Safety Enhancement for School Children in Road Transportation

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ABSTRACT

Crimes against children are increasing rapidly. Safety support systems are developing continuously for school children to avoid theft, missing, road accidents. This paper deals with providing the highest level of safety for school children during daily transportation. However, present systems are not more powerful to provide safety to school children since these systems provide information to school which of the children did not board or leave the bus through issuing an alert message accordingly and also does not concentrate on vehicle aspects. The proposed system monitors pick-up and drop-off school children make use of RFID reader reads the tag and sends a message to parents through Global system for mobile communication (GSM) technology. In this system vehicle makes use of vibration sensor, gas sensor, and phone call avoidance set up which is mechanical monitors the bus helps to avoid the road accidents, fire accident and avoid phone call in the driver mobile at the time of driving. The prototype of the proposed system was implemented.

Keywords: RFID reader, GSM, Vibration sensor, Gas sensor, A Phone call avoidance setup.

I. INTRODUCTION

Children safety is essential to their parents though using safety measures, children, due to lack of skills to protecting themselves from danger, they end up their life. To improve the transportation safety, some schools employ a bus supervisor. But nonetheless, driver fault may still lead to the heartbreaking ending to the precious life of children. Furthermore, the reliable system has to be constructing in school transportation.

The System developed by Anwar Al-Lawati, ET.AL, used RFID technology to monitor pick-up/drop-off of school children and send a message to school [1]. The disadvantage of this system is not concentrated on vehicle aspects and it provides less security from the vehicle. J. Saranya, ET.AL, had designed a system of implementing children tracking system for every child attending school and monitoring child cry in the school and it is tracked by child module and intimate to parents through android application [2].The disadvantage of this technique are the modules are not convenient for children. Yuichiro Mori, ET.AL, had proposed a Hiroshima City Children Tracking System is a tracking system that utilises android terminal with Bluetooth technology to make cluster based on ad hoc network technologies [3].The key drawback of this system is that the deployment cost is high. H Abdul Shabeer, ET.AL, had designed a real-time safety system base on surface mount technology to avoid cell phone accident [4]. The previous incidents were like a child is forgotten in the bus by the negligence of the bus driver and child end up his life due to suffocation [5-6]. Siva Shankar Chandrasekaran, ET.AL, had designed a system of an automated control system for air pollution detection in vehicles which is used to control the pollution emit by vehicles [7]. Some commercial tracking systems are used for tracking the children with Bluetooth technology. It can be connected with a mobile application and it might alert the parents if their kids went outside the specified region [8]. The main drawback of this system works within the limited range. A biometric system is also used for children tracking. Children scan their palm while entering into the bus. The scans are comparing

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with the database and send a message to the school [9].It is not automatic and not easy for the children to keep their palms properly on the scanner.

The proposed system concentrates all the safety measures in the daily school transportation. The system aims to provide assurance to parents by automatically detecting when children board or leaves the bus and issues a message accordingly. This system helpful for physically challenged as well as all the school children in transportation. However, the proposed system concentrates all the safety measurements from vehicle aspects also. It is shown in the below figure1.

