Smart School Bus

Arifa K, Aryadas R, Asha KR, Amrutha J, Anju P

Abstract— Millions of children need to be moved from home to school and vice versa every day. Safer transportation of school children has been a critical issue as it is often observed that, kids find themselves locked in the school bus at the bus stop after going to school, they miss the bus, or ride the wrong bus with no way to track them. This research tested the applicability of radio frequency identification (RFID) technology in tracking and monitoring children during their trip to and from school on school buses. Also most of the school buses get accident because no proper safety measures are taken especially at curves and hair pin bends humps. This system can be used for prevention of such problem by indicating a pre indication and also reducing the speed of bus by reducing the fuel rate of bus. As the action is in terms of fuel rate so the bus automatically goes to control and avoids accidents. This speed reduction is done by using RF technology. When a complete prototype of the proposed system is implemented, the system will promise safer transportation of school children.

Index Terms— RFID, RF Technology, Child safety, Speed reduction, Tracking.

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1 INTRODUCTION

THIS paper presents a system to monitor pick-up/drop-off of school childrento enhance the safety of children during the daily transportation from and to school. For parents, obtaining a safe transport for their children is a crucial issue. The students ride their bicycles, take buses, and arrive in vehicles with one purpose getting to and from school Safety. In this paper, we focus on a particular risk associated with the daily bus trip to and from school. There have been previous incidents where a child is forgotten in the bus and eventually die because of suffocation .To improve transportation safety, some schools employ a bus supervisor to look after the children inside the bus. Nonetheless, human oversight or supervisor absence may still lead to a heartbreaking ending as in the previously cited stories.

The paper proposed a bus safety system which was designed to control the entering and exiting of students from the bus. Also controls the speed of school bus to avoid accidents. The system aims at automatically detecting when a child boards or leaves the bus and issue an alert message when child doesn't board or leave the bus to reduce the parent's concerns about using the bus for the daily transport of their children without being lost or forgotten. And also gives alert to the students about their respective stops while returned from school. RF transmitter and receiver are used to control the speed of school bus at curves and humps. A camera is used to monitor the surroundings when hump or turning detected.The camera is connected using a relay circuit. Because the camera needed to turn on when only the hump or turning detected.An IR IN-OUT counter is used to count the number of students in the bus to avoid the overpacking of children.

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If the number of students is greater then the seat capacity value, then system will pass the information to the authorities by giving the entire data of school bus.This IR sensor is also used to detect the presence of students on footstep of the bus.If sensor is detected the presence, then it will alert to the driver by using buzzer and displayed on LCD.

2 SYSTEM CAPABILITIES

The system will be designed to monitor children ridership in a safe and non-intrusive way. It will use a combination of RFID, GPS, GPRS technologies for monitoring entering and exiting of students. Each student is issued a unique RFID card to carry. As the student's tag is detected by the reader installed in the school bus upon entering or leaving the bus, the time, date and location is logged and transmitted to a secure database. It will require no action on the part of drivers or students, other than to carry the card and will deliver the required performance without impeding normal loading and unloading process.

The system will enable parents to receive instant SMS alerts when bus is within 10 minutes of designated pickup and drop off points reducing the time the child spends on the street. The system will also notify parents via SMS when the child boards and alights from the bus or enters/leaves the school. Parents will take the appropriate action because they have precise answers to boarding status and times. If a child is still inside the bus for a predefined time after the vehicle's engine is turned off, and doors are closed, an SMS message will be sent to the school authorities.

APR (Audio Play Recorder) is used to give alerts to the students about the respective stops. IR sensors are used to detect the child stands on the footstep and buzzer is used to give alert to the driver that child stand on the footstep. IR in-out counter is used to count the number of students entering to the bus. If the number of students is greater than the seat capacity, then it will send information to the authority. This system also uses RF transmitter and receiver for reducing

the speed of school bus at curves and humps. At curves and hair pin bends the line of sight is not possible for the drivers so the special kind of transmitter which is tuned at a frequency of 433MHZ are mounted as these transmitters continuously radiate a RF signal for some particular area. As the vehicle come within this radiation the receiver in the vehicle gets activate. The transmitter used here is a coded transmitter which is encoded with encoder. The encoder provides a 4 bit binary data which is serially transmitted to transmitter. The transmitter used here is ASK type (amplitude shift keying) which emits the RF radiation. Also system will send information about the speed of bus to the school authority.

