

Development of an Attendance System for Students with SMS Notification to Parents

Dipankar Kundu¹, Shubhra Nandy², Alok Kumar², Ayush Kumar²

Assistant Professor, ECE Dept., St. Thomas' College of Engineering and Technology, Kolkata, India¹

UG Student, ECE Dept., St. Thomas' College of Engineering and Technology, Kolkata, India²

Abstract: The conventional method of taking attendance of students is time consuming and insecure, hence inefficient. Radio Frequency Identification (RFID) based attendance system is one of the solutions to this problem. This system can be used to take attendance of students in schools, colleges, and universities. It can identify each person uniquely, based on his/her RFID tag type ID card, making the process of taking attendance easier, faster and secure. Successful fabrication of a prototype of such a system is presented in this paper. With real-time clock facility, the process can be made more accurate, since the time will be recorded. Through a GSM Module, messages can also be sent to the respective parents. The system can be connected to the computer through RS232 or Universal Serial Bus (USB) port to store the attendance in a database for comparison and authentication.

Keywords: Attendance system, RFID, Real Time Clock, GSM Module

I. INTRODUCTION

In earlier days, attendance of students was given by marking them present next to their enrolment numbers, which was a tedious task. Then, people moved onto the method of magnetic strip card. But, the operation was affected by the stray magnetic field. These are the past scenario, which normally used to take too much time for execution and there was no saving in power or energy. Nowadays, an efficient and effective system is needed to mark attendance of students, which will deliver SMS via Global System for Mobile communication (GSM) to their respective parents.

The proposed attendance system is basically an embedded system, where hardware is fully controlled with the help of software. In addition to this, power is efficiently saved in it. The Arduino Mega is the heart of the system. The main objective is to mark the attendance of the students, which requires a unique facility of distinguishing different persons. This is done by using the new emerging technology named 'Radio Frequency Identification (RFID)'. The main parts of an RFID system are RFID Tag with unique ID number and RFID reader to read the RFID tag. There is an IC present in the RFID tag and magnetic field is generated by the RFID reader. Whenever an RFID tag is brought in front of the RFID reader, it starts matching the frequencies of both. For every card, a special ID number is issued. Once the frequencies are matched, the data, which are there on the particular RFID tag number, are read and the data can be displayed on an LCD module. The Arduino Mega microcontroller can be directly connected to the RFID reader and the GSM module. When a student places his/her RFID tag to the RFID reader, then the attendance is marked as present and simultaneously, a message is sent to the parents as well as the school authority with the help of the GSM module. After marking the attendance, the student enters into the class and sits in the respective place. A real time clock (RTC) is also directly connected to the Arduino, which helps to fix the duration for attendance (e. g. 9:00-9:35 AM). The students, who come after 9:35 AM, are considered to be absent and their attendances are not marked as present. After 9:35 AM, with the help of Arduino program, one pin of Arduino is turned low and the LCD display shows that the time is over. In this way, power saving is executed.

The smart classroom attendance system is an important part of a campus management system, which can mark students' attendance intelligently. In addition, the system can automatically collect data or information in real time. The collected data are analysed and processed automatically and reported using a visual interface, and SMS notification is sent at the same time. The system has certain advantages, like reducing paperwork, saving power and cost, and sending SMS notifications to parents as well as the school authority.

II. LITERATURE SURVEY

Radio Frequency Identification (RFID), a popular wireless technique, appeared in the 1940s and 1950s with only military applications. The applications beyond military use started in the 1960s. Charles Walton, who was the first to use the RFID acronym [1], is documented as the first RFID patent holder for his design of a portable radio frequency

emitting identifier in 1973. In the recent years, RFID is used for the identification of various physical objects, like products, human beings and so on [2]. This technique is much more advantageous, safe, secure and easy with lower overhead compared to other conventional techniques. It is much faster and requires only two components, an RFID tag and an RFID reader.

In [2], the authors have proposed a PC based attendance system for students and employees with SMS sending facility using GSM cellular network and RFID technology. The benefits of the system are students' attendance record to the parents on daily basis, employees' attendance notification as they punch, which reduce the overhead in the compilation of attendance at the end of the month. Also, the employee can know the amount of salary from the total duration of work done. The model helps one to monitor data, easily, from a remote location via SMS.

