giving proxy for students that are not physically present at the classroom by their friends, taking attendance in a large class could be cumbersome where the class strength is high, which would consume time. Also the lecturer might misplace the attendance register. RFID technology is implemented because it is cheap, secure and easy way of marking the attendance as compared to other technologies.

4. System Architecture

4.1 Client Side Architecture

The RFID reader is connected to client computer. As mentioned earlier the reader is usually on and continuously senses its field of operation. Whenever a tag enters its vicinity, it sends an electromagnetic wave to the tag. The tag reflects back the wave along with its unique identification number. The java application for taking attendance is executed using shell script.

The lecturer needs to authenticate himself by logging into the system. If the response is positive, the lecturer is redirected to the 'take attendance' panel where he needs to enter the subject name for which he wants to take attendance. The subject name is validated using database and a code is executed for reading tags, checking redundancy and creating a Java file containing tag IDs. The Java file is then sent to the server for further processing. At the end the Java file is deleted from the client PC.

4.2 Server Side Architecture

The server fetches the Java file from client and parses the Java file to retrieve subject name and corresponding tag IDs. The tag IDs that are obtained is

validated and attendance is stored in the database. The user can access the web portal for viewing attendance. The web portal in turn queries the server database and retrieves student attendance. Finally the web portal responds to the user with the attendance.

4.3 State Transition Diagram

The primary role of an administrator is to allocate tag IDs to the student and monitor the entire system. Whenever a student wants a unique tag, he needs to go to the administrator. The administrator selects a random tag and reads the tag ID. He logs into the system and assigns that tag ID against that particular student.

A student can register for a session and view his attendance. Once he is enrolled, he can view his attendance for a particular subject.

A lecturer records the attendance by logging into the system and activating the RFID reader. He can also view attendance of all students enrolled for a particular subject. An ER Diagram is shown below which describes the entire process of recording the attendance.

ER DIAGRAM
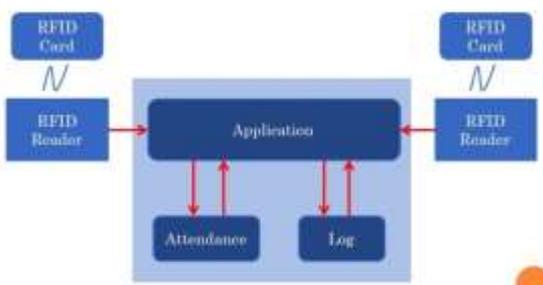
5. Application Description

RFID technology has a widened horizon as it transcends into an era of emerging applications.

This paper focuses on the development of an attendance management system using RFID

technology to monitor the attendance for a group of students.

The software module of the application processes the raw data fed in by the hardware circuit. The raw data fed into the application are:

- Unique tag sequence number
- Time stamp of data entry

The unique identifier from the reader is fed into the application and then the application compares it with the list of stored tags. If the ID sequence is present, then the details are fetched and stored. If the not then a new record is created with the corresponding timestamp which is further stored in the database. Now the student bearing the new ID card will be prompted to fill in the following details:

- Name
- Course details
  - ❖ Course
  - ❖ Stream
  - ❖ Semester

There are 2 ways in which the attendance can be recorded:

1. Figure 1 describes the method through which attendance is automatically recorded once the tag has been scanned successfully by the reader.
2. Figure 2 describes the method through which one can manually enter the attendance by filling up the required data. This can also be used to search for particulars of a student whose information is already present in the database by simply entering the unique ID.

The third figure depicts the manner in which the data is being stored. Here the lecturer can also analyse the attendance of a particular student.

