

# RFID Based Secure Smart School Bus System

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**Abstract**— Recently all over world millions of children's are missing. Some parents are busy with their job. There is no time for taking care of child. The objective of proposed system is to develop an application that allows a user to check status of security appliances using IOT. The proposed system will offer more security in checking drunk and drive, speed control, missing children's, accident emergencies and inappropriate drop etc. This system is helpful to solving the problems of parents and school management. They can track their child's location by using GPS. RFID tag is used to identify the child in the bus with the help of reader present in the bus. GSM technology for sending the message to parent and school management. It also provides panic button in emergency. Everyday data of the students is stored in logistic management and Parents can check this data any time.

**Keywords**— RFID, GPS, Arduino, IoT, Sensors.

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## I. INTRODUCTION

Internet of things (IoT) is an environment in which all the devices communicate with each other to make the world smart. IoT has the endowment to broadcast the information to the devices without inter-communication between human-to-human or human-to-computer. IoT is a patchwork of interconnected things which are encapsulated with sensors, software, network connectivity and necessary electronics that enables them to aggregate and exchange data making them responsive [1]. All over the world School bus plays an essential role in carrying most of children every day. School going children's security at the time of travelling is a big issue to parent and management. Our proposed system aspires to look into initiating the safety with respect of school buses through bus tracking and security system that will help the school children's transportation in a protected and more secure way [2].

Remaining paper is arranged as follows. Section II gives brief summary of existing work. In section III will give overall idea and working of our proposed system. Section IV gives overview of technology. In section V comparative study. In section VI conclusion of proposed system. Study about existing system. Sections VI explain the actual flow of the system. In section VII conclude our papers.

## II. RELATED WORK

This section gives a brief survey of existing system related to proposed system. There are several existing system available for addressing the issues of child security but each of system has its own limitations our system.

#### A. *Tracking Location*

The Paper[2]describes related to location tracking the Android terminals which have wireless LAN device and Bluetooth device with the adhoc communication function, but limitation is that there is low bandwidth and low security. This limitation can be overcome by using GSM technology.

Paper [3] presents the system uses RFID, GPS technology to track the current position of the bus, GSM to send notification to parents regarding student and an ultrasonic sensor with buzzer to create special attention to drivers to avoid accidents. The drawback of this paper is there are only send the message for parents to entry and exit of student.

Paper [4] shows that RFID based school bus tracking technology is a feasible alternative for supervising and tracing the pupils during their drive to and from school.

The paper [8, 9] presents the system which is completely integrated so that once it is implemented in all vehicles, and then it is possible to track anytime from anywhere. This paper has many advantages such as large capability, wide areas range, low operation cost, strong expandability and easy to use in vehicle track administration. The drawback of this paper is that it does not provide any emergency application.

#### B. *Tracking Location*

In paper[5] presented work is used to avoid the accident by use of heart rate monitoring system, alcohol detection and person level identification method such as eye blink sensor, theft detection , and security system is used. In this paper can be provide as emergency button for driver.

#### C. *Tracking Location*

Paper [6] presents the system will send a text SMS to the parent containing longitude, latitude of location of school bus, children attendance status and also driver phone number. The drawback of this paper is that it does not provide send text SMS for school management.

The paper [7, 10, 12] presents that the RFID Attendance System is a RFID based Automatic & Comprehensive attendance management system. It provides robust, secure and automatic attendance management for both, Students and Staff. The drawback of this paper they do not store the information in the database.

#### D. *Panic button*

Paper [7] presented a new feature incorporated into child safety system that enables social contribution. In an emergency, this child safety enables users from the near vicinity of the situation by providing or verbal or visual information useful for better assistance to handle the emergency situation.

### III. PROPOSED SYSTEM

In this section, there is a description of the overall proposed system which is going to overcome all the limitations of the existing system.

#### A. *Problem Statement*

The objective of this proposed system is to develop an application which will help to provide security for school going children's. This allows parents and management to check the status of secure smart school bus by using Iota. The proposed system will provide various facilities like speed control, check drunk and drive, missing children's, accident emergencies, inappropriate drop, panic button, logistic management etc. which are helpful for child security.

#### B. *Propose system as a solution for Existing system*

The existing system has many disadvantages related to cost, performance etc. The proposed system is going to reduce all the defects of existing system. The proposed system uses the Arduino Uno kit which provides power of micro-controller as well as microprocessor which is going to increase the performance of the system with less energy consumption.