Another RFID based attendance system prototype is presented in [3], which has low cost. It provides several advantages over conventional methods of taking students' attendance in the class. The prototype is compact, light weight & can be run using a power adapter or a battery. These make the system portable & easy to be carried to class.

In [4], an RFID based attendance system, consisting of hardware and software parts, is elucidated. The hardware part consists of a motor unit and a low-frequency RFID reader with frequency 125 KHz. The RFID reader is connected to a host computer via a serial to USB converter cable. A Time-Attendance System GUI has been developed in the host computer using visual basic.Net to provide various functionalities of the overall system, like displaying live ID tag transactions, registering ID, deleting ID, recording attendance and other minor functions.

To solve the recurrent attendance monitoring problem in developing countries, another attempt is made using RFID technology in [5], which can eliminate the time wasted during manual collection of attendance and provide an opportunity for the educational administrators to capture face-to-face classroom statistics for allocation of appropriate attendance scores and further managerial decisions.

Another system is proposed, which can record students' attendance using interactive input, generate reports, view students' and lecturer's profiles and provide students' timetable [6]. But, the system has used barcode scanner for recording attendance. The RFID technology has a number of advantages, which include simultaneous collection of large quantities of data with high accuracy and no contact [7]. Its influence to our lives is increasing day by day and it is to replace barcode in supermarkets, gradually. Currently, most of the RFID applications are for access control and goods location tracking, since RFID can identify individual goods. Intelligent RFID applications are bringing new research and commercial opportunities. It reduces costs, enhances customer services [6].

Most of the existing systems have tried to resolve the problem of taking attendance manually. But, almost all of them are unable to make the attendance system all around automatic. Many of them have used RFID technique to mark the attendances of present students only. But, those systems are not able to send any confirmation message to parents and college/school authority. In many cases, the attendances are marked using RFID technique and messages are sent to the parents of only those students, who are present. They are unable to send any message for a student, who is absent. A major problem in the existing approaches is that no one has applied an RTC to fix the duration for taking attendance. In existing systems, if a student comes late, he/she is considered to be present, which should not happen. These are the main problems in the existing systems.

III. SYSTEM DESIGN

The block diagram of the proposed system is as shown in Fig. 1

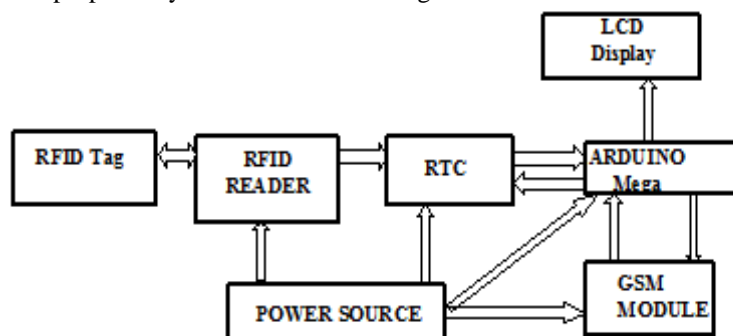


Fig. 1 Block diagram of the system

The hardware consists of RFID tags, an RFID reader, an RTC, an Arduino Mega microcontroller, an LCD display, a GSM module and power supply unit. The Arduino is an open source computer hardware and software development platform. It helps to design and manufacture single-board microcontroller-based kits for building projects with digital devices and interactive objects, which can sense and control objects in the physical world. Arduino IDE software is used for programming with the Arduino. The RFID tags contain at least three parts: an integrated circuit that stores and processes information, used to modulate radio-frequency (RF) signals, a means of converting incident reader signal into DC power and an antenna for receiving and transmitting the signal. The RFID reader is a network connected device, which may be fixed or mobile, with an antenna that sends power as well as data and sends commands to the tags. The GSM modem is a specialized type of modem, which accepts a SIM card. The RTC is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time. This device is used in personal computers, servers, and embedded systems. In general, RTCs are present in electronic devices, which need to keep accurate time. The LCD Display is needed to display text messages. The flow chart is shown in Fig. 2.

