IJREB

ISSN 2321-743X
International Journal of Research in
Engineering and Bioscience
Volume 6 Issue 3 (Pages 07- 12)
Journal home page: www.ijreb.org

IOT BASED STUDENT TRANSPORTATION SAFETY ENHANCEMENT

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ABSTRACT

In cities most of the students use school bus for their daily means of transportation from home to school. Ensuring safety to each and every student from their home to school is always a risky factor for an institution. In this project the main aim to develop a system to monitor pick-up and drop off of students during the daily transportation from home to school and from school to home. In this proposed system, IoT, RFID, and GPS technologies are used in order to help parents and school authority to trace their children. The system automatically detects when a student boards or leaves the bus and sends an alert message to parents and also the data's are uploaded to the web server. Web server even displays the data regarding the total number of students travelling in the bus, driver and bus information, which can be accessed from anywhere by using Internet of Things (IoT). The proposed system maximizes the overall security of each and every student who travels in school bus.

KEYWORDS: Internet of Things, RFID, GPS, Transportation safety, Bus monitoring

I. INTRODUCTION

In this modern world no one have time to take care of their children properly. So most of the parents uses school bus to take their children to the school, and they think that their kids are safe when they travel by the school bus. But there may a question arises Are they really safe? Did they enter the bus properly and alight school bus at correct location? There are many situations like students get kidnapped at the bus stop, bus getting delayed in traffic etc. Ensuring student safety is an important task and also almost importance to their parents. If we don't take measures to protect our kids it may end up in a situation that dangers their life.

As a solution for this a method is proposed which helps to ensure children has entered the bus and a method to track their school bus. The proposed method aims at automatically detecting when a student does not board or leave the bus and issue an alert message to registered phone number. Here IoT technology is used for performing all these functionalities. IoT stands for Internet Of Things, it enables individuals and objects to exchange and collect data. The main advantage of IoT is that it allows the individuals and objects to be sensed and controlled remotely. This integration creates the link between computer based systems and the physical

world. The main advantage of the proposed method is that implementation of RFID technology with the use of IoT technology.

Here each student has to wear a RFID tag fixed in their ID tag. When he enters the bus he has to swipe the card with RFID reader placed in the door of the bus. Four LED buzzers are used, two before the RFID reader and two after the reader to make sure that the kid have entered the bus. When one passes all these LED bulbs then only message sends to their parents showing that they have entered the bus.

2. LITERATURE SURVEY

Abhilash Kanakanti suggested a system to monitor pick up/drop off of students to enhance the safety of students durning the daily transportation from and to school[1]. And the system developed here sends the message to the parents. Pravin Suresh Bhave argued another method to monitor a person travelling from any place to any another place[2]. This method make use of only RFID technology. Chao Wang developed a system that incorporates the use of sensors to provide the intelligent transportation system[3]. Here the system problems might arise due to dependency on hardware sensors. The system uses the combined technology of Global Positioning Satellites (GPS), Assisted GPS (AGPS) and Radio Frequency Identification (RFID). Here, the system incorporates usage of multiple technologies. The dependencies rises on input and output of multiple technologies which could hamper the performance of system, provided one of the component of the system doesn't works appropriately. Dr R China Appala Naidu implemented a new system which will help the parents to identify whether their kid reached the educational organization at correct time or not[4]. In this paper the system keep track of the wards who board the bus and reach college or who manage to get down on the way to college or back home. The system detects when a child boards or leaves the bus and issue an alert message when a child deboard the bus at any location. To trace the students we implemented a system which uses an RFID, GPS, GSM and ARM processor. Nasneen Fathima [5] propose a system consists of RFID tags and readers which are designed to scrutinize the entry and exit of a person in a vehicle. Each person is assigned with a tag which holds the precise details. When he/she enters the vehicle, the reader reads the person‟s tag and stores the details of entry and exit. This information is notified to the concerned authority via SMS using GSM. The proposed system facilitates to know about the area where the vehicle has crossed the path using RFID. The GPS technology connected with this system helps in acquiring updates on student‟s real time location. The detail of current location is updated in the school server.

3. PROPOSED SYSTEM

The aim of the project is to design an IoT based system for student's transportation safety enhancement. This system make use of IoT, RFID and GPS technologies. It consists of processor, micro controller, RFID Reader,

Tags, GPS module. The overall architecture of the proposed system is shown below.

