

# SMART SCHOOL BUS MONITORING SYSTEM USING RFID

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## Abstract:

On reviewing the past work of school bus tracking, monitoring and alerting system, there is a possibility to categorize various methodologies and identify new trends. One among them is a challenge for vehicle tracking, monitoring and alerting system. Now-a-days with the increase in the crime rate and accidents, Student often get on the wrong buses and get off at the wrong stop. Bus drivers may be unable to identify all student and will not know in time if a student is missing. Parents have no way of knowing if their ward is safe until the evening when they return there is no provision to monitor driving with in speed limit unscheduled deviation. School student aren't allow phones. Working parents have no way of knowing if and when their kids get home. There is no reliable method for tackling delays or accidents, which further aggravate parents. This project makes use of the applicability of radio frequency identification (RFID) technology for tracking and monitoring children during their trip to and from school on school buses. And it has the advantage of efficient tracking capabilities, low cost and easy maintenance. The RFID tags are effective and it is used for tracking and monitoring children. Fire sensor is also used in this project to detect any fire accidents. send a message to the parents through SMS. The system consists of three main units, bus unit, parent unit and school unit. The bus unit is used to detect when a child enters/exits from the bus using RFID Card. This information is communicated to the parent unit and school unit that identify the presence of children. The system tracks the school bus by the IOT.

Keywords — Global Position System, Radio Frequency Identification, PIC16F877A microcontroller, Sensors.

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## I. INTRODUCTION

This project makes use of the applicability of radio frequency identification (RFID) technology for tracking and monitoring children during their trip to and from school on school busses. And it has the advantage of efficient tracking capabilities, low cost and easy maintenance. The individual RFID tags are effective and it is used for tracking and monitoring children. Fire sensor is also used in this project to detect any fire accidents. send a message to the parents through SMS Gateway. The system consists of three main units, bus unit, parent unit

and school unit. The bus unit is used to detect when a child enters/exits from the bus using RFID Card. This information is communicated to the parent unit and school unit that identify the presence of children. The system tracks the school bus by the IOT.

Smart bus tracking system has been proposed that when any student enter into bus the alert message will send to their parents and also arrival times, buses current locations, and bus routes on a map can be easily found out with the help of IOT. GPS (Global Positioning System) and Google maps are used for navigation and display services

respectively. Millions of children need to be moved from home to school and vice versa every day. For their parents, getting a safe transport for their children is a crucial issue. At present days all are very much aware about the safety concerns. At the same time parents can send their children to schools which have high reputation and all facilities. Now-a-days all schools have bus facilities, even by their child are going to school through school bus parents have some worry about their child, whether they reached safely or in a dangerous situation. This system gives an alert message when child boards and leaves the bus using the RFID tag wore by the child by placing that tag before the RFID reader. The sensors and RFID reader are interfaced with Microcontroller. Each RFID tag has an information about an individual children which was sensed by an RFID reader transmit the corresponding information to their parents using SMS. The outputs This SMS Gateway can sends the messages to authorized persons according to the received data . For instance, the Australian College of Road Safety says that bus travelling in the safest form of road transport system is safer than the private car for the children, and that the record for school bus travel in particular is very good . Global Positioning System and Global system for mobile communication module is designed for tracking and positioning the school bus. Also, the research undertaken by National Highway Traffic Safety Administration in USA notes that when comparing the number of fatalities of children aged 5 to 18 years during normal school transportation hours, school buses are 87 times safer than private cars . However, headlines like “Girl dies in bus tragedy”

from the May 18, 2010 issue of the Peninsula newspaper in Qatar seems to be repeated several times every year in different places of the world . This system will issue the messages to parents to convey them that their children are reached to school safely, and they are in the school and also give an alert message if any fire accident occurs. The tracking system includes the location and speed of the vehicle in current movement, speed of the vehicle is monitored and then SMS alert is send to the parents through the SMS Gateway. The proposed system shows that the RFID tracking

