Embedded System Controlled Smart School Bus

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***Abstract*-The aim of the project is to automate the school bus to overcome child injury during step into bus and automatic emergency door opening in presence of fire. The PIR sensor placed in the step helps to predict the movement of student in the step. If any movement occurs, the sensor sends intimation therefore it won't allow the bus to move further. The fire sensor predicts the presence of fire, which triggers the emergency door to open automatically.**

***Keywords*-Arduino UNO/ PIR Sensor/ DC Motor/ Fire Sensor/ Servo Motor/ Water pump motor/Arduino Nighty 1.6.5.**

I.INDRODUCTION

Road accidents have earned India a dubious distinction. With over 130,000 deaths annually, the country has overtaken China and now has the worst road traffic accident rate worldwide. This has been revealed by the World Health Organization (WHO) in its first ever Global Status Report on Road Safety. The report pointed to speeding, drunk driving and less use of helmets, seat belts and child restraints in vehicles as the main contributing factors. The total number of deaths every year due to road accidents has now passed the 135,000 mark, according to the latest report of National Crime Records Bureau or NCRB. The NCRB report further states that drunken driving was a major factor of road accidents and mostly they are due to bike accidents .It's growing day by day because liquor is a state subject and its happening everywhere in the country, The time for action is now: Road deaths increased by nearly 40 percent between 2003 and 2008 in India and the more progressive and developed states like Andhra Pradesh, Maharashtra and Tamil Nadu are the ones most affect[1][2].

To prevent or to reduce these road accidents we introduce the SMART SCHOOL BUS. Our project SMART SCHOOL BUS aims to automate the school bus to overcome child injury during step into bus and automatic emergency door opening in presence of fire. The PIR sensor placed in the step helps to predict the movement of student in the step. If any movement occurs, the sensor sends intimation therefore it won't allow the bus to move further. The fire sensor predicts the presence of fire, which triggers the emergency door to open automatically. The water pump motor attached in the bus will automatically start to flow water, which helps to stop fire in initial stage. The GSM helps to send alert to school admin regarding the fire accident as a SMS. The AT command helps to send alert call to the respective user[3].

II. PROJECT DESCRIBTION

The PIR sensor placed in the bus step helps to detect the movement of person. If PIR sensor detects the human movement, it stops the bus to move further therefore occurring of accident can be overcome[4][5]. The DC motor movement stops once the PIR sensor finds the presence of student movement in step. The stopping of movement helps to overcome the occurrence of accident. The fire sensor placed in the bus will detect the occurrence of fire. The flame sensor is very sensitive to IR wavelength at 760 nm ~ 1100 nm light, which helps to detect the presence of fire for the range of 3 feet. It is covered with black epoxy, since the sensor is sensitive to infrared radiation. The water pump motor attached in the bus will automatically start to flow water, which helps to stop fire in initial stage. The Servo motor operate the emergency door attached in the bus will trigger automatically to open[6]. The GSM helps to send alert to school admin regarding the fire accident as a SMS[7][8].

III.DETECT HUMAN MOVEMENT

1. The Arduino Uno Board

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, 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 a AC-to-DC adapter or battery to get started. It's an open-source physical computing platform based on a simple

microcontroller board, and a development environment for writing software for board[9].

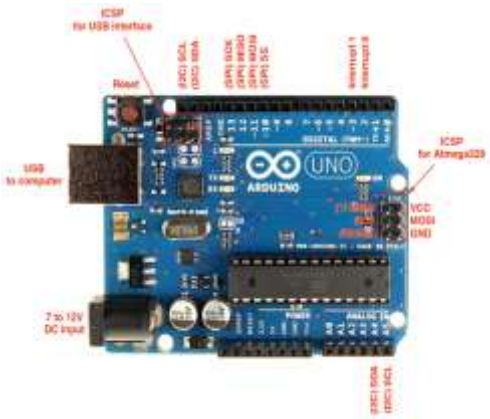


Fig 1. Arduino Board

2**. PIR sensor**

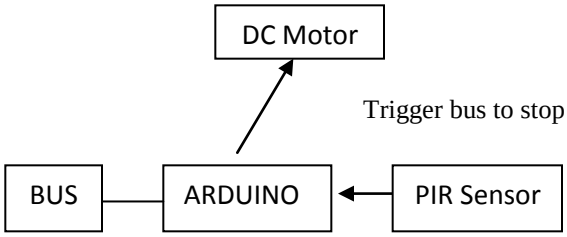
PIR-based motion detector is used to sense movement of people, animals, or other objects. The sensor detects the change in the infrared radiation and triggers an alarm if the gradient of the change is higher than a predefined value. The field does not have to be broken by an object with a different temperature in order to register change, as highly sensitive sensors will activate from the movement alone.

