



RFID BASED STUDENT STATUS IN SCHOOL BUS

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ABSTRACT

In a day, many children need to be moved from home to school and school to home. Many children enter into the wrong bus or leave at the wrong place. For parents safe transportation of their school children is a big concern. This proposed system aims to provide a safe transportation for school children, from home to school and vice versa and sends an email notification to parents when children have boarded/unboarded the bus. This preferred system uses the application of Radio Frequency Identification in tracking children during their trip to and from school on school buses. RFID is preferred for this system because it is faster than barcode and smart card systems and cheaper than biometric system. In this system each children will have a RFID card and RFID reader will be placed on the door or the entry gate of the school bus. Whenever children wants to enter in the bus or exit from the bus they have to show the RFID card to the RFID reader. Children have to take the RFID card near to the RFID reader then the RFID reader will note down the RFID card number which is unique of each children and the time at which the children boarded/unboarded the bus. This RFID system is divided into two parts first is bus unit and another is school unit. In the bus unit a children have to show RFID card when pick up from home/school and drop to home/school. This information is transmitted to the school unit by using zigbee module that identifies which of the children did not board or leave the bus and issues an alert message accordingly to the parents by email. In the school part all the information of a children is stored in the form of a database.

Keywords—RFID (Radio frequency identification); Student safety; HTML; SQL; Zigbee module;

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1 INTRODUCTION

The number of crimes against children is increasing day by day. In present time parents are worried about their children due to missing of children, child kidnapping and road accident cases. In this proposed system the aim of using RFID technology is to increase the efficiency, reduce data

entry errors and free up staff to perform more value added function. Radio Frequency Identification (RFID) is a technology that uses radio waves to transmit data from an electronic tag, called RFID tag attached to an object through a reader for the purpose of identifying and tracking the object. The system here automatically detects when a child

enters or exit the bus. It additionally sends a message when a children enters or exit the bus to reduce the parents concern about using the bus for the daily transport of their children. In this project the RFID reader is interfaced to the microcontroller (PIC16F877A). So first children have to insert the RFID card number into the microcontroller memory it can be done by school authority person while issuing the RFID card. Whenever a new child joins a school at that time RFID card will be issued and same card number is stored in the microcontroller program memory. For each children only one RFID card will be used for pick up and drop operation. If any unauthorized/outside children have a RFID card and this card does not have entry in our system and if he/she shows card to the reader, then microcontroller will check and find this card is not stored in memory. So the children strength is not incremented in the bus by unauthorized card.

The rest of this paper is organized as follows: section II describes in brief RFID technology, in section III system design is presented, in section IV result is discussed and finally conclusion is discussed in section V.

2 RADIO FREQUENCY IDENTIFICATION

In recent years, There is a wide research and development in this area trying to take maximum advantage of this technology, and in coming years many new applications and research areas will continue to appear. RFID is a superior and more efficient way of identifying and tracking objects than any other systems. RFID does not require line of sight or contact to "see" an RFID tag, the tag can be read inside a box or other container, and at a time many RFID tags can be read by a reader. Bar codes can only be read one at a time. This technique is safe, secure, faster and easy to use with lower overheads in contrast with the other conventional techniques such as bar code, biometrics etc.. There are several methods of identification and tracking, but the most common is RFID, in which a RFID tag stores a serial number that identifies a person or object, and perhaps other information of a person or object on a microchip which is inside the RFID tag, microchip is attached to

an antenna (called an RFID tag). The antenna enables the microchip to transmit the identification information of a person or object to a reader. When RFID tag is shown to RFID reader the RFID reader receives radio waves from RFID tag and converts the radio waves into digital information that can then be passed on to microcontroller that can make use of it. Radio frequency identification (RFID) uses radio waves to automatically identify people or objects. If range of RFID system is above 1m these type of systems are known as long-range systems. Range of 3m can now be achieved using passive (battery-free) transponders, while ranges of 15m and above can even be achieved using active (battery-supported) transponders. The battery of an active tag, never provides the power for data transmission between RFID tag and reader. The power of the electromagnetic field received from the reader is the only power used for the data transmission between tag and reader. One of the most important characteristics of RFID systems is the operating frequency and the resulting range of the system. The operating frequency of an RFID system is the frequency at which the reader transmits. The transmission frequency of the tag is disregarded. In most cases the transmission frequency of the reader and tag are same. The three different transmission frequency ranges are, low frequency (30–300 kHz), high frequency (3–30MHz) and ultra-high frequency (300MHz–3 GHz). RFID reader transmits electromagnetic waves around its surrounding region. Whenever an RFID tag comes under the coverage of radio waves of reader, it sends back unique id number which is stored within the tag called an Electronic Product Code (EPC). The reader itself is not able to process the information sent by tags. So it needs the support of a computer. Computer receives the information from RFID reader and stores the information into database. In the system of RFID Based Student status in school bus with Notification to Parents, the passive type RFID reader is used whose maximum range of detection is around 10cm. It operates at frequency of 125 kHz (low frequency) and 12V power supply.