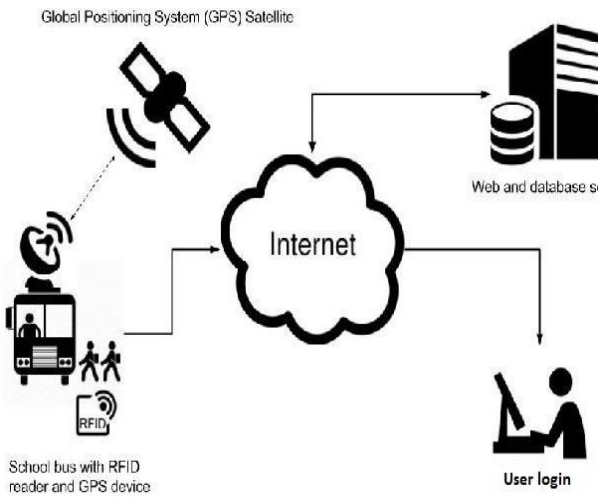


Fig 1. Architecture of proposed system

The student enters the bus with a RFID tag that is placed in his ID card. The RFID Reader scans the tag and collect data from the tag. Along with GPS data it sends message to the registered mobile number regarding whether the student has entered/ alight from the school bus. At the same time data will be updated in the cloud with the use of internet. By using IoT technology anyone can get the data at anytime from anywhere using any device.

4. SYSTEM DESIGN

In the proposed system it make use of additional technologies rather than the existing systems. Here it make use of Internet of Things(IoT), RFID, GPS technologies. The block diagram of proposed system is shown below.

Each student who enters the bus is given with a RFID tag that is fixed in their ID card which contain the student details. The RFID reader, kept in the bus, will read the serial number of the tag that contains the details of the students. Along with the information GPS location from where the student enter into the bus or alight from bus is send to the registered mobile number as a message. And also the data get updated in the cloud server.

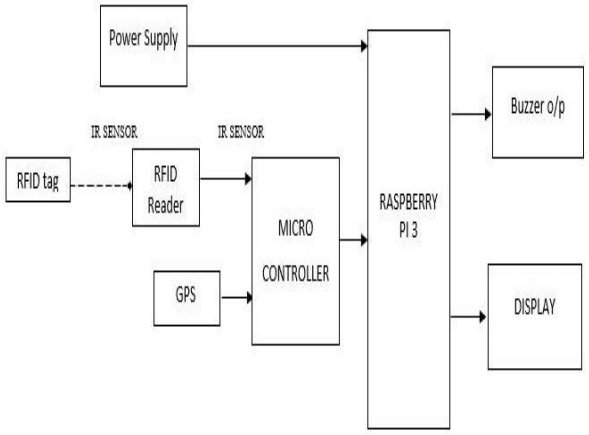


Fig 2. Block diagram of proposed system

In the proposed system RFID Reader is placed at the entrance of the school bus. An IR sensor is used to detect the movement of students in the bus. Two IR sensors were used, one before RFID Reader and other after RFID Reader. A buzzer system also used for making sounds. When the student enters the bus, they should scan their ID card and also go to IR sensors placed. Then only then only messages will be send, otherwise a beep sound is produced by the system showing an error happened. Two additional buttons are provided to the driver which can be used to erase data from the system in the bus unit in case. When he erase the data from the system the data get erased only from bus unit, the data in the cloud server cannot be erased by this action.

A. RFID Reading

The function of the RFID reader is integrated with RFID tags. It contains the reader module, which works as both the transmitter and receiver of radiofrequency signals. The transmitter consists of an oscillator to create a carrier frequency, a modulator that impacts on data commands, and amplifier to enhance the signal enough to awaken the signal. On the other side, the receiver has a demodulator to extract the restored data and it contains an amplifier to strengthen the processed signal. The microcontroller forms a control unit that stores data and then sends it to the raspberry pi and then send it to the network. RFID tag scanned from a distance and as well as to capture the signals and send them to the reader, thus it detects each and every tag and sends the data to the server. RFID comes in different forms such as a label card, which can have a barcode Printed on it. The experiment has used a 40bit Unique ID; it cannot be reprogrammed, blank, flexible, and white in colour.

B. GPS Tracking

The Global Positioning System based on satellite navigation system that provides location and time information in all weather conditions. Positioning system basically consists of Transmitter and Receiver. The transmitter's job is to track the location with the help of information from satellite based on longitude and latitude position. Working of GPS is explained as follows, the GPS transmitter sends the signal to the satellite through which satellite reads the current position of the bus and sends to the GPS receiver, using GSM the current latitude and longitude of the bus is sent to the school server.

C. Database Server

The school server maintains a database that contains the details of the students such as name, contact person, mobile number of the concerned authority and the location of the bus. This server can be accessed by the parents anytime to know the entry and exit of their children and the current location of the bus.