Fig 2 PIR Sensor

3. DC motor

The DC motor movement stops once the PIR sensor finds the presence of student movement in step. The stopping of movement helps to overcome the occurrence of accident. A DC motor is any class of rotary electrical machines that converts direct current electrical energy into mechanical energy[10].

Detect Movement Block Diagram



To predict human movement

Fig 3. Block diagram of detect movement

IV DETECT PRESENCE OF FIRE

1. **Fire sensor**

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line and activating a fire suppression systems.The fire sensor placed in the bus will detect the occurrence of fire. The flame sensor is very sensitive to IR wavelength at 760 nm ~ 1100 nm light, which helps to detect the presence of fire for the range of 3 feet. .

Fig 4. Fire sensor

2. Servo motor

The Servo motor operate the emergency door attached in the bus will trigger automatically to openServo motor consists of feedback control system whereas stepper motor is not used as it doesn't have any feedback control system. Operating range of servo motor is 4.8 to 6V .Servo motor works on PWM(Pulse width modulation) principle, means its angle of rotation is controlled by the duration of applied pulse to its control PIN. Servo motor is made up of DC motor which is controlled by a variable register.

Fig 5. Servo motor

3. **Water pump motor**

The water pump motor attached in the bus will automatically start to flow water, which helps to stop fire in initial stage. The motor operates on 24 v which pump the water which connects towards relay will operate automatically to flow water.

Fig 6 Water pump motor

4. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. This in turn decides to start or stops the water pump motor.

5. GSM

GSM/GPRS Sim900a Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. Using this modem, you can make audio calls, SMS, Read SMS, attend the incoming calls and internet etc. through simple AT commands.

Fig 7. GSM

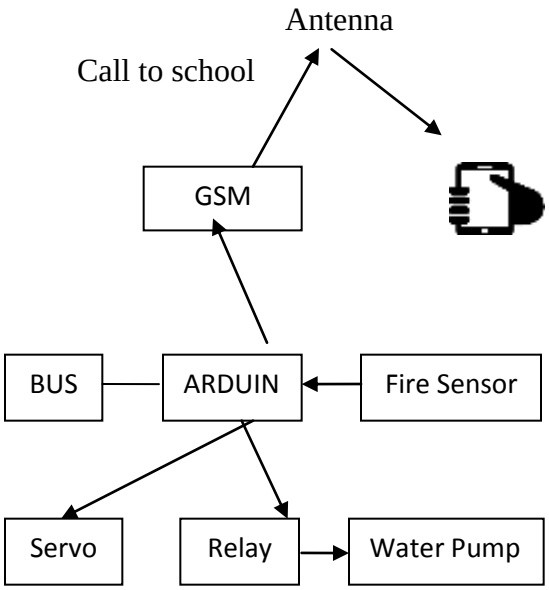


Fig 8.Block diagram of fire detection

V. RESULT AND DISCUSSION

Implementation

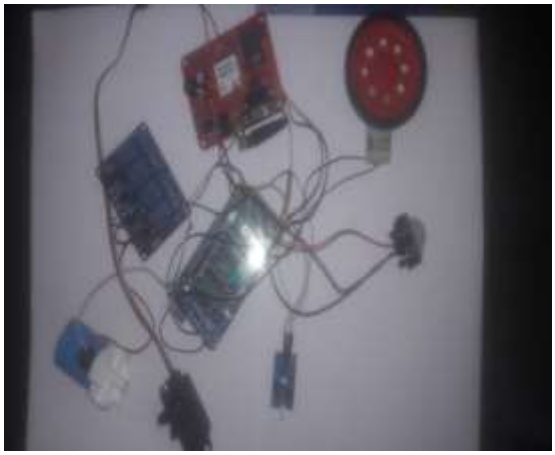


Fig 9. Overall circuit description

The movement of children in step can be predicted; therefore occurring of accident can be overcome. In case of occurring of fire in bus, the emergency door attached in the bus will trigger automatically to open therefore huge accident can be overcome.

VI. CONCLUSION

The accident in school vans are occurred due to without knowing the intimation of presence of student in movement in steps. In case of occurring fire in bus, the children won't have any idea to come out of the bus by emergency door. They can't even have knowledge of opening emergency door. The movement of children in step can be predicted; therefore occurring of accident can be overcome. In case of occurring of fire in bus, the emergency door attached in the bus will trigger automatically to open therefore huge accident can be overcome. The implementation of the project would helps to overcome the accident in school bus which built a bus in a safe and secure manner.

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