Microcontroller Based Attendance System Using RFID and GSM

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Abstract – Integration of radio frequency identification technology and GSM technology had shown wide applications in the automation of electronic systems. In this paper the design of microcontroller based attendance system using RFID and GSM modem has been presented which will automatically update the attendance of the students and send the SMS to the absentee's parent for the continuous monitoring of the attendance of his/her ward.

Index Terms – RFID, GSM, Microcontroller.

1. INTRODUCTION

The conventional method of taking the attendance of students is through the manually maintained register and calling by their names or serial numbers. A lot of drawbacks are associated with this method like attendance not marked due to human error on both sides i.e. students as well as teachers, proxy attendance, time consuming etc. The role of radio frequency identification (RFID) technology in tracking objects and its implementation in automatic electronic equipments has been widely used by designers and found in the literature [1].A number of automated attendance system has been designed and reported using the RFID. M. Kamaraju in year 2010 presented the design of automated attendance system using RF technology [2]. In the year 2013 attendance system using RFID has been reported using GSM and RFID [3-4]. In year 2014 another web based attendance system using RFID has been presented [5].

In this paper prototype design of microcontroller based attendance system using RFID and GSM has been presented. The paper is organized as follows: Section II describes the design and working of the system, Section III explains the algorithm and flow chart of the designed system and finally section IV contains the concluding remarks.

2. DESIGN OF MICROCONTROLLER BASED ATTENDANCE SYSTEM

Fig.1 shows the block diagram of microcontroller based Attendance System. The complete system is designed around three microcontrollers (atmega16). The first microcontroller is interfaced with the RFID and is responsible for the student entrance into the class as well as the motor motion. The motor motion provides the physical barrier for the student entering the class. It also holds the temporary information of the student's presence within the time window (the time for which student entry and exit is allowed).

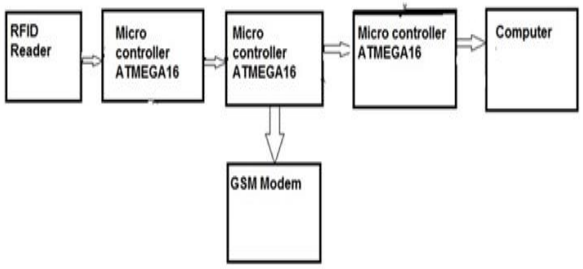

Fig.1: Block Diagram of Microcontroller Based Attendance System

The second microcontroller is interfaced with the GSM modem and is responsible for sending the notification message to the parents or concerned authority for a particular student who is absent for the class. The third microcontroller is interfaced with the computer and is used to maintain the database that holds the students attendance details.

Each student is given his characteristic RFID through which entrance is allowed in the class. The entrance is made quiet similar to the metro system, i.e. as soon as the student punches his card the door which in our case is the physical barrier opens or moves. This barrier is controlled by the motor which is controlled using the microcontroller atmega16 (the first microcontroller). As soon as the student enters the class, he passes from in front of the IR sensor which in turn closes the gate. This presence signal for the student in that class is temporarily stored in the microcontroller. A predefined window of 5minutes is available for the students to enter the class. During this window that student entry is allowed.Fig.2 shows the schematic of the design and Fig. 3 shows the PCB layout of the system design respectively.

The system is initiated or started as soon as a teacher's RFID is read. This marks the beginning of the 5 minute window in which the students are required to reach the class. As stated earlier the student enters the class through their respective RFID tag which sends a high signal against their name thus marking them as present. After the completion of this window the student information is stored temporarily in the microcontroller. If a student has entered the class and then again left within the window then also there is a low or absent signal against his name.

