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ADVANCED SCHOOL BUS SAFETY SYSTEM

Miss Nandana Das M S[*1], Miss Subina S[2], Miss SuhanaSujan[3], Mr Anandajith H[4] & Asst.Prof.Anju V Gopal[5]

[*1, 2, 3, 4&5]Department of electronics and communication, college of engineering perumon, India

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Nowadays, School buses carry millions of children to the school and from the school. The safety of school children have became an important issue nowadays. It is important for every school to have a secure transportation service to ensure the safety of the students. . In this paper, we study different safety systems available for children till now and we propose a system that overcomes the problems with existing systems. Since more than 50 percent of school bus injuries occur due to vehicular accidents, according to a 2006 report by the Centre for Innovation in Pediatric Practice in Columbus, Ohio. Since most of the accidents occur due to over speeding, we propose a system which controls the speed of vehicle automatically in any critical zone without major inconvenience to the driver. Another causes may include any mechanical failure in the vehicle like brake failure, major cause of brake failure is due to brake fluid issue, so by constantly checking the brake fluid level using a sensor we can handle this problem. Over crowdedness is another issue, in our system we set a counter mechanism to avoid this problem. Also many accidents are happening because of the alcohol consumption of the driver, so here we introduce a system to solve such a problem using an alcohol sensor. In this system we also provide an accelerometer so that dangerous driving can be detected. It can also be used as a rollover detector. With signals from an accelerometer, an accident can be recognized efficiently. According to our paper, when a vehicle meets with an accident, immediately the accelerometer will detect the signal and sends it to the controller. Microcontroller sends the alert message through the GSM MODEM to the police control room or a rescue team.

KEYWORDS: MQ3sensor, MEMS accelerometer, GSM modem, Accident detection).

1. INTRODUCTION

This paper presents different safety systems to ensure the safety of school children during daily transportation. There are many issues that might disturb the parents regarding the safety of children in school buses.The main aim of our project is to focus on the safety of students in school buses by avoiding accidents. The safety measures that are to be taken inorder to avoid accidents,for that first we have to analyse the causes of accidents. Since most of the accidents occur due to over speeding, we propose asystem which controls the speed of vehicle automatically in any critical zone without causing any inconvenience to the driver. Another reasons for the cause of accidents may include brake failure,drunk driver etc. Mainly brake failure occur due to brake fluid issues so by providing a fluid level sensor we can constantly check the fluid level and the problem can be solved. By making use of an MQ3 sensor we can detect whether the driver is drunken or not [1]. Also in our system we set a counter mechanism inorder to avoid over crowding. In case if any accident occurs,we propose an accident detection system using an accelerometer and alert messages are send to concern authorities through GSM [2].

2. LITERATURE SURVEY

School bus is the most convenient means of student transportation. There are a number of school bus safety issues faced by students travelling by school buses. In India “The Vehicle Motor Act” was first introduced on July 17, 1988 in which the driver should drive in 80 km/hr. Later on 2003 a device was introduced known as “SPEED GOVERNOR” in which it maintains the speed up to 50 km/hr and does not allow to exceed the threshold speed limit. But the main problem of this system is drivers have the temptation to tamper.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Speed limiter tampering continues to be a safety concern in the transport industry as long as there is the temptation to do so. According to the motor vehicle department's new circular, every educational institution bus other than three wheeled vehicle shall be fitted with a speed limiting device with speed limit set at 50km/hr. By making certain adjustments anyone is able to successfully remove the speed limiter from the vehicle. This is the main drawback of the existing system. The main advantage of the proposed system is to overcome the problem of tampering.