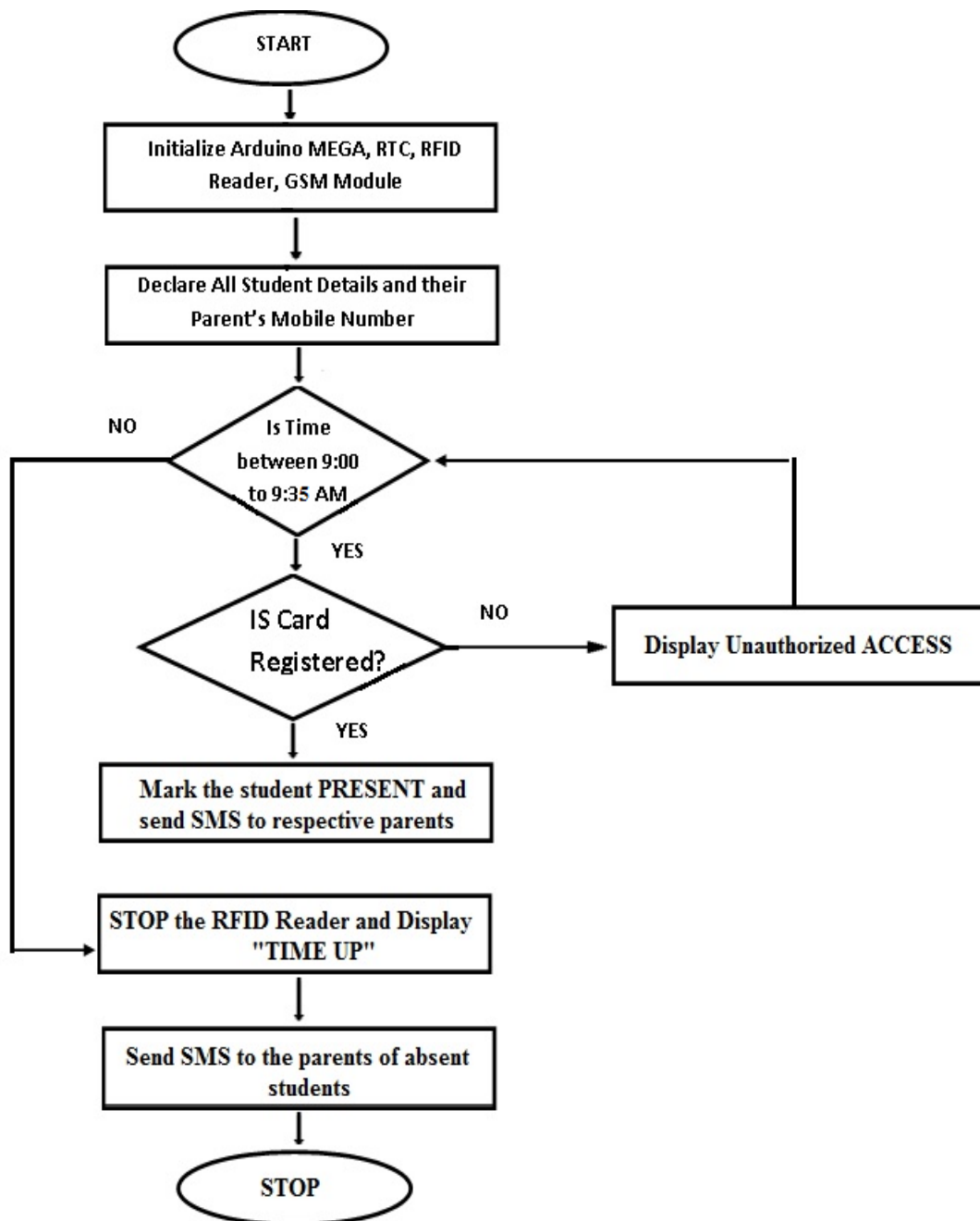


Fig. 2 Flow chart of the system

IV. CIRCUIT DIAGRAM

The complete circuit diagram is shown in Fig. 3.