**C. Architecture & working of the proposed system**

In the proposed system, there is a use of wireless module. The board receives the signal from the sensors and transmits that to the user using the wireless module. The proposed system has four elements that are arduino kit, sensors, RFID, android application.

The proposed system has the following elements,

- **Attaching the sensors to the board**  
First attach the sensors to the board. Sensors will send the value to the Galileo board. Further, these values are Processed by the board.
- **Arduino Board**  
Arduino board is a main control unit which is used as a bridge between the sensors and the smart phone. All the sensors are attached to the board and also used for processing the data.
- **Wireless module**  
This module is used to connect the user with the board. After processing all the data are transmitted to the user using the wireless module.
- **Android application**  
This is an app which is used as a user interface. User can interface with the system using the application. All the values send through the wireless module can be seen through the application.

The Architecture of the proposed system is given below,

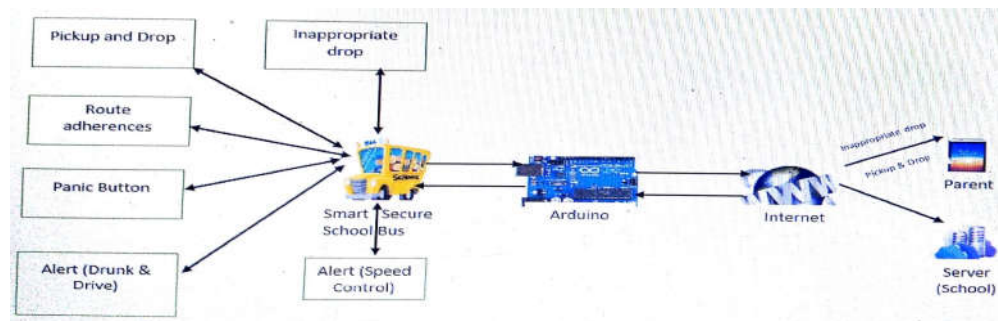


Fig.1 Architecture of Proposed System

The proposed system provides following application.

- **Pick-up and Drop**  
In this application, information about child that is when child is picked up and when dropped will automatically sent to the parents. Parents can see this information in the android application via smart phone.
- **Pick-up and Drop**  
In this application, when child will get dropped at inappropriate place or drop then the location of the child will get automatically sent to the parents as well as school management. Location of the child will tracked by the GPS sensor.
- **Route Adherence**  
This application is provided for the route adherence. If the driver change the regular route of the school bus then via live tracking school management will come to know that driver has changed route and they can take appropriate action against it.
- **Panic Button**  
This application is going to use in emergency cases. We will provide there two panic buttons one for the driver and one for the children's. If there is any emergency such as road accident, heart attack to the driver and any in case of driver then there is a panic button near to the driver so that he/she can press that button. After pressing panic button the voice message will get sent to the school management.

Here second panic button will be provided for the children's. if there is any problem to the children's seated in the bus then there will be a panic button so that child will press that button and buzzer will ring near to the driver so that driver will come to know that there is some problem to the child.

- **Drunk and Drive**

In the drunk and drive application, if driver will have drunked, then sensor will detect and voice message will get sent to the school management so that they will take action about that. To detect alcohol MQ-3 sensor will be used.

- **Speed Control**

In this application, if driver cross the speed limit of the bus then sensor will detect the over speed of the bus and then voice message in that case will sent to the school management. To detect the over speed of the bus RPM sensor will be used.

- **Logistic Management**

The logistic management will be provided for the data storing purpose. Data about child that is pick-up, drop with date and time, Bus attendance of child etc. such data is will be stored in the logistic management. User of this system can see this data online anytime.

## IV. OVERVIEW OF TECHNOLOGY

### A. *Hardware specification*

In our proposed system we are using following Hardware.

#### A. *Arduino UNO :*

The Arduino UNO development Kit is a microcontroller board based on the ATmega328P(datasheet).It has 14 digital input/output pins (of which 6 pin can be used as PWM outputs),6 analog inputs, a 16 MHz quartz crystal , a USB connection ,a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC- to-DC adapter or battery to get started. It also includes flash memory 32 KB of which 0.5 KB used by bootloader.