3. SYSTEM OVERVIEW

Block diagram

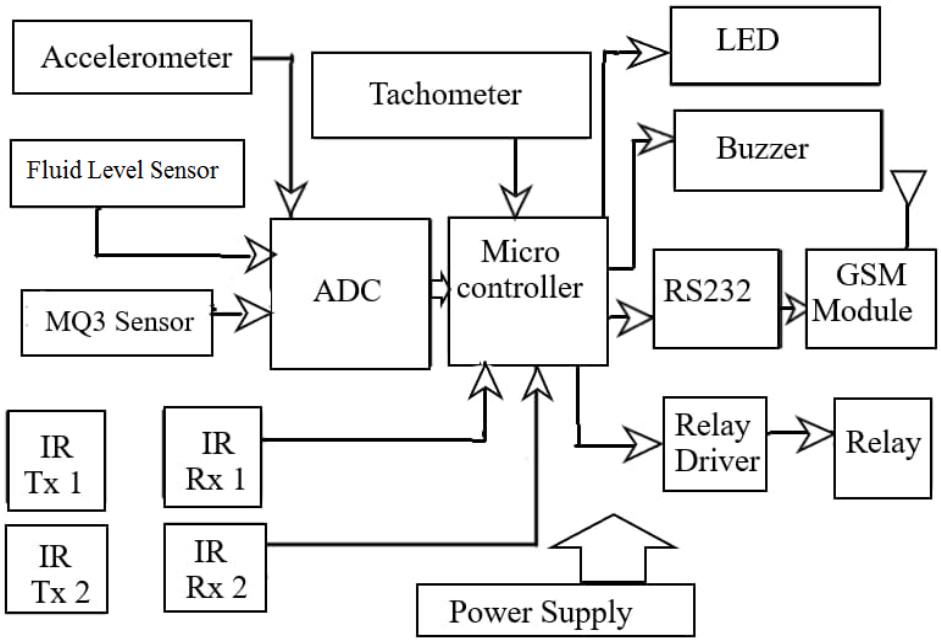


Figure 1: block diagram

The main aim of our project is to focus on the safety of children who travel by school bus. Nowadays the safety of school children has become a major issue, as many accidents are occurring and the lives of many children have lost. So it is important for every school to have a trustworthy and secure transportation service to ensure the safety of the students. In our paper, we first analyzed the major causes of accidents and have come up with certain safety systems through which we can control these accidents to a certain extent. Since increase in speed multiplies the risk of accidents, we propose a system which controls the speed of vehicle automatically in any critical zone without major inconvenience to the driver. Although the government have fixed a speed limit for vehicles, most of them are not obeying it. Also in the existing system there is a chance for tampering, so we can avoid tampering by introducing this system. In our system, we set a speed limit and if the limit is crossed the vehicle automatically slows down by cutting the fuel.

Another cause of accidents may include any mechanical failure in the vehicle such as brake failure. A brake failure may occur probably due to brake fluid issue, so by constantly checking the fluid level using a fluid level sensor we can easily handle this problem.

Over crowdedness is another issue. Vehicles are designed to hold a maximum number of passengers and if that number exceeds the vehicle's functionalities and design may fail. As the more mass a vehicle has, the longer its stopping distance. The more people stuffed into the bus, the chances for collision is also more. In our system, we introduce a counter like mechanism to avoid over crowdedness. Here we use two IR sensors to count the number

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

of people entering and leaving the bus and set a threshold as per the maximum capacity of the bus. And if the threshold is crossed, by using relay we can immobilize the engine and also a buzzing sound is produced.

Many accidents are occurring because of the alcohol consumption of the driver or the person who is driving the vehicle. Thus Drunken driving is a major reason for accidents. In our system,we provide an alcohol sensor to detect whether the driver is drunken or not. And if the driver is drunken then it will automatically immobilize the engine and will not be able to move. And also messages are send to concern authorities [1].

In this system we also provide an accelerometer so that dangerous driving can be detected. It can also be used as a rollover detector during a crash. With signals from an accelerometer, an accident can be recognized [2]. According to our project, when the bus meets with an accident immediately the accelerometer will detects the signal and sends it to the controller. Microcontroller sends the alert message through the GSM MODEM to police control room or a rescue team [3].

4. COMPONENTS

1. ATMEGA 328 microcontroller
2. ADXL335 accelerometer
3. MQ3 sensor
4. MAX232
5. Relay
6. Tachometer
7. IR sensor module
8. Voltage regulator
9.GSM module

5. COMPONENT DESCRIPTION

a) Microcontroller section (ATmega 328)
The ATmega 328 is a single chip microcontroller created by Atmel in the AVR family. It is considered as a third generation microcontroller. Here the microcontroller continuously monitor the charge and perform logical decision making. It is 8 bit microcontroller with 28 pins.