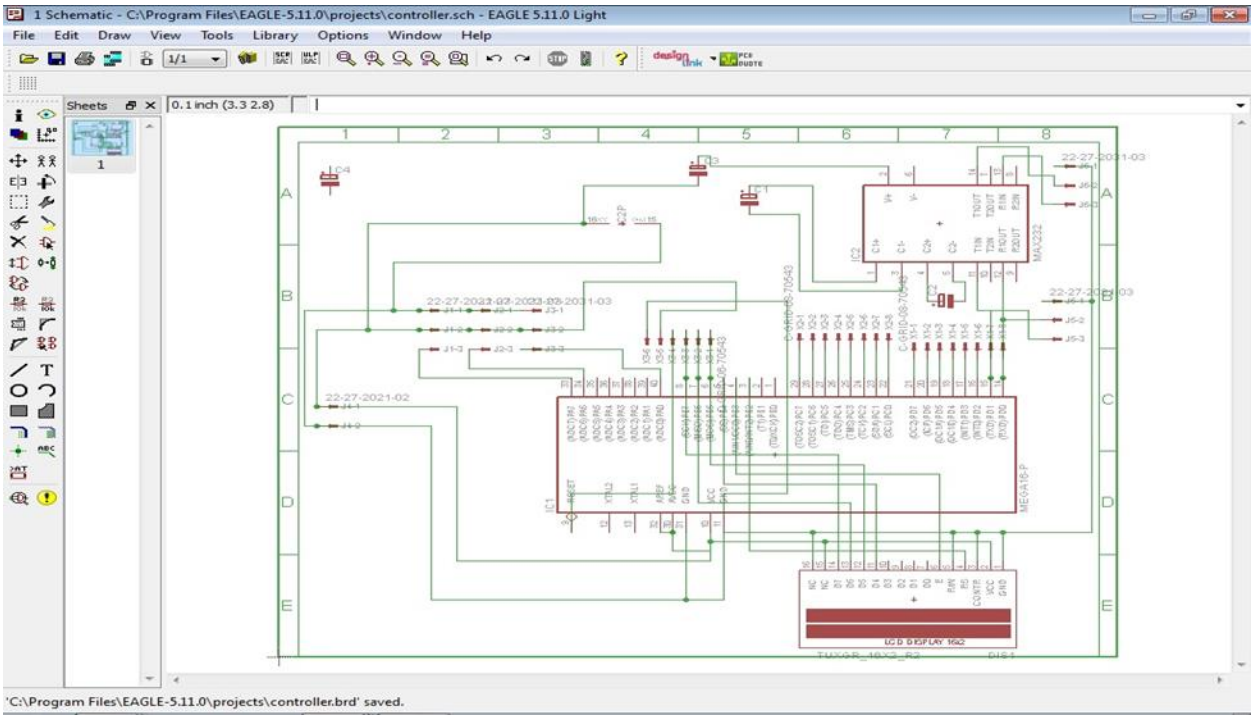

Fig.2: Schematic of the Designed System

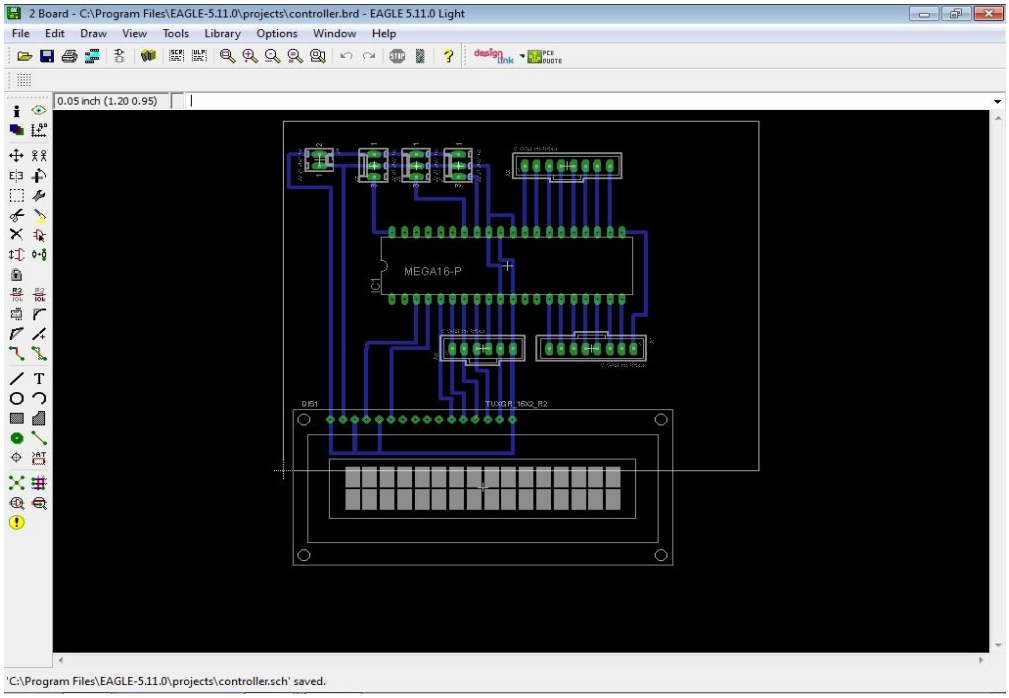

Fig.3: PCB Layout of the Designed system

Now once the period is over and the teacher punches his/her card to leave the class; it is now that the entire updating takes place. The signals are sent simultaneously to the other two microcontroller boards. These in turn send the notification message to the parents of the absent student (2nd microcontroller) as well as update the database regarding the student attendance (3rd microcontroller).

3. FLOWCHART AND SOFTWARE DESIGN

A. RFID PROGRAMMING

The RFID tag with students contains unique 12 digit number. When student /teacher swap their RFID tag the unique code from tag is passed to the microcontroller via RFID reader. The microcontroller compares the code with the stored code. If there is match then the motor is rotated anticlockwise and physical barrier opens and hence teacher/student enters .if the code doesn't match "access denied" is displayed on the LCD. After that the value of IR sensor is checked if there is any variation in the value then the motor rotates in clockwise direction and hence the physical barrier shuts. After the complete entry of the teacher /student the corresponding LEDS interfaced with the port of the microcontroller are lighten by sending a high signal/1. Fig.4 shows the flow chart of the RFID programming.