Algorithm for IoT based student safety enhancement system is given below;

1. Start
2. Scan the student RFID tag using RFID reader.
3. Detection of presence of student using IR sensor.
4. If presence is detected go to next step.
5. Validate RFID tag.
6. If RFID tag is valid goto step 8
7. Else goto step 9
8. Send message to registered mobile number & update database server.
9. Produce beep sound by buzzer showing error
10. End process.

Flow chart of the proposed system

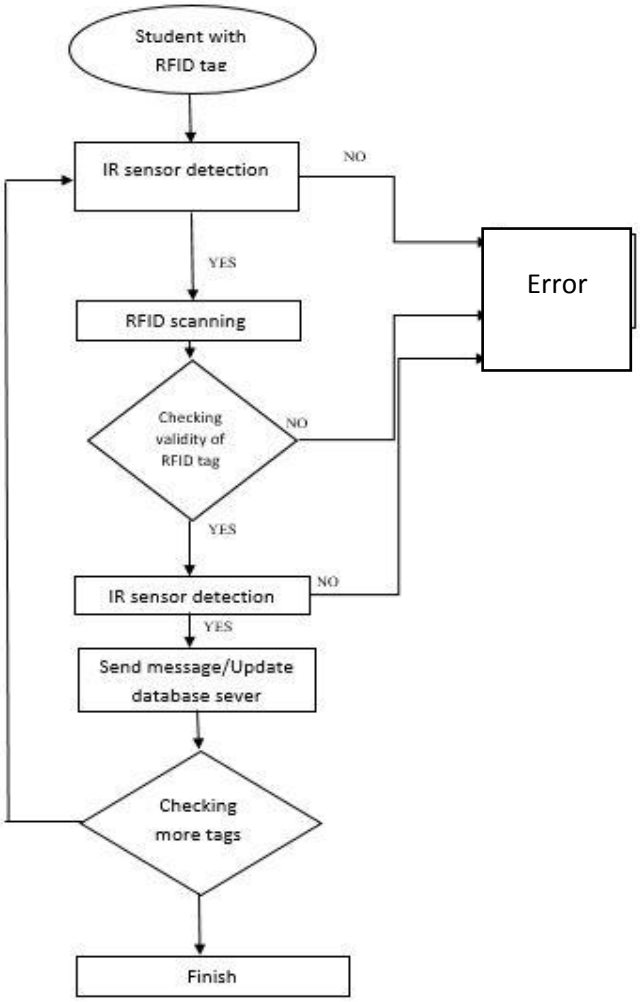


Fig 3. Steps in the proposed system

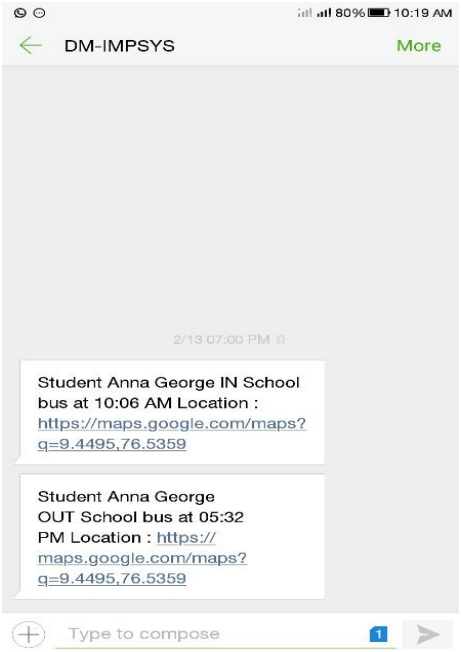
D. Advantages Of Proposed System

- Provide facilities like people identification, object tracking.
- Cost of RFID is less.
- The system is automatic
- Ensures safety of each and evey student.
- The system detects when a child boards or leaves the bus and issue an alert message when a child deboard the bus at any location.
- Easy to use.

5. RESULT AND ANALYSIS

a) Hardware setup

b) Screenshot of message send to registered mobile number



Description	Existing System	Proposed System
Implementation	Complex, involves major changes with introduction of electronic subsystems	Easy, as compared to existing system
Maintainability	High	Negligible

6. CONCLUSION AND FUTURE WORK

The system presented here uses IoT based system for enhancing student safety transportation to and from school during the school bus trip. RFID-based detection unit located inside the bus detects the RFID tags worn by the children. It then sends, the relevant data to the parent and database server using internet. This system also provides a Google map to track location of the Bus. The parents can log into system website and monitor the details.

In future we can add more sensors such as fuel sensor (to detect level of fuel in the bus), speed sensor(to detect the speed of bus), can place camera inside the bus which helps students parents to watch their children activities inside the school bus.

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