Specifications and features
- Operating voltage = 1.8 – 5.5V
- Maximum operating frequency = 20MHz
- Three types of memory (32K of flash memory, 1K of EEPROME AND 2K of internal SRAM)
- General purpose I/O pins= 23
- Timers (two 8 bit timer 9tc0&TC2) and one 16 bi timer TC1)
- Real time clock
- ADC (successive approximation type)
- Serial communication devices(USART, SPI and TWI)
- Analog comparator
- Power

Pin description
- GND
- VCC: digital power supply
- Port B (PB7:PB0)

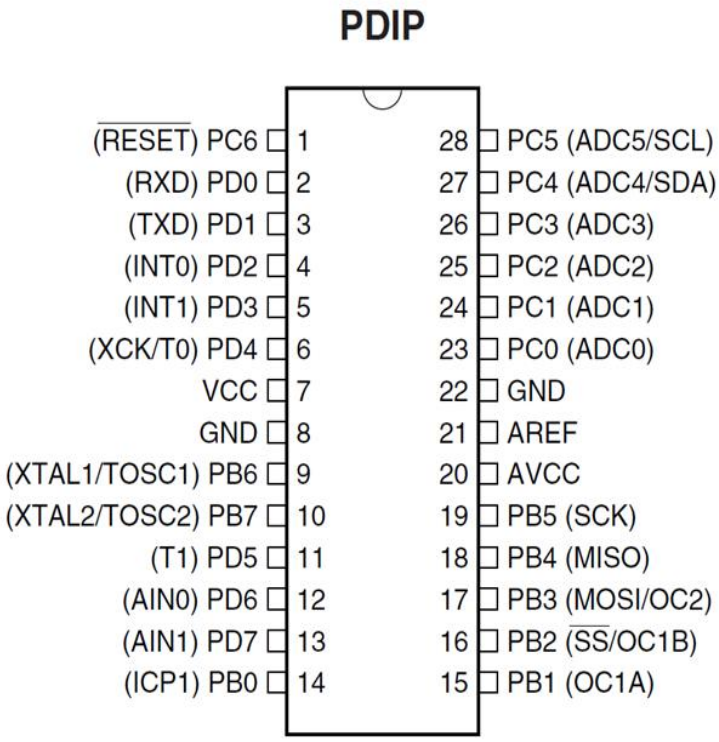
8 bit bi-directional I/O port. Pins are externally pulled low will source current if the pull up resistor are activated current tri-stated even in the reset condition and if the clock is not running.

PB6- input to the inverting oscillator amplifier and input to the inverting clock operating circuit.
PB7- output from the inverting oscillator amplifier.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

PB6:7- input for asynchronous timer.
- Port C (PC5:PC0) -7 bit bidirectional I/O port.
- Port D (PD7:PD0) – 8 bit bidirectional I/O port.
- RESET - a low level on this pin will generate a minimum pulse length.
- AVCC – supply voltage pin.
- AREF – Analog reference pin.
- ADC 7:6- Analog input.
- PCINT pins- port change interrupt.

Pin diagram



Specifications and features
- 3.3V, 5V, 12V, 15V are adjustable output versions.
- 3A output current.
- Maximum supply voltage 40-45 V.
- Wider input voltage range.
- 53 KHz fixed frequency internal oscillator.
- Inbuilt thermal shutdown and current limit protection are available.
- Output voltage for fixed voltage regulator are 3.3V, 5V, 12V, 15V.
- Output voltage for variable voltage regulator is 1.23V-37V

b) Accelerometer (ADXL335)

The ADXL335 is a 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a full-scale range of ±3 g. It can measure the acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user can select the bandwidth of the accelerometer using the X, Y, and Z capacitors. Bandwidths can be selected for suitable applications, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

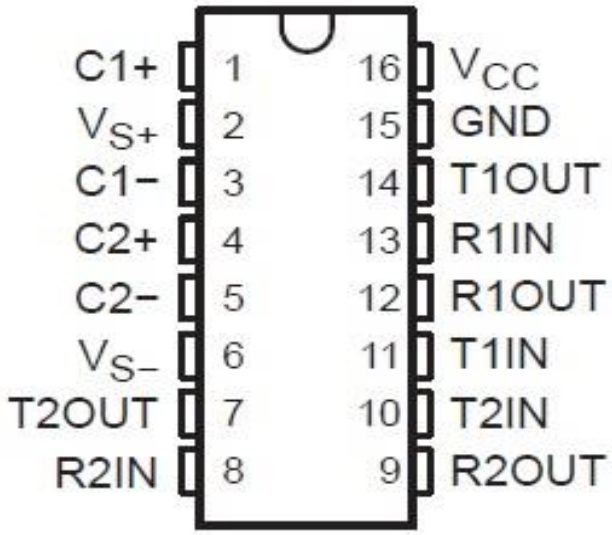
ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

c) MQ3 sensor
Features
* High sensitivity to alcohol
* Faster response and High sensitivity
* Stable and longer life span
* Simple drive circuit and small sensitivity to Benzene