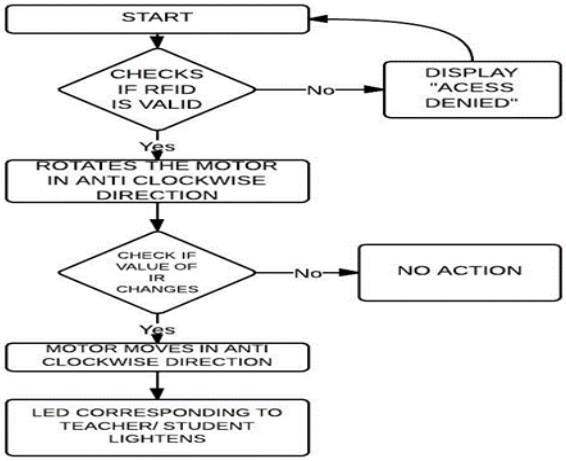

Fig.4: Flow chart of the RFID Programming

B. GSM PROGRAMMING

The prototype system has been tested which will allow maximum of two children and one teacher. In order to send the SMS to the parents of the absent students we have used AT commands. Since the SMS is only to be sent to the parents of absent students there will be four possibilities or conditions. In order to the check if the student is absent we have to monitor the status of pin c.1 & pinc.2. This status will be passed from the microcontroller 1 to microcontroller2.

CONDITIONS

PINC.1	PINC.2	RESULT
0	0	Both students are absent
0	1	Stud1 absent & stud2 present
1	0	Stud1 present & stud2 absent
1	1	Both students are present

For the first condition, when both students are absent, firstly the status of the pins is checked. Status of the both the pin is 0 indicates that both students are absent. Now the SMS will be sent to the parents of both students. Their mobile number will be stored corresponding to the pins. Pinc.1 represents stud1 whereas pinc.2 represents stud2. In this case SMS will be sent to both the parents. Fig.5-Fig.9 shows the various flow charts for GSM programming.