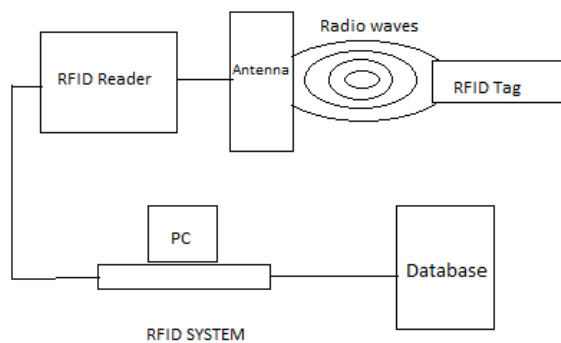


Fig. 1. RFID system

RFID system consists of two parts RFID Reader (Interrogator) and RFID Tag (Transponder).

2.1 RFID Tag: The RFID tag consists of an antenna, a transceiver, and an Integrated Circuit (IC) with memory. A tag consists of a microchip that stores a unique number, also called electronic product code (EPC). In a tag microchip can store maximum of 2KB of information. The tag memory can be read-write or read-only, read-write chips can be reprogrammed multiple times but read only chips have information stored on them during the manufacturing process. So in these chips information is permanently stored information on such chips can never be changed. RFID tags are powered and classified as active or passive. Active RFID tags have a battery that allows for long read range, Passive tags have no battery, so these tags do not have any power supply. Through the tag antenna, the magnetic or electromagnetic field of the reader provides all the energy required for operating the tag. Semi-passive tags use a battery to run the chip's circuitry, but communicate by drawing power from the reader. Active and semi-passive tags are useful for tracking long ranges. In this proposed system passive RFID tags will be used for the children monitoring because passive RFID tags operating distance is limited to the readers range. So by using passive RFID tags, it will only detect the children when they are inside the bus. But if the child was outside or near the bus, the reader will not detect him. Passive tags are cheaper as compared to active tags and they do not need maintenance.



Fig. 2. RFID tag

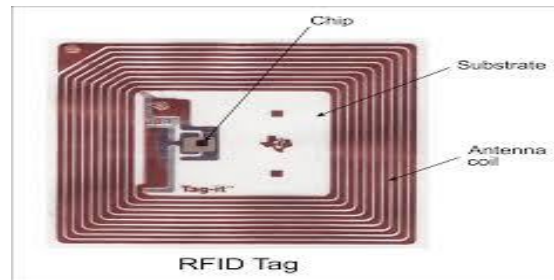


Fig. 3. RFID tag

2.2 RFID Reader: The RFID reader has an antenna, transceiver, power supply, and an interface for connecting it to a computer. Wireless communication is used in between RFID tags and RFID Reader. The tag exchanges data with the reader using radio waves that are operating to the same frequency as the reader and within the operating range of the reader. Reader does not require line of sight with tags for communication. RFID reader interfacing with Microcontroller is done using serial port. RFID reader will communicate with Microcontroller using serial communication. When RFID tag comes in the field of operation of RFID Reader, then RFID reader detects RFID card and sends the unique tag number to microcontroller. And then microcontroller will compare the incoming chip number with the number which is stored in program memory of microcontroller. The RFID reader used in this system operates at a frequency of 125KHZ and 12V power supply with a read range of 10cm only.

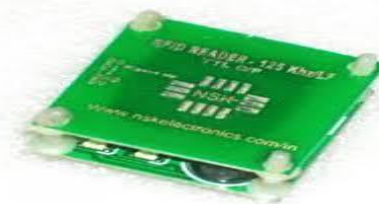


Fig. 4. RFID reader

3 SYSTEM DESIGN

In order to implement the RFID Based Student status in school bus System with Notification to Parents by email, the bus unit and school unit are discussed below.

3.1 Bus unit: The Bus unit in our proposed system consists of RFID tags, RFID reader, PIC16F877A, Zigbee module and an LCD display. The RFID reader is interfaced to the PIC16F877A which in turn is interfaced to the LCD display that keeps track of the number of student in the bus and their name. The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontroller with PC. RFID reader is kept at the door of the school bus and monitors the boarding and unboarding of the students. The RFID reader is positioned in such a way that it will only detect the children when they are inside the bus. In our proposed system passive RFID tag and reader of low frequency is used so that whenever the student is outside or near the bus, the reader will not detect him.

