Enhanced Protective System For Children In School Transportation

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Abstract:

The higher number of vehicles on the roads increase in the number of road accidents worldwide. And these problems are considered as major public safety problem. A major part of providing a quality education to every children is ensuring their safety during transportation from their home to school. Thus, we have developed a smart and effective school bus system for the safety of children while transportation. This paper discusses about the hardware-based smart and effective school bus system for ensuring and monitoring the safety of school-going children through school bus. In this project, vehicles are considered as the main key enabling technology to improve children safety and the emergence of next-generation cooperative intelligent transport systems (ITS). In ITS, network services and applications (e.g., safety messages) will require event location information. Faster and efficient routing protocols could play a vital role in the applications of ITS, safe guarding both the driver and the children and thus maintaining a safe on-road environment. In this project, an intelligent transportation system (ITS) is designed to monitor real evacuation tests where an emergency event has been simulated and experimented and a general methodology is reported with the description of the main models and procedures. Models are calibrated and validated employing observed data obtained from ITS.

Keywords: Arduino UNO, Temperature Sensor, Alcohol Sensor, Vibration Sensor, Child Safety, Bus Transportation

INTRODUCTION

During every year, 23.5 million school children rides on bus to school every day, according to School Transportation News [8]. In our country, the school bus system is the single largest public transit system.

Like any form of vehicular transportation, accidents and safety issues involving school buses are inevitable. Every year, nearly 17,000 children are treated in the hospital emergency rooms for injuries and accidents associated with school buses during transportation. Children can be injured while they are riding in the bus, getting on or off the bus. In various countries, large number of children travel to their schools by bus daily. Safe and secure transportation of children is the top priority for school authorities and also for their parents. Supervising children during their in and out of the bus can be difficult at many times. This paper intends to introduce an access safety and school bus tracking system which will ensure safe transportation of children to the school.

LITERATURE INVESTIGATION

A literature review has shown that there are many studies which uses Radio Frequency Identification (RFID) which transmits the identity of an object using radio waves by Kumar. A system was proposed to track the children during transportation using a child module that transmits the information to the database and to the mobile device [1]. The disadvantages of this system are the modules are always not so convenient for children and wide-scale deployment is expensive. Authors in [2] reports a tracking system which utilizes Android terminals that communicate between themselves using a Bluetooth technology to form clusters. These clusters communicate the information using WLAN. The main drawback of this system is that the installation cost is high and expensive. Also there are commercial systems for tracking activities of children such as Bluetooth-based tracking devices which are designed to be worn by children as a necklace or a bracelet [3]. In this type of tracking, these devices are connected with mobile and the systems can alert parents if their child went outside a range specified by them. If the child walked outside the specified range, the device will send an alert message to their parent. Besides, these application sends the location of the child by using the geographical map. One of the major disadvantages of this type of devices is that they work only in a certain limited range. Other products may rely on biometric features such as the Kid track biometric system in which the children scan their palms across a palm reader when they enter the bus [4]. It uses infrared light to read the palm's unique pattern. It uses green and red LEDs to ensure the scan works. Then, those scans are sent for cross-checking against a

secured database of pre-registered users' patterns. Based on this, the administration could find the information of the bus, like when and where it tracked the child, and where the bus was at that time [5].

From the above kinds of literature, we conclude that this approach is not automatic and it's difficult for children to place their palms correctly on the palm reader. We develop a system in which the child's activities in the bus are being monitored using an RFID system irrespective of range. Besides, the parameters such as bus accident location, Driver's alcohol consumption, and Bus fire accident can be monitored by our system.

PROPOSED SYSTEM

In the proposed method we develop a safety system for school children. RFID Tag will be fixed in the id card of a student and the signal is transmitted. The transmitted signal will be received in the bus unit by an RFID reader and it will be monitored on the server. The server is present in the school unit and also message will be sent to their parent's mobile number through Global System for Mobile (GSM) communication. The position of the child is tracked through Global Positioning System (GPS) and send the messages to their parents during on entering and exit of the child in the school bus. The RFID system is connected to the door of the school bus. The door opens only when the child is entering or leaving the school bus. Here a Single Pole Double Throw (SPDT) switch is used as a Bus key. Suppose the driver consumes alcohol and drove the bus there is a chance for an accident. So monitoring this parameter is very important in this system. So the alcohol sensor is used to check whether the driver consumed alcohol or not. When the driver is seated, the alcohol level will be instantly checked. In case if he consumed alcohol the system will intimate it to the school management and the driver will not be allowed to start the school bus. Suppose the accident happens there is a maximum vibration in the bus. To detect that vibration the vibration sensor is used in this system. If the value reaches maximum level then an alert message will be transmitted to the ambulance. The temperature sensor is used to detect the bus temperature. In case if the temperature is raised due to a fire accident, then engine speed will be gradually reduced and turns off. There are some advantages in this proposed system such as we can avoid accidents, easily identify the school bus location, and drunken drivers are also identified.