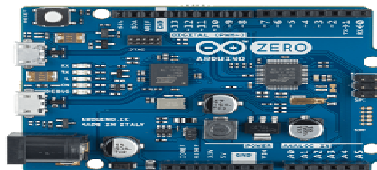


Fig.2: Arduino UNO

#### B. *Sensors:*

In our proposed system we are going to use three different types of sensors.

##### a) *MQ3 Sensor:*

This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common Breathalyzer. We will use this MQ3 sensor in case of driver to check whether driver is drunked or not.

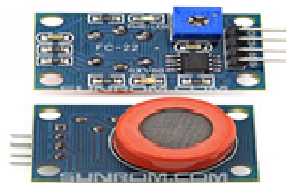


Fig. 3. MQ sensor

**b) RPM sensor:**

The RPM sensor is an internal electronic device that measures an engine crankshaft's rate of revolutions per minute. In proposed system we will use this sensor for speed control application.



Fig. 4. RPM sensor

**c) GPS sensor:**

In our proposed system we will use GPS sensor to locate the current location of child.



Fig. 5. GPS Sensor

**3. RFID Reader:**

It uses electromagnetic field to automatically identify and track tags attached to objects. In our system we are going to use RFID reader to identify the child.



Fig. 6. RFID Reader

**4. RFID Tag:**

RFID tagging is an ID system that uses small radio frequency identification devices for identification and tracking purposes. That's why in proposed system we will use RFID tag for identifying and locating the child.

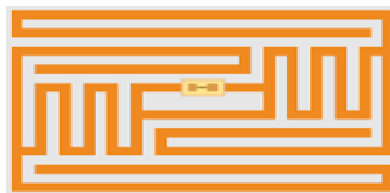


Fig. 7. RFID Tag

### B. Software requirement

In our proposed system we are using following software.

#### a) Eclipse:

Eclipse is an integrated development environment (IDE) used in computer programming. In our proposed system we are going to use Eclipse to develop an android application.

#### b) Arduino IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions. We will use this for displaying output of sensors.

#### c) MySQL:

MySQL is offered under two different editions: the open source MySQL Community Server and the proprietary Enterprise Server. In our proposed system we are going to use MySQL database to store the data of our system.

## V. MATHEMATICAL MODEL

Following is the mathematical model of our proposed system.

System Description:

Input: Different sensors and device used in the system

Output: various information collected by sensors and devices

Functions:

- Pickup and drop message
- Inappropriate drop message
- Route adherence message
- Panic button
- Drunk and drive message
- Speed control message
  - Logistic management

Mathematical formulation

$$I = \{CA, A.in1, A.in2, Rin, Rm, Ein, Em1, Em2, Din, Dm, Sin, Sm\}$$

CA=Corrective action by school management

A.in1=child pickup

A.in2=child drop

R.in, Em1, Em2, Dm, Sm=message to school management.

R.in=Route adherence

E.in=message in case of emergency

D.in=Drunk and drive

S.in=Speed control

$$Q = \{q0, q1, q2, q3, q4, q5, qf\}$$

q0= Child safe journey

q1= Route change condition

q2= Emergency condition

q3= Drunk and drive

q4= Speed management

q5= School management

qf= Successful journey

$$qf=Q*I$$

Q= Valid state

I= Valid input

qf= Successful journey

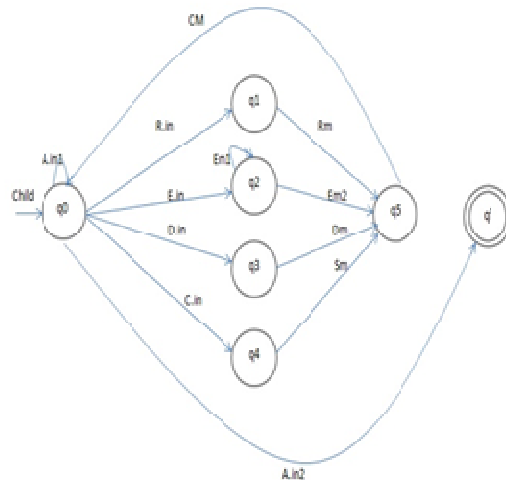


Fig. 8. Mathematical model

## VI. CONCLUSION

This paper show that RFID based smart secure school bus technology is a feasible for supervising and tracing the child's during their drive to and from school. Also the speed control, drunk and drive, missing children's, accident emergencies, inappropriate drop, panic button and logistics management plays a major role to improve child security.

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