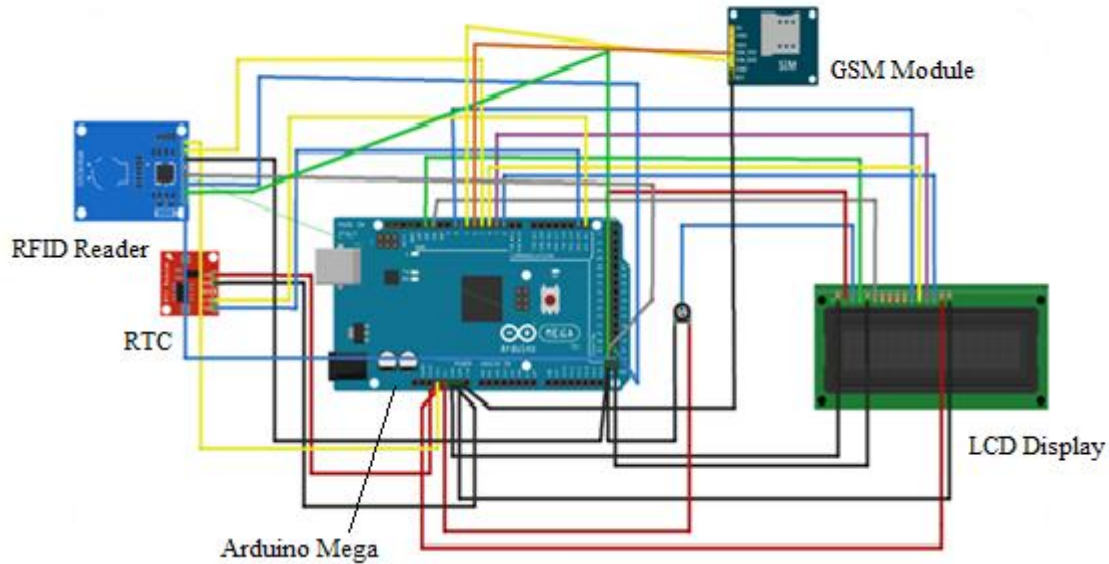


Fig 3 Complete circuit diagram

The RFID Reader is connected with Arduino Mega to read the RFID tag and verify whether the tag is assigned to any student or not. The RTC is connected to Arduino Mega to check whether the student has come on Time or late. The LCD is directly connected to Arduino Mega to show messages. When a student comes in time and places his/her RFID tag in front of the RFID reader, the LCD display shows welcome message. The GSM module is connected to Arduino Mega to send messages to the parents of both the present and absent students and the school authority. For proper function of the whole circuit, the power supply unit needs to supply two different voltages, one +5V and another +12V for connection with the Arduino Mega and GSM module, respectively.

V. RESULTS

First, the Arduino MEGA, RFID reader, RTC, GSM module are initialized after entering all students' details and their parents' mobile numbers into the database within the Arduino. The RTC tests whether the student has come within the allowed time period, which is 9:00 to 9:35 AM.

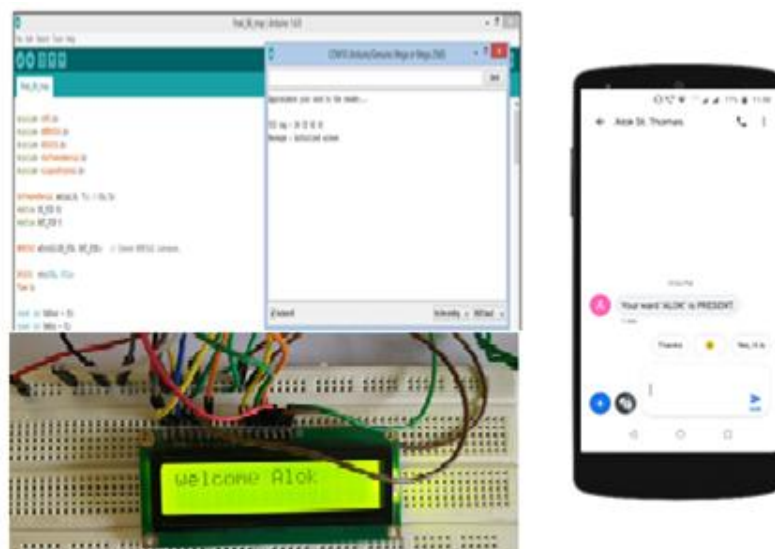


Fig. 4 The results of placing an authorized tag before reader and the corresponding SMS to the parents

If a student comes in between 9:00 AM and 9:35 AM, the RFID reader starts reading the corresponding RFID tag. The Arduino Mega consults the database to know whether the tag is registered or not. If the tag is registered, the serial monitor shows “AUTHORISED ACCESS” and the LCD (16x2) display shows “WELCOME XYZ” as shown in Fig. 4. Then, the student is marked as present and an SMS, saying “YOUR WARD IS PRESENT” is sent to the parents. If the tag is not registered, the serial monitor shows “ACCESS DENIED”, which is shown in Fig. 5. When a student comes after 9:35 AM, the Arduino Mega stops the RFID reader to read RFID tags, the serial monitor shows “ACCESS DENIED” and the LCD displays “Attd. time is UP”. The GSM module sends SMS saying “YOUR WARD IS ABSENT” to the parents of the absent student, as shown in Fig. 6.