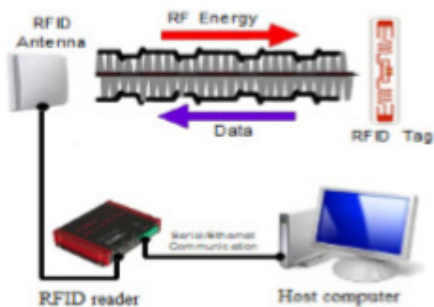
technology is a practical option for monitoring and tracking the child during their trip to and from school on school bus. The system tracks the school bus by the GPS Module and also gives an alert if the bus crosses the speed limit. The GPS Module is used for Live Tracking of the School Buses and alerting if fire accident occurs and send an alert message to the parents, school .

## **2. Literature Survey**

The project idea is to put an end to incidents like Innocent children are ending their lives for unworthy reasons . There are many systems which provide security to the school children. The use of RFIDs makes it easier to maintain and use, but could not give the certain information about the situation in the bus i.e. this system does not provide any information when children are in dangerous situations . To track the live location of the bus for the speedy recovery when it is subjected to accidents .To intimate the school management and parents about the hazardous situation in the bus . To avoid the rash driving and to intimate when the bus is subjected to tilt this paper devised a method to identify the students are dropped at correct locations and if they are dropped elsewhere the location is identified and alert is sent to parent. The system monitors the children inside the bus in a safer manner. It uses the combination of RFID (Radio Frequency Identification), GPS (Global Position System) technologies. Each Student carries a unique RFID card embedded in each of the student’s school bags. When the student enters or exits from the bus the reader records and transfer data in the database. Radio Frequency identification (RFID) is used to transmit Information of a subject using radio waves .

This information consists of unique digital number which differentiates various objects. An RFID system is made up of two different parts viz. RFID tag and RFID reader . There is a microchip antenna inside tag; This chip consists of useful data in different forms. A study has showed that, the performance of reader decreases rapidly with increase in a distance .Children carries the unique RFID card. This RFID card is embedded on his

own smartcard. When children in or out from school bus, reader will record a response and send an alert to parents and school. The system shows an efficient and systematic way of using RFID tracking applications coupled with smart phone technologies to fulfill the key security and monitoring purposes. In order to optimize the proposal, this paper investigated the effects of variable localization of RFID tags from reader and power loss, inefficiency and distance constraints caused due to equal power allocations to the tags. Reducing the number of reader by using smart antenna in RFID and increasing coverage area, several other sectors will be hopefully able to leverage the benefits of RFID technology.



**Figure 1.** Typical Passive RFID System.

The RFID reader consists of an antenna, power supply, processor, transceiver and an interface for connecting it to a host computer (i.e. via serial port, or Ethernet). The RFID tag has an antenna, a transceiver, and an Integrated Circuit (IC) with memory. The performance of the RFID tag is determined by factors such as IC technology used, the read/write capability, the read range, the radio frequency, and external factors such as the environment and packaging.

### 3. Proposed System

In this system PIC16F877A microcontroller has been used. The system consists of three units, bus unit, school unit and parent unit. Bus unit consists of RFID Reader, Fire sensors and SMS to alert messages to parents when their children boards or leaves the bus. Fire sensor will be placed within the

busunit to detect fire and issues alert messages by giving the location of the bus using IOT. School unit consists of RFID Reader and GSM Module. The entire data in two units will be processed by using PIC16F877A microcontroller. PIC16F877A microcontroller is used in this system. This processor has advantages like, total number of pins 40 and there are 30 pins for input and outputs, 368 RAM bytes, 5MIPS CPU speed, 8 channels of 10 bit ADC converter is used.