Specifications
Power requirements: 5 V DC at ~165 mA (heater on) / ~60 mA (heater off).
Interface: 1 TTL compatible input , 1 TTL compatible output.
Operating temperature: 14 to 122 °F.
Dimensions: 1.50 x 1.0 x 1.0

d) MAX232
MAX232 is a dual driver device. It includes a capacitive voltage generator. It provide TIA/EIA-232-F voltage levels from a single 5 V supply. These receivers have a normal threshold voltage of 1.3 V, a typical hysteresis of 0.5 V, and can accept ±30-V inputs.

Features
Meets or exceeds TIA/EIA-232-F and ITU recommendation V.28.
Operates from a single 5 V power supply with 1.0µF capacitors.
Operates at 120 k/bits.
Two drivers and receivers.
Low supply current of 8mA.
PIN Diagram

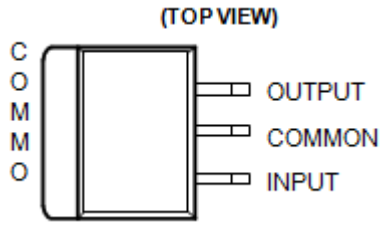


e) Voltage regulator (LM 7805)
- 3 Terminal device
- High Power Dissipation Capabilities
- Output current upto 1.5 A
- Internal short-circuit current limiting
- Internal thermal overload protection
- Output transistor safe-area compensation.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

These regulators of fixed-voltage integrated-circuit voltage regulators are designed for a wide range of applications. Each of these regulators are able to deliver an output current upto 1.5 A. The internal current-limiting and thermal-shutdown properties of this device essentially make them immune to overload condition. These devices can be used with external components for obtaining adjustable output voltages and currents and can be used as the power-pass element in precision regulators.

f) Relay
PIN Diagram



Features of 5-Pin 5V Relay
Trigger Voltage is 5V DC
Trigger Current (Nominal current) is 70 mA
Maximum AC load current is 10 A at 250/125 V AC
Maximum DC load current is 10 A at 30/28 V DC
Compact 5-pin configuration with plastic moulding
Operating time is 10 msec and release time is 5 msec
Maximum switching: 300 operating/minute

g) IR sensor module (TSOP 1738)
The TSOP17xx series are receiver system used for infrared remote control systems. Preamplifier and PIN diode are assembled on a board, the package is designed for IR filter.The demodulated output signal can be decoded efficiently by a microprocessor. It is the standard IR remote control receiver series for transmission codes.

h) GSM module:-The GSM module can provide wireless communication solution for any product that has requirement of voice communication and data transmission through state of the art cellular technology. With the GSM module, devices are enhanced in both functionality and usability based on state of the art wireless technology.

6. ADVANTAGES AND APPLICATIONS

- Simple in construction.
- Readily available ICs are used.
- High accuracy.
- Automatic and user friendly.
- Less man power is required.
- Driver alertness is more.
- Lot of accident possibilities are avoided.
- Suitable for all kind of speed reduction vehicle.
- Can also use in all type of vehicle.
- This project can be use in various organisations to detect alcohol consumption of employs

7. CONCLUSION

The integration of microcontroller, GSM,accelerometer,tachometer,MQ3 sensor 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. Accelerometer based detection unit locate inside the bus detects

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over speed. If accident occurs it also sends relevant data to the rescue and police station including the position with the help of GSM system. The supervision of over crowdedness is effectively done by using a counter mechanism. The consumption of alcohol by the driver during driving is detected by "Alcohol sensor". The resistive signal output to the microcontroller immobilizes the engine automatically and inform to the school authorities. The brake fluid level sensor the level of the fluid checked properly and avoids the mechanical failure due to the improper maintenance of the break system. This system provides overall comfort for the students. This project is the result of analysis of technologies for the enhancement of safety of transportation of school children. This paper provides an idea for the safety of school students with effective and economic way.

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