BLOCK DIAGRAM

BUS SECTION

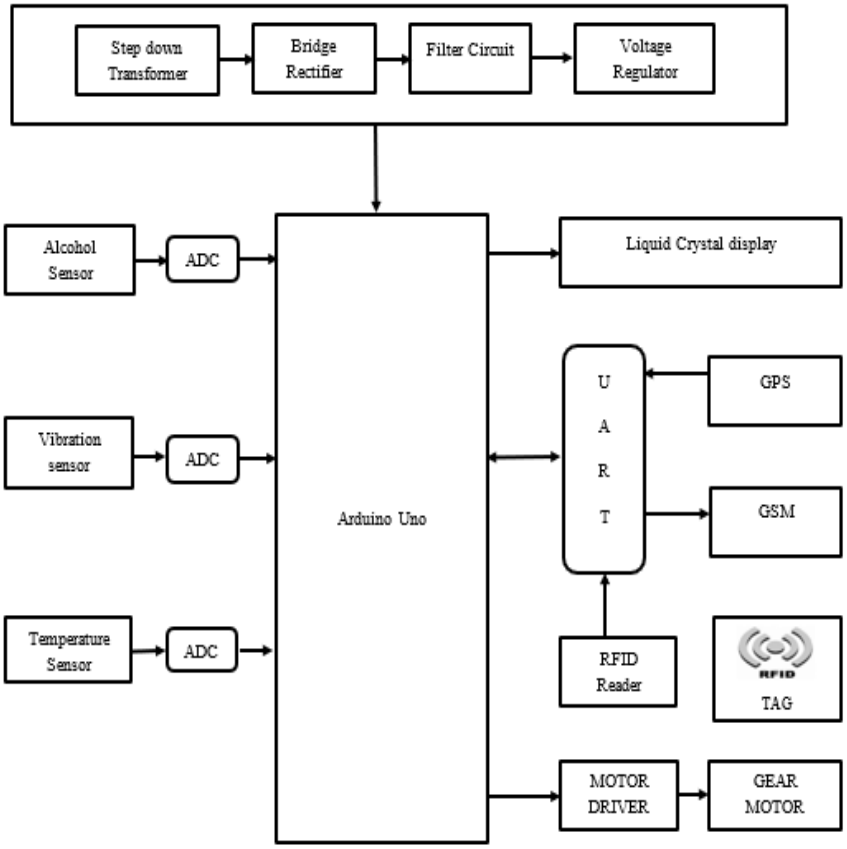

Fig. 1 Block Diagram of Proposed System

The block diagram is shown in Figure 1.Here a power supply circuit is used to provide the dc supply to the system. GPS, GSM, RFID reader are connected in serial communication with Arduino. The motor driver is used to provide adequate supply to operate the motor. The Liquid Crystal Display (LCD) is used to display the alcohol and temperature values. The sensors are connected to an Analog-to-digital converter (ADC) to provide a digital signal to Arduino. From the above block diagram, the various hardware used in this project are given below:

- Arduino Uno
- RFID Reader
- RFID Tag
- Global System for Mobile (GSM) communication
- Global Positioning System (GPS)
- Temperature Sensor
- Alcohol Sensor
- Vibration Sensor
- Motor

The Hardware setup is shown in Figure 2.