In this system Fire sensor is used to detect the fire accident. If there any fire accident occurs, The alert message will be send to the school unit and parents with the help of IOT and SMS . Each student consist of an individual RFID tag with the help of RFID tag, IOT. Parents and school unit can receives an alert message. The information of RFID tag is read by RFID reader. The reader transmits the corresponding information. RFID tag is used to send an alert message like the location of a person, speed of the bus to their respective parents. In this system IOT is used to send the alert message to the parents if their respective child is get in the bus or get down the bus with the help of RFID tag and reader. LCD stands for Liquid Crystal Display is a flat panel display technology commonly used in TVs and computer monitors. It is also used in screens for mobile devices, such as laptops, tablets, and smartphones. The backlight in liquid crystal display provides an even light source behind the screen. This light is polarized, meaning only half of the light shines through to the liquid crystal layer. The liquid crystals are made up of a part solid, part liquid substance that can be "twisted" by applying electrical voltage to them. They block the polarized light when they are off, but reflect red, green, or blue light when activated.

ADC Power Supply Unit (commonly called a PSU) deriving power from the AC mains (line) supply performs a number of tasks: It changes (in most cases reduces) the level of supply to a value suitable for driving the load circuit. It produces a DC supply from the mains (or line) supply AC sine wave. It prevents any AC from appearing at the supply output. Power supplies in recent times have greatly improved in reliability but, because they have to handle considerably higher voltages and

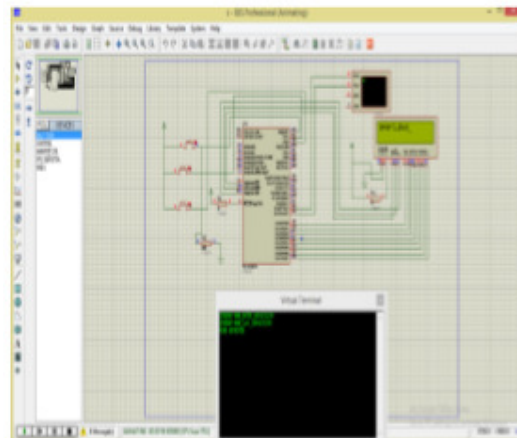
currents than any or most of the circuitry they supply, they are often the most susceptible to failure of any part of an electronic system. GPS is a satellite navigation system used to determine the ground position of an object. Each GPS satellite broadcasts a message that includes the satellite's current position, orbit, and exact time. A GPS receiver combines the broadcasts from multiple satellites to calculate its exact position using a process called triangulation.

#### **4. Implementation**

In this paper, school bus tracking and monitoring has been proposed. RFID is used for the identification of the children. Each student has their individual RFID tag with the help of the RFID tag the student can monitored by their parents and also by school. When the student enters or exits from the bus the reader records and transfer data in the database. For every entry and exit RFID tag is sensed by the RFID reader. The number of students can be counted in the bus. Here front door is considered as the entry door and rear door is considered as the exit door. Sensor is fixed on both the doors and the sensor count the exit and entry of the student. Only one person can entry or exit at a time. The RFID reader read the tag and send an alert message to their respective parents through GPS . The front door sensor increase the count. The rear door sensor decrease the count and both the sensor calculate the total number of students present. Fire sensor is used to detect if any fire accident occurs, it will send an alert message to parents, school, and fire engine. The tracking system details will be sent to the server at the school side for storage and on the mobile device to the parents. The information of students is stored in a database at a school side. The proposed system is used to detect the speed of the vehicle and send an alert to the parents, if the bus cross the speed limit. Parents use the Google map in android to track the bus. If the parents open the Google map the speed of the bus and the current location of the bus can display in the android. The GPS module is used to send the alert message to the parents and also to the school

unit. The LCD display is fixed in the school bus to display the identification of the student to the driver.

The proposed system is used to intimate parents about the bus location and also about the child boarding to the school bus. The system addressed t faced by parents of waiting on the bus stop for long duration. The system includes RFID for unique identification and the GPS is used for the location tracker which is inbuilt in the android phone. The complete location and children details are database. Each student has the unique key at the school side to display the student details not only at the entry and exit of the student at any time. If the first key is pressed the respective student details displayed in the android mobile in school unit. A key is fixed in a bus unit at a driver side to send an alert message to parents which overcomes the problem faced by the parents of waiting on the bus stop for long duration. The GPS module which is present in the android mobile starts to track the location of the bus in the form of latitude and longitude.