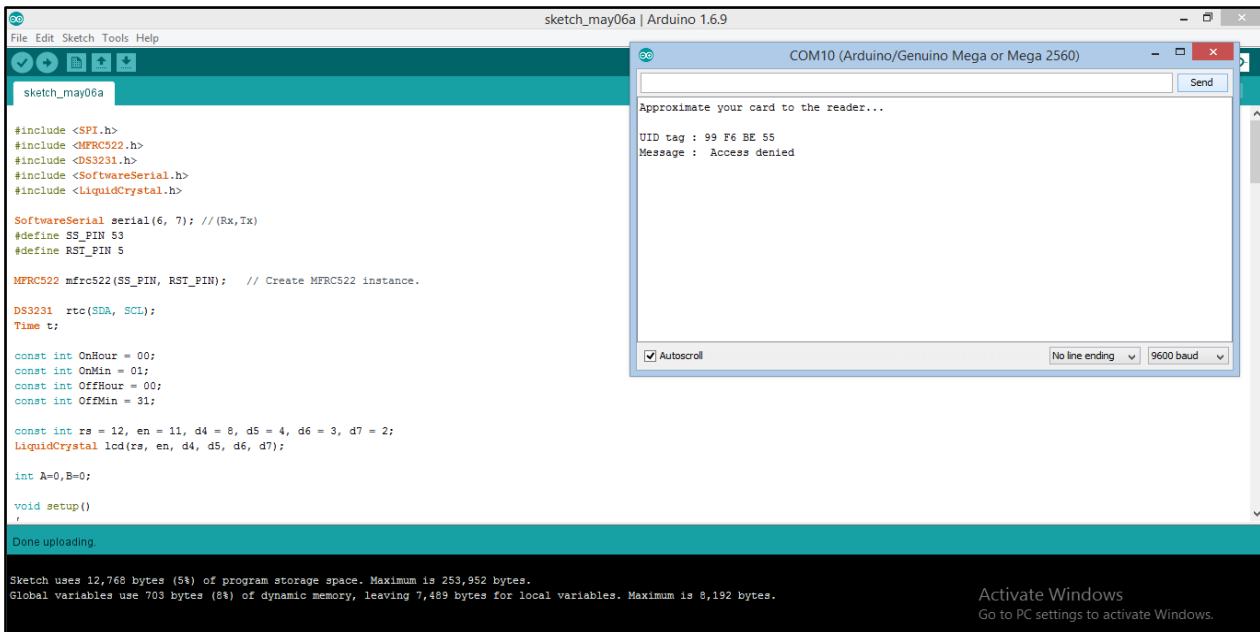


Fig 5 The result of placing an unauthorized tag before the reader

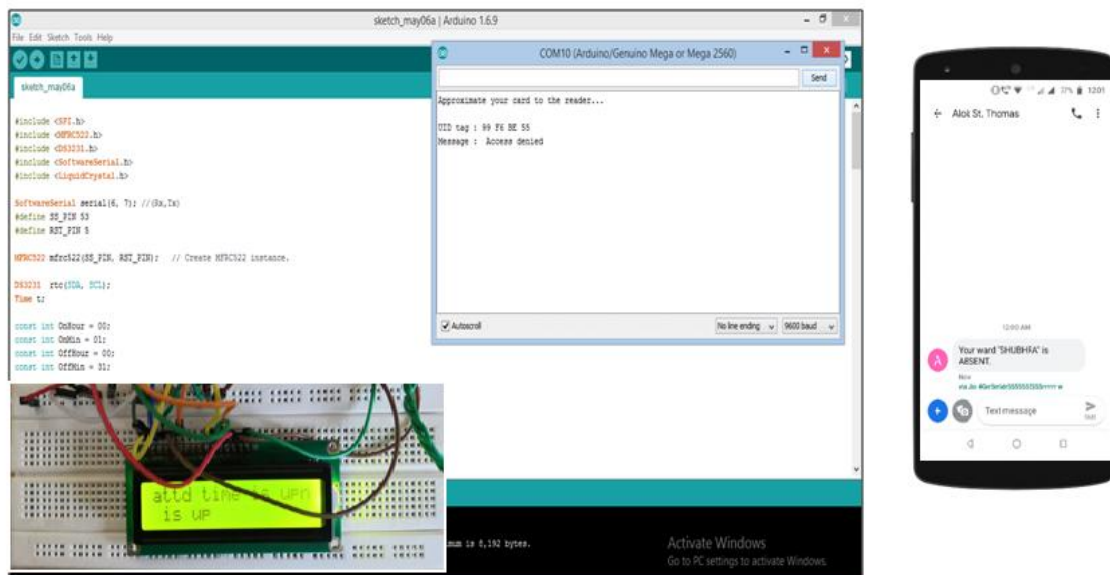


Fig 6 The results for a student coming after 9:35 AM

The attendance management system generates a database in the form of a table, as shown in the following, which is maintained by the school authority. When a student comes within time, attendance is marked successfully and message being sent to parents is shown in one column of the table. For a student coming late or not present, attendance is not marked and different message is written in another column of the same table. In this format attendance of every student is recorded in the database.

Table 1: Attendance Table

Date	Student Name	Attendance Time (9:00-9:35 AM)	RFID Card No.	Arrival status	Status	Message status	Message status
5/6/2019	Alok Kumar	9:10	D6 CD 5D 30	P. O. T	P	your ward is present	
5/6/2019	Shubhra Nandy	9:20	96 03 29 F8	P.O. T	P	your ward is present	
5/6/2019	Ayush Kumar	9:40	99 F6 BE 55	P.C. L	A		your ward is Absent
5/6/2019	Debayan Ray	9:50	D6 CD 6D 35	P.C. L	A		your ward is Absent
5/6/2019	Rahul Singh	9:20	96 43 79 F7	P.O. T	P	your ward is present	
5/6/2019	Atul Kumar	Nil	69 F4DE 55	Absent	A		your ward is Absent
5/6/2019	Amit Kumar	Nil	D6 FD 7D 20	Absent	A		your ward is Absent
5/6/2019	Aman Singh	9:28	96 23 39 F9	P.O. T	P	your ward is present	

P.O.T -Present on time
P.C.L – Present come late

P- Present
A-Absent

VI. CONCLUSION

A low-cost RFID based attendance system with SMS notification to parents as well as the school authority is presented in this paper. The system provides several advantages upon the standard method of taking attendance in class. The system can take automated attendance. It is closely packed, lightweight and consumes low power. It can be run using a power adapter or battery power. Therefore, it