3.1.1 PIC16F877A microcontroller: PIC16F877A microcontroller is used for this proposed system. When a student shows RFID tag to RFID reader the RFID reader sends the RFID tag no. to the microcontroller, The PIC microcontroller compares the receive RFID tag no. to the tag no. which is stored in microcontroller memory if the RFID tag no. matched then the student is authorized else unauthorized and this information is updated in the database through a zigbee module. The microcontroller programming is done using Embedded C, a middle level language for control units. Some features of PIC16F877A microcontroller are

1. RISC architecture only 35 instructions to learn
2. Operating frequency 20 MHz
3. 8K ROM memory in FLASH technology, Chip can be reprogrammed up to 100.000 times
4. 256 bytes EEPROM memory
5. 368 bytes RAM memory

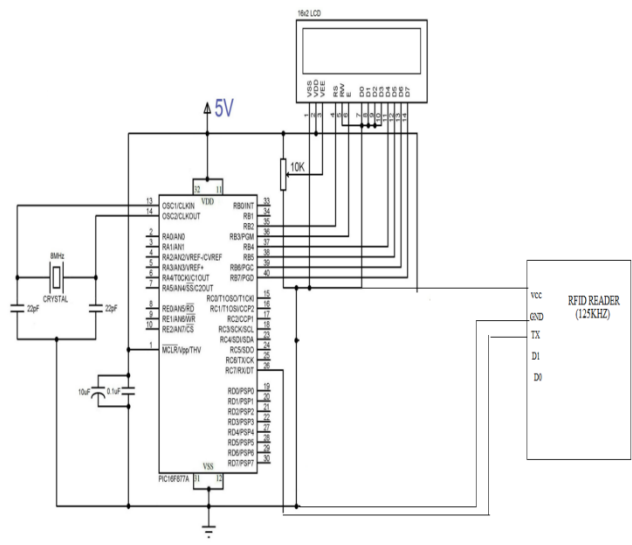


Fig. 5. Pin connection diagram

3.1.2 ZIGBEE Module; ZigBee is a low-cost, low-power, wireless mesh network standard targeted at the wide development of long battery life devices in wireless control and monitoring applications. For this proposed system zigbee transmitter of 2.4GHZ is used.

3.1.3 FLOWCHART

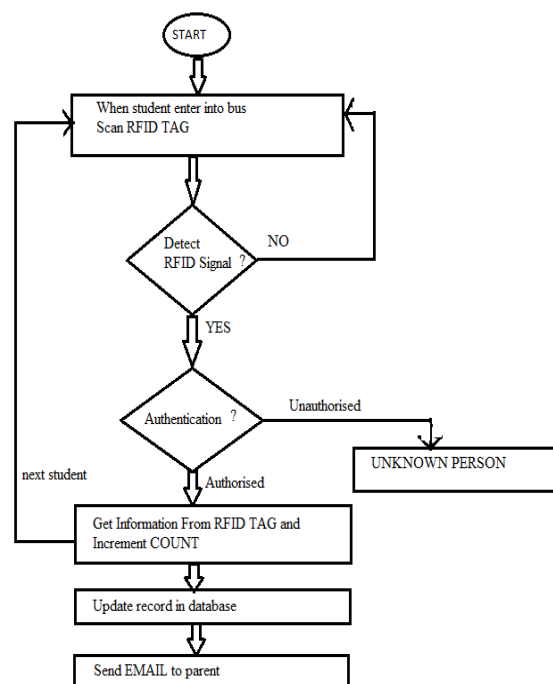


Fig. 6. flowchart of entry unit in bus

3.2 School unit: The school unit in our proposed system consists of a database interfaced with Zigbee module to receive data from the bus unit. The school unit consists of a separate Zigbee module that acts as a receiver. The server simultaneously acts as database server and web server. The entire details of the student is stored in the form of a MySQL database. The school unit also acts as a host for the web-application. The web application consists of two portal parent login and administrator login. The administrator login allows the administrator to modify/update the records in the database and query the system database. The parent login is developed to enable the parents to view the record and attendance status of their own child. In this unit once the student tags in the bus his record is immediately updated to the school server along with the time. Based on this received information, other related child's information is retrieved from the database and an alert email is sent to their child parents.

4 RESULTS

4.1 WEB PAGE VIEW: The below figure shows the front view of our web page. In this diagram there are two logins:

1. Admin login
2. Parent login

And for each login different login credentials (username and password) is required.