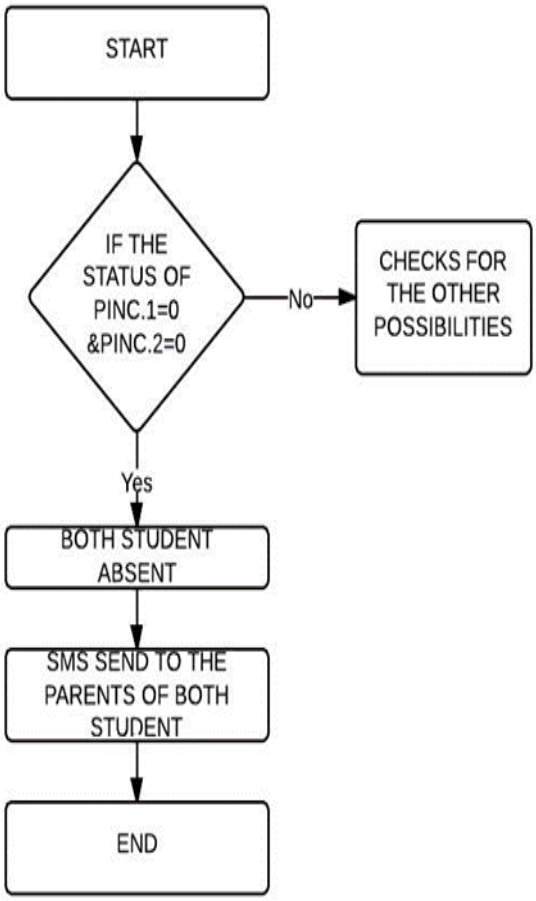

Fig.5:Flow Chart when both students are present

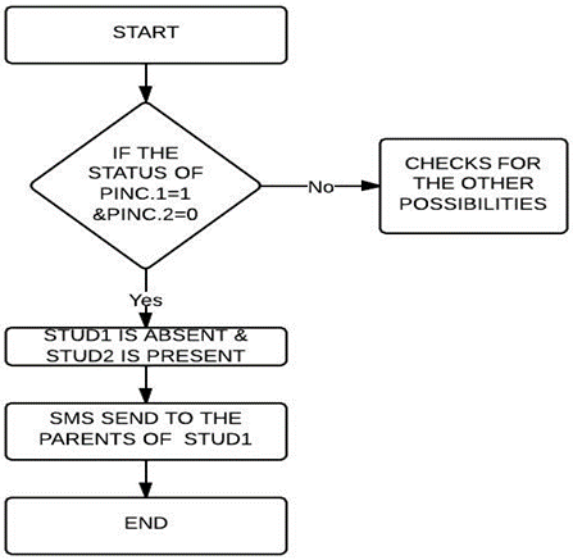

Fig.6: Flow Chart when student1 is present & student 2 is absent

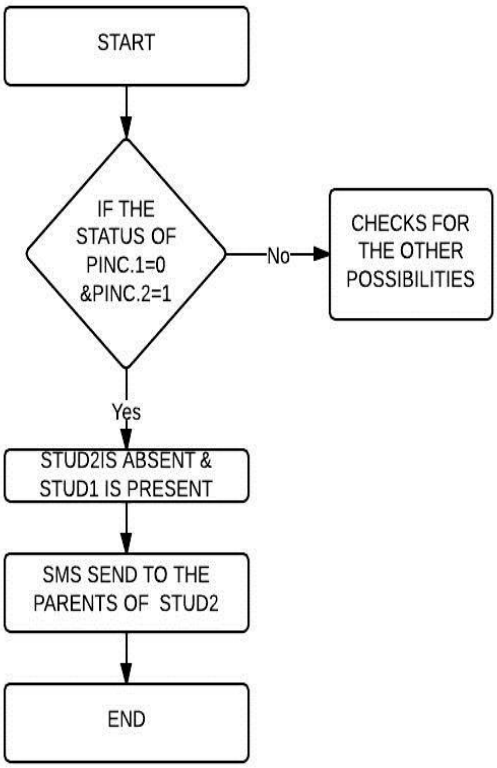

Fig.7: Flow chart when student 1 is absent and student 2 is present

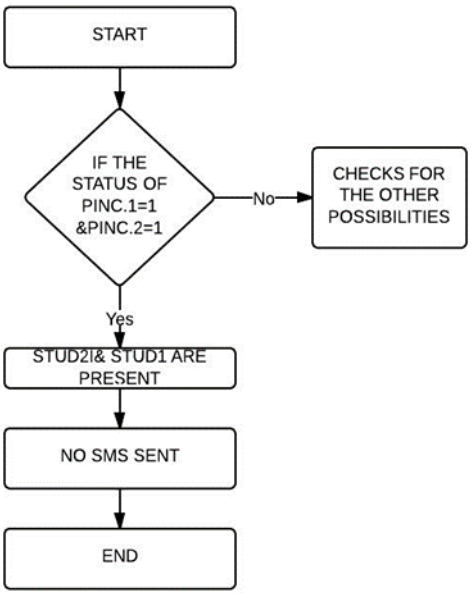

Fig.8: Flow chart when both students are absent

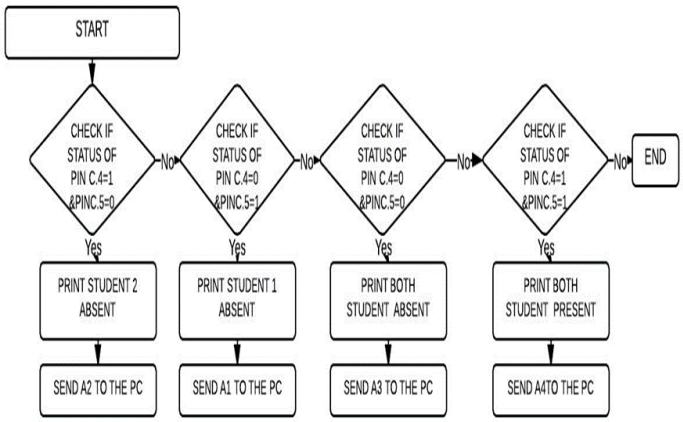

Fig.9: Flow chart for communicating with PC.

Pinc.4	Pinc.5	Interpretation	String to be send to the pc
1	0	Stud2 absent	A2
0	1	Stud1 is absent	A1
0	0	Both absent	A3
1	1	Both present	A4

C. DATABASE PROGRAMMING

Fig.10 shows the flow chart for the database programming. Firstly the string received from the ATMEGA 16 is check and interpreted as following:

A1 represent that student 1 is absent and student 2 is present.

A2 represent that student 2 is absent and student 1 is present.

A3 represent that student 1 and student 2 is absent.