is very portable and can be carried to the class for taking attendance. The attendance taken is protected and precise since the tag ID has a unique 12-digit code. It is user-friendly with easily available switches and communication ports. Attendance can be stored and recovered easily. Another advantage of the system is that it has high identification and verification speed. This system can be applied not only in the classes, but also in working places with recording of the total working hours.

REFERENCES

- [1]. (2019) The wikipedia website. [Online]. Available: <https://en.wikipedia.org/>
- [2]. Zatin Singhal, and Rajneesh Kumar Gujral, "Anytime Anywhere Remote Monitoring of Attendance System based on RFID using GSM Network," International Journal of Computer Applications (0975 – 8887), vol. 39, no. 3, pp. 37-41, Feb. 2012.
- [3]. T.S. Lim, S.C. Sim, and M.M. Mansor, "RFID Based Attendance System," in IEEE Symposium on Industrial Electronics and Applications (ISIEA), 2009, paper 10.1109, p. 778.
- [4]. Ononiwu G. Chiagozie, and Okorafor G. Nwaji, "Radio frequency identification (RFID) based attendance system with automatic door unit," Academic Research International, vol. 2, no. 2, pp. 168-183, March 2012.
- [5]. O. T. Arulogun, A. Olatunbosun, O. A. Fakolujo, and, O. M. Olaniyi, "RFID-Based Students Attendance Management System," International Journal of Scientific & Engineering Research, vol. 4, no. 2, Feb. 2013.
- [6]. Sidi, Jonathan, N Syahrul, Junaini, and Lau, S. Ling, "Tracking Student Attendance using Interactive Student Attendance management System," in third Malaysian Software Engineering Conference (MySEC'07), 2007, p. 1.
- [7]. Dong-Liang Wu, Wing W. Y. Ng, Daniel S. Yeung, Hai-Lan Ding, "A Brief Survey On Current RFID Applications" in proc. of 8th International Conference on Machine Learning and Cybernetics, 2009.