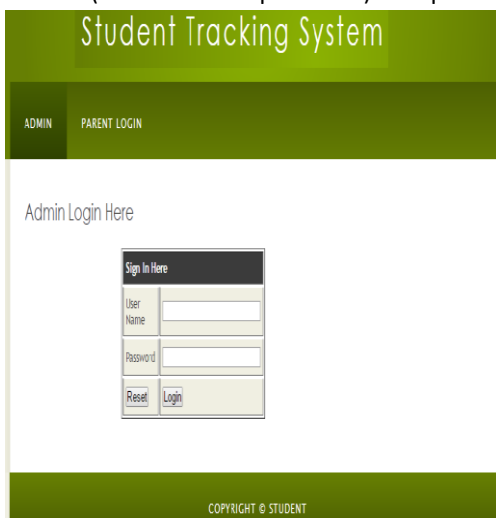


Fig. 8. Web page

4.2 ADMINISTRATOR LOGIN

This is accessible to admin only where the admin person can enter username and password to access the system this diagram shows all the options available under administrator login. Administrator has four options

1. Registration
2. Verification
3. Update
4. Logout



Welcome Admin



Fig. 9. Administrator login page

4.2.1 REGISTRATION

The below figure shows the registration page which contains details of student information during admission under administrator login.



Welcome To Register Page

RFID No	<input type="text"/>
Name	<input type="text"/>
Parents Email	<input type="text"/>
Department	<input type="text"/>
<input type="button" value="RESET"/>	<input type="button" value="REGISTER"/>

Fig. 10. Registration page

4.2.2 VERIFICATION

The below figure shows the verification page under administrator login, in the verification page administrator can check the status of all students when they board or unboard the bus.



Welcome To Verification Page

S.NO	RFID NO	Name	Department	Parents Email	Boarding	Unboarding
1	0	null	null	null	2016-04-06 23:50:16	2016-04-06 23:54:19
2	14739	Puneet	ECE	puneetmittal666@gmail.com	2016-04-06 23:51:03	2016-04-06 23:51:57
3	63220	Nitesh chauhan	ECE	niteshsingh.chauhan2012@vit.ac.in	2016-04-06 23:51:47	2016-04-06 23:53:30
4	14739	Puneet	ECE	puneetmittal666@gmail.com	2016-04-06 23:53:50	2016-04-06 23:54:01
5	0	null	null	null	2016-04-06 23:55:03	2016-04-06 23:56:24
6	14739	Puneet	ECE	puneetmittal666@gmail.com	2016-04-06 23:55:49	2016-04-06 23:56:04

Fig. 11. Verification page

4.2.3 UPDATE

The below figure shows the update page under administrator login. Administrator can change/modify the personal information of the student.



Update Here

ID No	Name	Class	Parent Email	Update
0	null	null	null	Edit
14739	Puneet	ECE	puneetmittal666@gmail.com	Edit
63220	Nitesh chauhan	ECE	niteshsingh.chauhan2012@vit.ac.in	Edit

Fig. 12. Update page

4.3 PARENT LOGIN

The below figure shows the parent login page, parents can check the status of their school children when they board or unboard the bus.



Profile

ID Number	Student Name	Department	Parent Email	Board	Un Board
14739	Puneet	ECE	puneetmittal666@gmail.com	2016-04-06 23:51:03	2016-04-06 23:51:57
14739	Puneet	ECE	puneetmittal666@gmail.com	2016-04-06 23:53:50	2016-04-06 23:54:01
14739	Puneet	ECE	puneetmittal666@gmail.com	2016-04-06 23:55:49	2016-04-06 23:56:04

Fig. 13. Parent login page

4.4 EMAIL

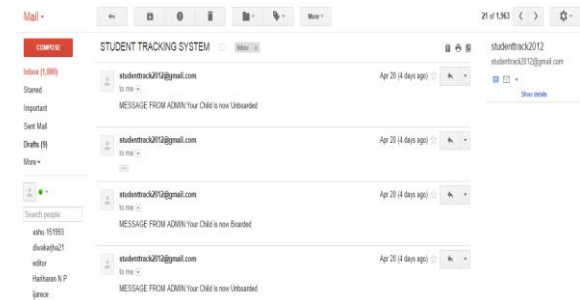


Fig. 14. Email to parents to check their school children board/unboard status

5 CONCLUSION

This paper presented an RFID based school children system that aims to provide safety to a school children during the daily bus trip to and from school on school buses. In this system each children will have a RFID card and RFID reader will be placed on the door or the entry gate of the school bus. Whenever children enters into the bus he/she has to show the RFID card to the reader. Children have to take the RFID card near to the RFID reader then the RFID reader will note down the RFID card number which is unique of each children and the time at which the children board/unboard the school bus. When children boards/unboards the bus an Email will be sent to their parents. In addition, there is a separate online portal having two logins. Parent login allows parents to check the details and status of their children at any time while administrator login allows the administrator to modify/update as well as view student details.

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