A4 represent that student 1 and student 2 is present.

After this interpretation the excel sheet containing the record of the students attendance is updated. The present student can be identified by a symbol 'p' against their name and the absent student can be identified by symbol 'a' against their name.

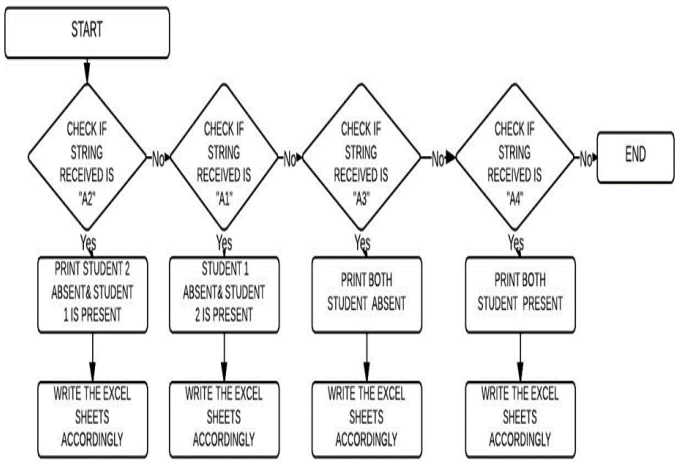

Fig.10: Flow chart for the database programming

4. CONCLUSION

In this paper prototype design of microcontroller based attendance system using RFID and GSM has been presented. The system automatically update the attendance in the database, sends SMS to the parents of the student who are absent, doesn't provide entry to the late comers, take care in case of proxy attendance. The system also has been provided with the security by giving the condition that it will be available for the students only after the teacher have swapped his RFID and made his entry.

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