In addition, the system will include Web-Based information, a student report, which provides time and date for all loading and unloading activities by student and bus report that provides all students ridership data by bus. In summary, the system will enable school authorities, fleet owners and parents to keep track of the bus online help transporters and authorities to plan and manage the bus routes better, saving money and ensuring smooth and quick rides to the destinations.

3 SYSTEM ARCHITECTURE

Mainly the system architecture is divided into two parts:
A) Children tracking module. B) Speed controlling module.

A. Children tracking module

The main task of this module is to identify the children tags that are onboard the bus and retrieve the data stored using two RFID antennas. Each school bus will be equipped by an RFID reader.
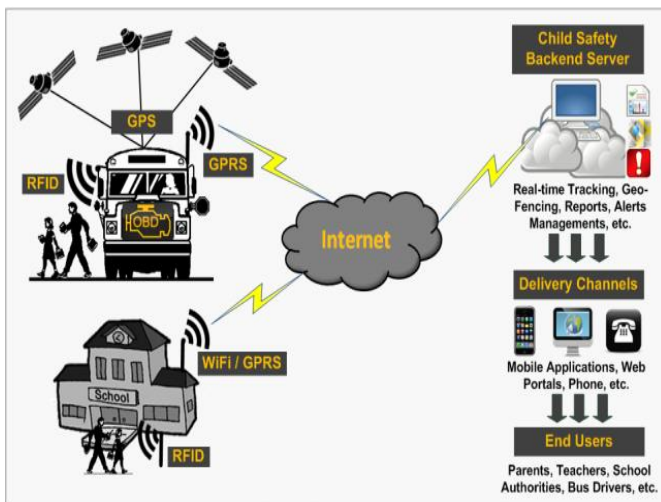

Fig 1 Children Tracking Architecture

Each school bus will be equipped by an RFID reader, and two

RFID antennas mounted on the bus door. A passive RFID card will be issued to each child, which contains his personal information. Thus, whenever a child that has a tag is within an RFID reader's read range; the reader can detect the child instantly and retrieve the ID from the tag.
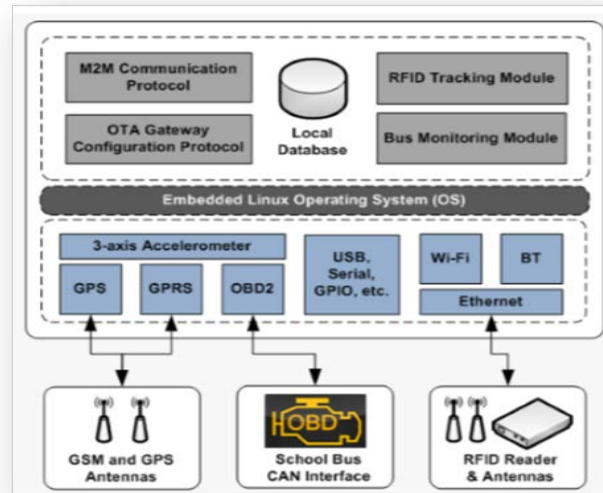

Fig 2 Smart Gateway Hardware and Software Components

The Smart Gateways system is in charge of managing the different hardware components and aim at: providing local intelligence for the RFID Tracking system, tracking the school buses and driving behaviours, providing network connectivity through GPRS or WiFi to Internet. This smart gateway is able to collect various and useful information, such as to the current bus location, the vehicle health information, the bus driving behaviours and the list of children who left or stepped into the bus. All this information are then processed and filtered by the local smart gateway and are transmitted wirelessly to the remote Child Safety Back- end servers for post-data analysis and decision making.

Back-end server represents the core of the Child Safety solution and is responsible for translating the received data from the Smart Gateways into useful and comprehensive high level services. More specifically, the Backend Server will filter and analyze the received data, track in real-time the current locations of children and school buses. It will help the school authority to make decisions, and optimize crisis and emergency management. It will deliver high level applications through web portals, mobile applications, and phone calls/SMS.