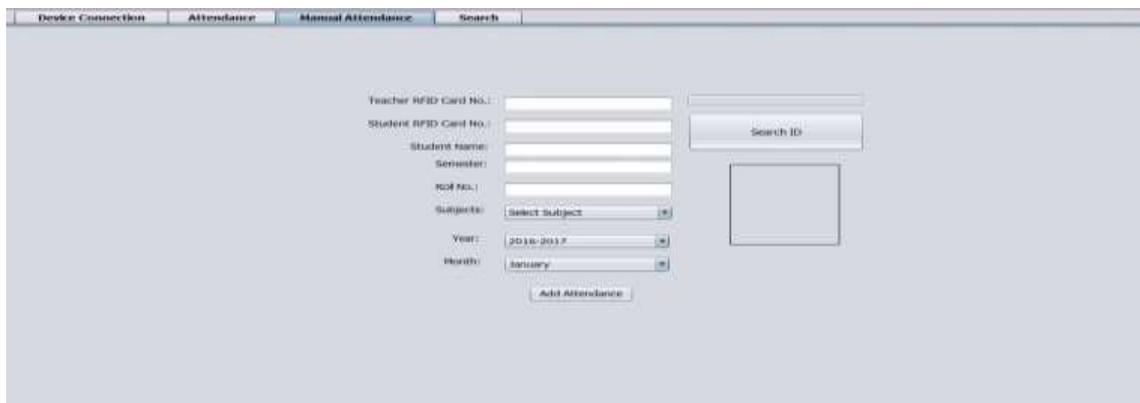Image 1: Automatic Attendance Entry Page
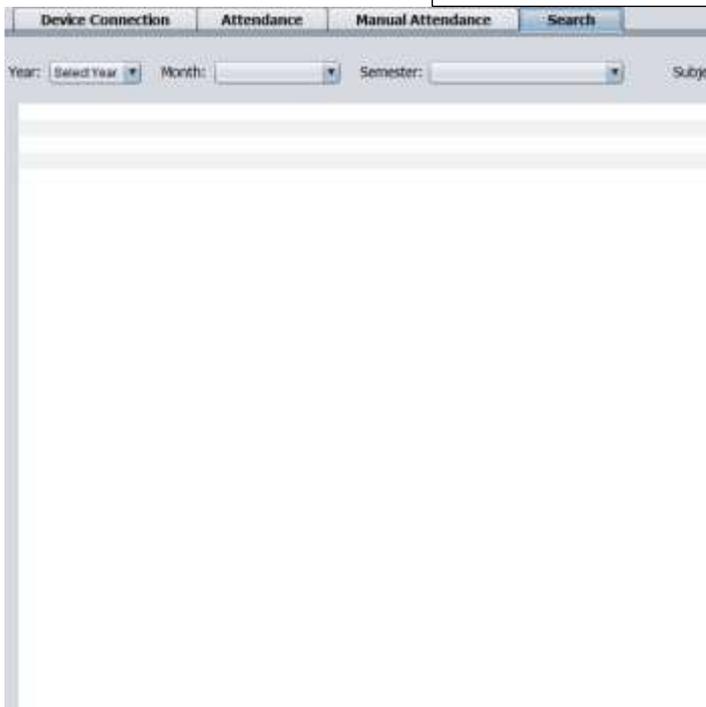

Fig 2: Manual Attendance Entry Page

Fig 3: Stored data Retrieving Page

6. Results

The research was conducted on a sample of 60 students, enrolled in a particular course. The implementation of RFID technology has definitely quickened the entire of process of recording attendance. The traditional method of recording attendance involves individual manual entry; an arduous and a time consuming process. On average, based on experiment, the total time taken to record the attendance of a class of 60 students by manual entry method took approximately 10 minutes. This implies that approximately 10 seconds per student was required to record their attendance. This time duration includes visual and written authentication, after which the teacher records the attendance. In comparison (see figure 4), the total time taken for recording the attendance of 60 students using barcode and RFID technology is 120 seconds and 12 seconds respectively (see table 1). Based on the relationship obtained, a projection for a batch of 100 students is also forecasted.

7. Conclusion

The research has identified and explained the key benefits of RFID technology. RFID will open doors to a pool of applications in various sectors of industry.

Although the biggest challenge to thwart the adoption is its investment cost, but on the other hand RFID technology provides an ocean of opportunities that could convince several firms to adopt it.

RFID technology definitely promises an increased effectiveness and improved efficiency for business processes. In the long run, with reducing unit tag and reader costs, several businesses will be able to gain the benefits of RFID technology.

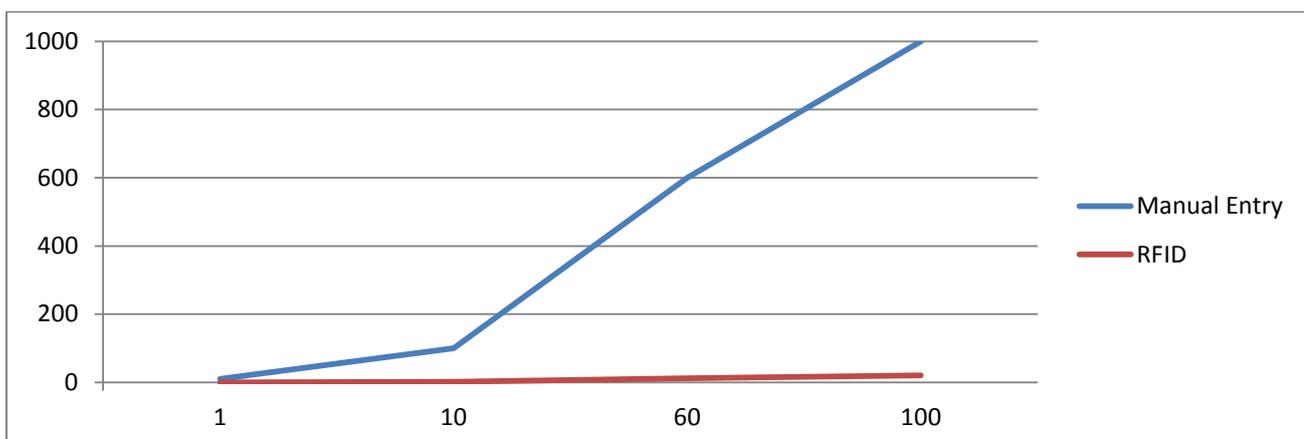| Method	Total No. Of Students			
	1	10	60	100
Manual Entry	10 seconds	100 seconds	600 seconds	1000 seconds
RFID Technology	0.2 seconds	2 seconds	12 seconds	20 seconds

Table 1: Results of the study

Fig 4: A line graph showing the comparison of total time taken to record the attendance of the students

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