**Figure 2.** Simulation result

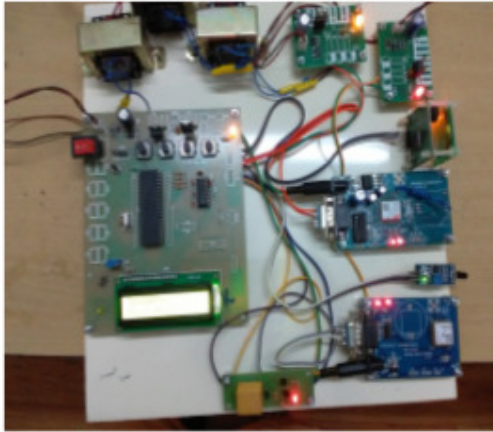
The Proposed System consists of hardware parts and android and web based application as shown in the Figure 2. The proposed system is divided into 3 main units as shown in figure 3.

- A. Bus unit
- B. Parent unit
- C. School unit

#### **A. Bus unit**

The Bus Unit is used for detecting the child when the child enters and exits the bus and send this information to the School Unit as well as parent unit. The Bus Unit consists of:

- a. RFID Technology: RFID Reader and RFID Tag (Radio Frequency Identification Detection).



**Figure 3.** Overall view of 3 modules

- b. GPS Module: Global Positioning System
- c. Switch
- d. PIC16F877A Microcontroller.

The functions of RFID Reader are integrated with the RFID Tags. The RFID Reader is attached at the entrance of the bus and the RFID Reader module works as both transmitter and receiver of the radio frequency signals. The RFID Tag is enhanced in students ID card. The GPRS Modem is used for communication with the Server via GPRS. The GPS Module is used for Live Tracking of the School Buses and alerting if the bus crosses the speed limit in build in GPS Module. The switch board consists of a button where, when the bus is in major trouble can press the button as by microcontroller can communicate with the server.

## **B. Parent Unit**

The Parent Unit consist of an Android Application where the Parent Sign up with the mobile number registered in the School Database

Server and Login into the account to get the child's notifications automatically from the School Database Server and can also be able to track the bus in which the child is traveling.

The Parents who are not able to use the Android Application; The messages will be send in the Inbox of the Parent Phone. There is the drawback for the Parents who are not using Android Application; they could not able to view the live bus location.

## **C. School Unit**

The School Unit consists of a Web Based Application where the Admin can be able to do all the Master Entries like Add, Delete, Update, Modify the details of the School Buses, Students, Routes, Stops and many more as required and hence it has been saved on the Server. Via GPS Module attached in the Buses; the School Unit can able to view the bus locations of the Buses on the Google Map with optimized route and schedule given to cover each stops from source to destination. The School Unit gets the alert message instantly when the Bus Crosses the Speed Limit. The School Unit keeps the records of the students, buses, routes, stops, speed of bus as well as the overall history with children in/out, time into/from the bus; assigned optimized bus route, cover all the stops, etc. These all are included in the Reports on the Web Based Application which is been able to view by the Admin only.

## **5. School Database Server**

The School Database Server contains overall database for the child safety and is responsible for transmitting the received data from the Microcontroller into useful services. The Server filters and analyses the received data, track the real time current location of the buses, generate alert messages, notifications and reports and so on. School Database Server consist databases like students information, their parents details, school buses details and need some of the algorithms to complete the task like sending notification of specified parents in the database of each and every

activity of the student and the bus details. School Database Server also includes data School Unit with the location of the Bus with showing optimized route to reach the bus location on the Google map

## 6. Conclusion

This proposed system aims at enhancing the safety of children during the daily transportation to and from school. RFID Reader located inside the bus detects the RFID tags of the child. It sends instant notification with the relevant data from the school database server via internet. The parents can log into the Application and monitor the details of their children and track the location of the bus. The admin can add stops, and generate an optimized route and can have a live tracking of the bus. Further this system can be enhanced by Parking Management System, having VANET for bus to bus communication. This system can be extended for full-time monitoring of children that will be helpful for parents and guardians at minimum cost.

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