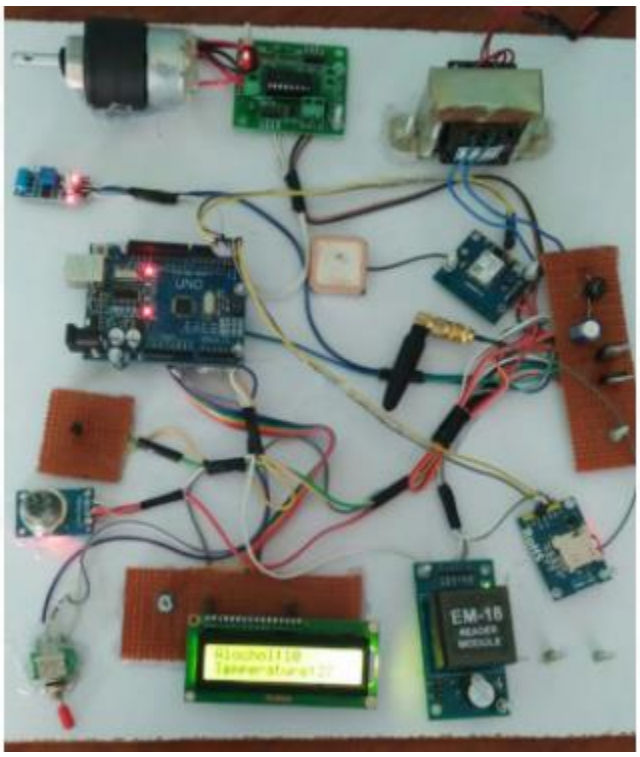

Fig. 2 Hardware Setup

RESULTS & DISCUSSION

The hardware is demonstrated by fixing this system in the school bus. When the children entered the school bus using RFID system the messages will be sent to the parents as follows:

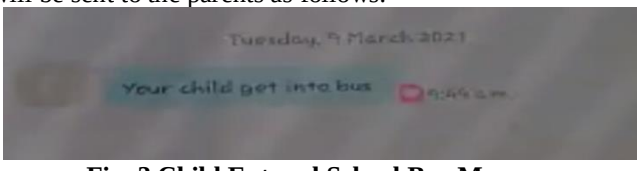

Fig. 3 Child Entered School Bus Message

From Figure 3, when the child entered the school bus using an RFID tag, the message "Your child gets into the bus" will be sent to parents using GSM.

During school bus traveling there is a chance that the child may leave the bus halfway. This can be detected because the child needs to scan the RFID tag to leave the bus because of the RFID system connected with the school bus door. If the bus is stopped at the bus stop the engine will be in 'ON' condition and so the Bus key is also in 'ON' condition.

The main factor to check here whether the bus key is 'ON' or 'OFF'. If the bus key is in 'ON' condition and the child tries to leave the bus using an RFID tag then the message will be sent to parents as shown in Figure 4. That is "Your child get down from bus" message is sent to the parents

Suppose if an accident occurs the vibration sensor sends a digital signal '1' to the Arduino and a global system for mobile (GSM) communication sends a message to an ambulance along with location using a global positioning system (GPS). When the temperature rises above 35ºC due to fire, the engine speed will be gradually decreased and then turned off. Due to this, we can save

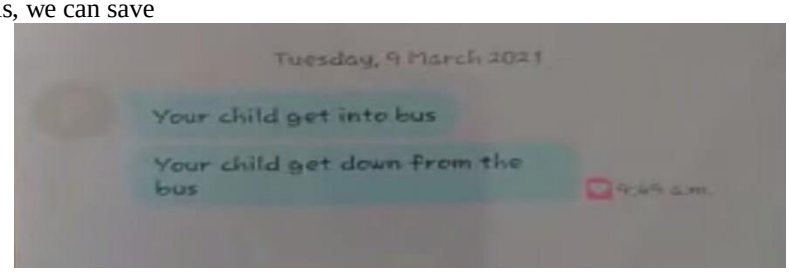

Fig. 4 Child Left the School Bus in Halfway Message

children from major fire accidents prematurely. When a driver consumes alcohol and tries to operate the bus, the alcohol sensor detects and sends the message to school management to avoid unnecessary accidents and deaths. This happens when the value of the alcohol sensor goes above 60 ppm Figure 5 shows the value of Alcohol and Temperature values in the LCD.

When the School bus reaches the school campus the bus goes to 'OFF' condition. So the key needs to be in 'OFF' condition. Now when the child leaves the bus using an RFID tag, the system sends the message to parents as shown in Figure 6. That is "child entered school campus" message is sent to the parents.

Conclusion

This project is entitled an RFID-based system which aims the safety of children during the bus trip to and from the school daily. RFID-based detection unit which is located inside the bus detects the RFID tags worn by the children. It then transmits message, via a GSM modem to their parents. The system detects and checks when the child did not board or leave the bus then it gives an alert message to the parents. This security system endeavours safe transportation for school children in their daily life. This security system uses RFID for detecting whether the child entered or leaves the bus along with the child's stopping place. The message will be sent simultaneously to child's parents and to their school. By using this security device we can overcome child kidnapping cases.

Fig. 5 Sensor values display through LCD

Fig. 6 Child Entered the School Campus Message

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