This paper is organised as follows. Section 2 the proposed work of the overall system. Section 3 gives a detailed description of system architecture. Section 4 gives information on communication models. Section 5 Results of the system. Section 6 concludes the paper.
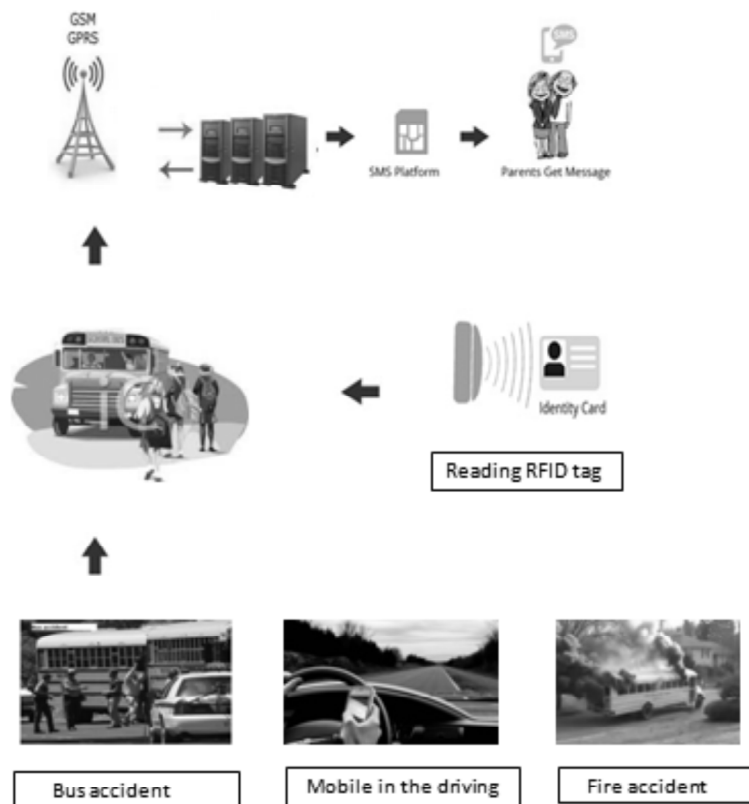

Figure 1: The proposed System Architecture

II. PROPOSED SYSTEM

The system is classified into two units bus unit is present in bus and database is located inside the school. The bus unit detects each child when they leave and boards the bus. It uses the database to store the student information in school and as well as the school management can use this database to take attendance also. This system detects when children board and leaves the bus using RFID technology and sends information to the database via modem and in turn, it sends a message to parents. The proposed system mechanically monitors the vehicle if it senses any vibration occurs above the threshold level due to accidents then it allow controlling the speed of the bus, opens the emergency doors of the vehicle and opens seat belt automatically. The designed system avoids the phone call, and it automatically senses the phone call makes to cut and sends a message to called person. If again call from the same number it allows reaching. This system monitors proper maintenance of the vehicle. It mechanically senses the vehicle, therefore, it detects fire accidents or releasing of more amount of carbon dioxide due to improper maintenance then it control the speed of the vehicle and provide an alarm to the driver. The proposed system is shown in Figure2.
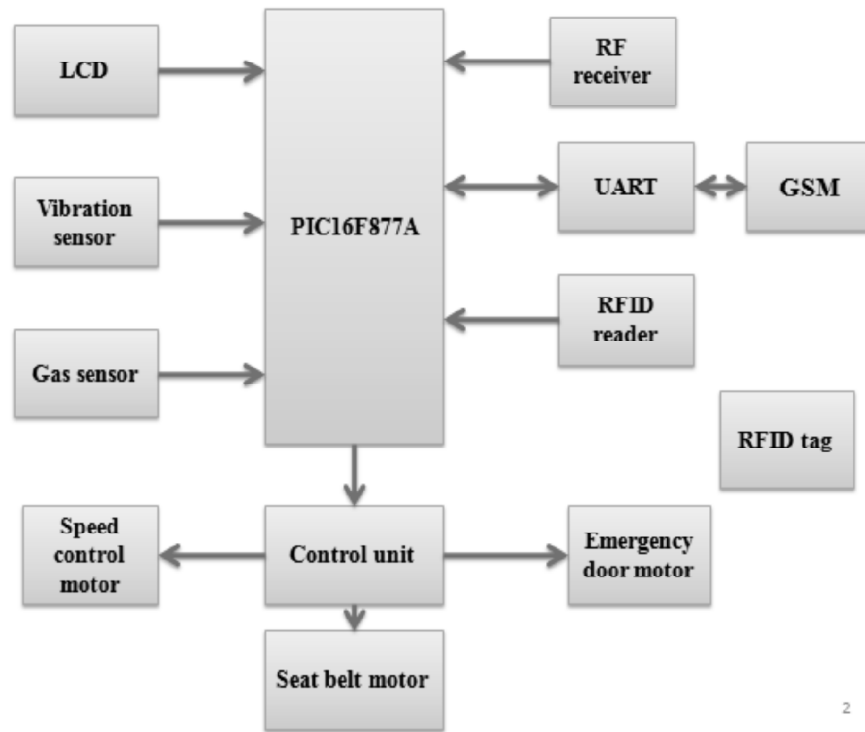
Figure 2: Block diagram of the proposed system