B. Speed Controlling Module

The speed of the school bus is controlled by using the RF technology. Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation. Radio Frequency 10 KHz to 300 GHz frequency range that can be used for wireless communication Radio Frequency also used generally to refer to the radio signal generated by the system transmitter, or to energy present from other sources that may be picked up by a wireless receiver.
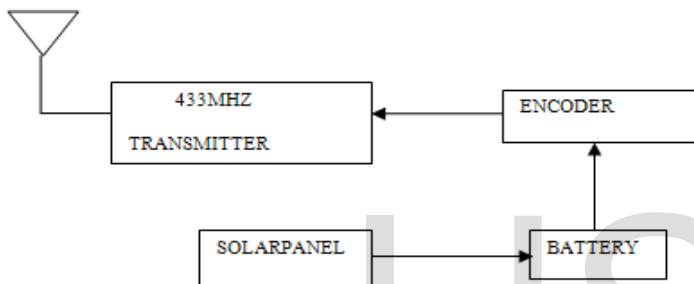
TRANSMITTER SECTION:

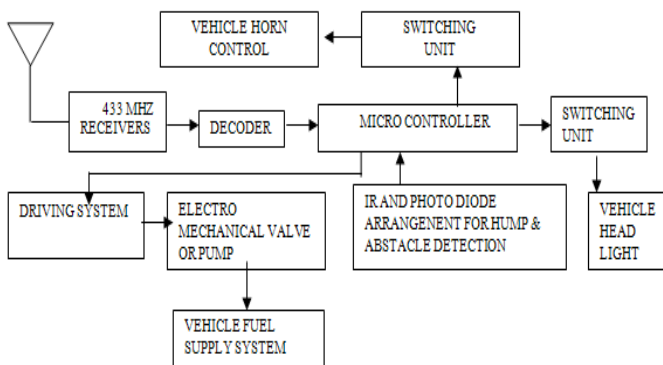Fig 3 Transmitter Diagram

RECIVER DIAGRAM:

Fig 4 Receiver Diagram

The arrangement at school bus side is shown above a 433MHZ receiver which receives the RF signal when the transmitter frequency is interacting. The data available from receiver is in terms of serial this data has to be converted back in terms of parallel through a decoder which decodes the data and it is in the form of parallel. The decoded data is interfaced to microcontroller and the controller is so programmed that it now driving system drives the signal to a suitable level that which

controls the action of electromechanical valve or pump. The valve regulates the fuel rate when the RF frequency is interacting with receiver. The fuel rate goes to low level which reduces the speed of bus so the accidents can avoided. For different curves the data differently encoded which is received by the RX and fuel rate can be adjusted differently.

The same kind of method is implemented for the detection of humps with help of IR LED and photo diode technique which acts as a proximity sensor when the IR signals transmitted from LED depending upon the distance of the humps there is a reflection of IR beam from that, material the circuit provides the signal to the microcontroller and with the same process of fuel has been reduce and reduce the speed of bus and prevents the accidents

4   APPLICATIONS AND ADVANTAGES

- The system uses RFID tags for children detection which is not harmful since it uses frequency ranges that are safe and legally approved.
- The deployment cost is reasonable.
- The system is automatic and user friendly.
- Speed control through RF technique.
- Less man power is required.
- Driver alertness will be more.
- Lot of accidents possible is avoided.
- Suitable for all kinds of vehicle speed reduction.

5   CONCLUSION

The integration of RFID, GPS and GPRS technologies for safety and security purpose is very important nowadays due to increase in accidents of children gets missed out at the bus which may lead to death due to suffocation. RFID based detection unit locate inside the bus detects the RFID tags worn by children. It then sends relevant data to the system database server. The system checks and detects which child did not board or leave the bus and issues an alert message to this effect. In earlier systems the driver has to monitor the entry and exit of students. The supervision of entry and exit of students is effectively done by RFID mechanism. This system provides overall comfort for the students.

In addition, the system reduces the speed of school bus when curves and humps are detected. Therefore we can avoid the accidents due to over speed. T his project is the result of analysis of technologies for the enhancement of safety of transportation of school children. This paper is proposing an idea which provides complete safety of school children at low cost using newer technologies.

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