III. SYSTEM ARCHITECTURE

(A) RFID reader

The system uses RFID reader in bus unit. This system detects students by reading RFID tag when student board/leave the bus and process the information to the controller. Therefore, it processes the information to the database, in turn, it sends a message to parents about their children through GSM modem. This system uses RFID Technology it consist of three type of reader based on their frequency ranges i.e. Low, High, Ultra- high frequency. If we choose LF RFID reader, because it has fast data rate transfer capability and it can be a comfort for short ranges.

(B) Piezo- based vibration sensor

Piezo -based vibration sensor is used in the construction of bus so that it senses incessantly in driving. If the vehicle meets with any accident, therefore, it senses and process to the controller. The controller checks if it exceeds particular threshold level then it sends a signal to controls speed of the bus, opens emergency doors and opens seat belt and provides a buzzer so that nearby people will help the children at that instant. Implementation is shown in the below figure 3.

(C) RF Transmitter and receiver

RF Transmitter tracks the driver mobile incessantly. If calls occur during driving it will mechanically cut the call and sends a message to called person. If again call from the same number also it won't allow reaching the mobile and third time moreover call from the same number, it allows reaching the mobile with the help of AT commands.

(D) MQ Gas sensor

This system right minds the proper preservation of the vehicle. It senses the vehicle is emitting more carbon dioxide or its facing problem like fire accident, therefore, it detects and provide an indication to the driver
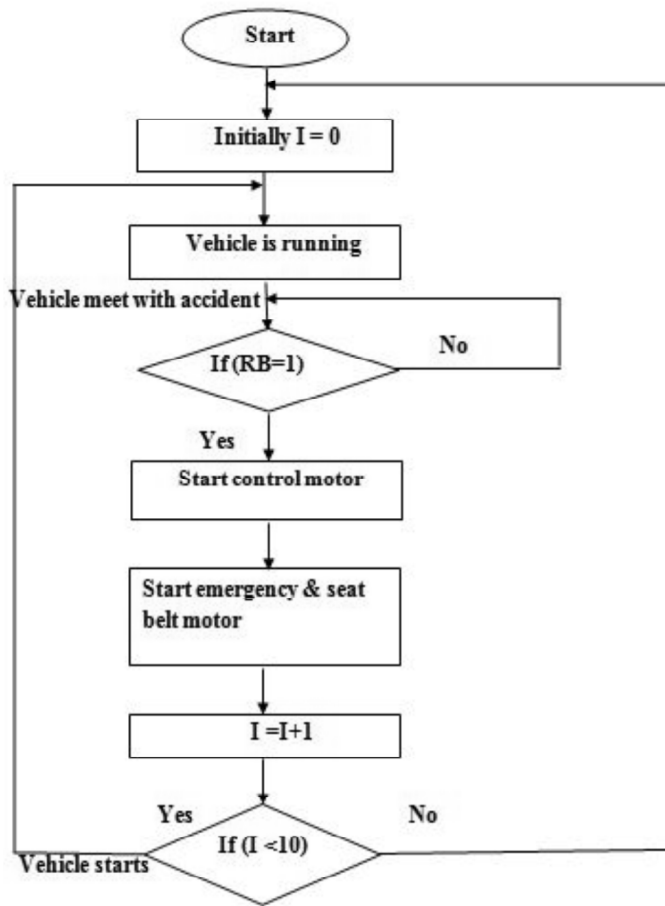
Figure 3: Implementation of vibration sensor module

and helps to protect the children. It can generally use in the all type of vehicles to controls pollution emission. It is fixed at emission outlet and monitors pollution content releases into the environment. If it exceeds the particular threshold level, it can mechanically control the fuel valve in turn reduce the vehicle speed is constant.

IV. COMMUNICATION MODELS

The proposed system has used PIC Microcontroller because it is low power consumption, high speed, more compatible with CAN protocols, low cost. PIC Microcontroller was used to interface the reader and GSM modem for data exchange. The reader communicates with the micro controller using serial communication interface RS232. However, due to the difference in the voltage levels, a max232 is used to convert the signal from RS232 serial port to signals which are suitable for use in TTL compatible digital logic circuits. The vibration sensor is interfaced with a microcontroller in port B, the MQ2 Gas Sensor is interfaced with a controller in port A. PIC Microcontroller has the advantage of inbuilt ADC converter so that it can directly convert analogue values into digital values. MP Lab is an integrated development platform for developing an application on PIC controller. This project uses HI-TECH C compiler which supports project management, debugging and programming in the controller. Embedded C programme was written in MP Lab 8.6 to exchange the information between RFID reader and the GSM modem through the microcontroller. If the microcontroller reads the data from the RFID reader the LED will be turned on to indicate the successful read of the tag number.

GSM modem is efficient network design for less expensive and efficient use of spectrum; it transmits data up to 9600 baud.GSM modem used in this project consist of SIM900A which has all the features

mentioned above. SIM900A chip which is responsible for communication. It is controlled by AT commands (Attention commands). It is responsible for sending and receiving an SMS and call avoiding and indication purpose also. SIM900A can vary from country to country depends on frequency band they are using.

V.   RESULTS

The RFID reader reads the tag and processes the information to the controller. It was verified unique student ID and reader parameters appropriately (baud rate, start bit, data bit, parity check bit) and transmits information to mobile number through GSM modem. It is shown in the below Figure4. Voice indication is also provided to physically challenged students through this system. The voice board is used to store and display the voice for particular unique ID. It is shown in the below figure 5.
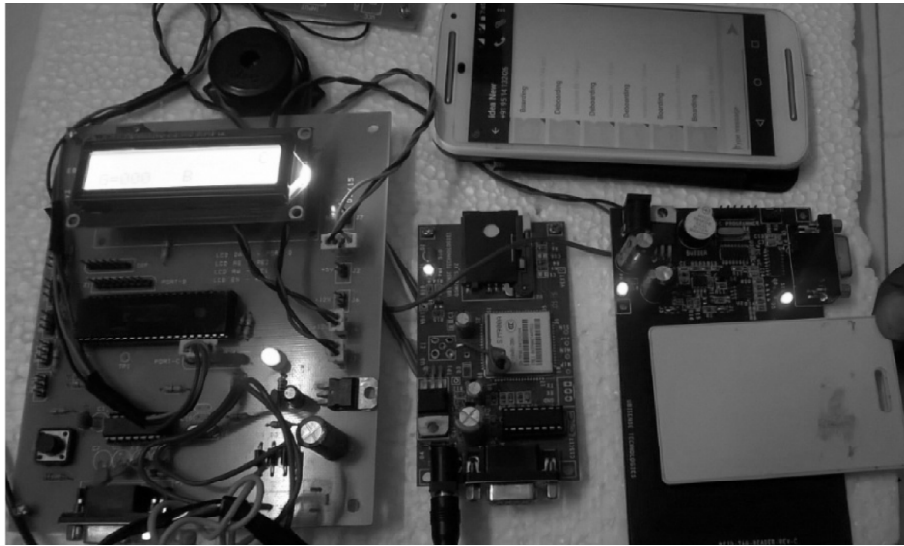

Figure 4: Reader - microcontroller interface circuit

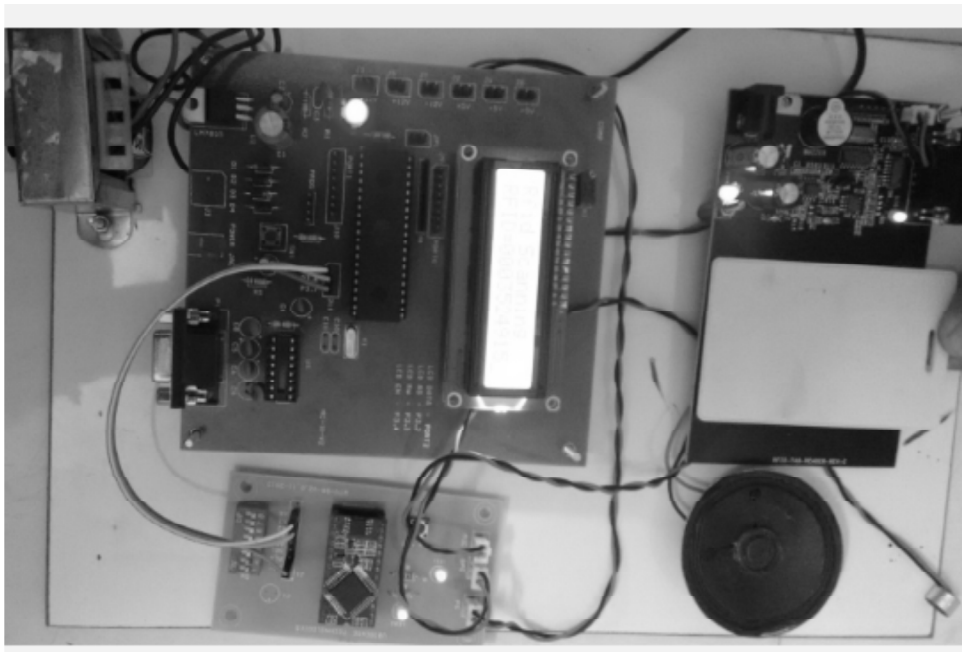Voice indication is provided by reading RFID to physically challenged students.

Figure 5: Voice board-microcontroller interface circuit

Piezo-based vibration sensor senses if vibration occurs in the vehicle. It processes the signal to the processor, therefore, it sends the signal to control the speed of the bus and runs seat belt motor and emergency motor. It is shown in the below Figure 6.

Figure 6: Vibration sensor –microcontroller interface circuit

RF transmitter senses calls occur during driving, therefore; it cut and sends a message to called person. It allows the only emergency calls i.e. the call from the same number more than two times then also to reaching the mobile. It was done by using AT commands. It is shown in the below Figure 7 and 8.

MQ2 gas sensor detected the excess amount of carbon dioxide is released from the vehicle or fire accident occurs in the vehicle. It immediately sends buzzer indication as well as reduces the speed of the vehicle. It is shown in the below Figure 9.
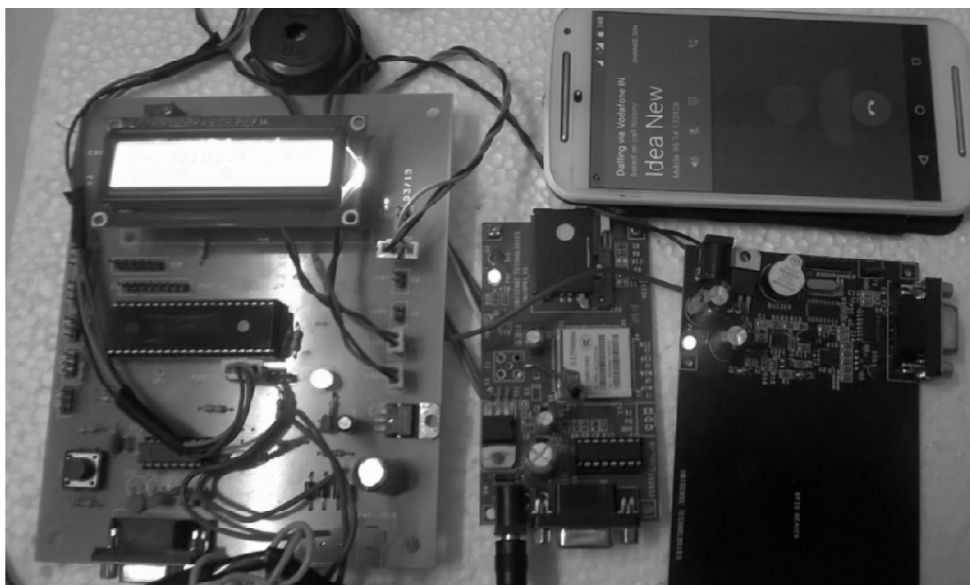

Figure 7: Phone avoidance setup

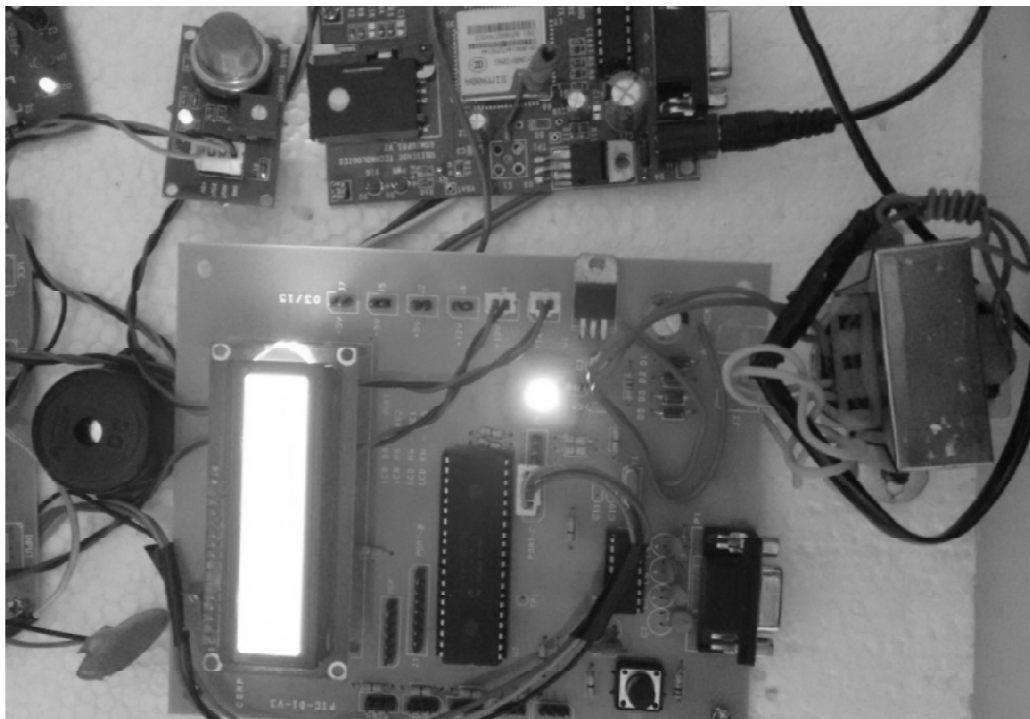**Figure 8: Phone call and message indication setup**

Figure 9: Gas sensor –microcontroller interface circuit

VI. CONCLUSION

In this paper, a low-cost safety system is designed for daily transportation for school children. It mainly concentrates on road transportation of school children. RFID reader setup is located inside the bus detects RFID Tag then it sends a message via GSM modem. The proposed system detects which child board/ leaves the bus and issue message accordingly to parents. Also, this system mechanically senses the vehicle. If it senses the abnormal condition of the vehicle due to the accident, fire accident, improper maintenance of the vehicle makes to control its speed, open the emergency door, seat belt and provide the alarm at that instant. This system makes used of AT commands and allows the only emergency call to reaching the driver mobile at the time of driving.

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