

# Automobile Collision Avoidance System

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## Abstract

The Objective of this paper is to develop a system to keep the vehicle secure and to ensure safe driving. This project develops a system that automatically stops the engine of the vehicle to avoid the accident by using ultrasonic sensor. Whenever any obstacle is detected in front of the running vehicle, the vehicle is stopped automatically depending on the distance between the vehicle and the obstacle. After alerting the driver using buzzer. The ultrasonic sensor attached in the vehicle is enabled only when the speed of the vehicle is high, since the speed of the vehicle is less in the traffic areas compared to the highways where it is required to be focused. Whenever the driver starts ignition, the sensor measures the content of the alcohol in his breath and automatically switches off the car and alert the driver using buzzer if he is drunken.

**Keywords** - High speed, enable sensor, minimum distance, alert driver, alcohol sensor, engine off.

## I. INTRODUCTION

Road accidents in India, 2016: 17

A Report on Road Accidents in India 2016, published by Transport Research wing under Ministry of Road Transport & Highways, Government of India, has revealed that more people died on roads accidents in India last year, as compared to the number of deaths in 2015.

As per the data cited in the report, the country recorded at least 4,80,652 accidents in 2016, leading to 1,50,785 deaths. The number suggests that at least 413 people died everyday in 1,317 road accidents. Further breaking down the statistics, the data reveals that at least 17 deaths occurred in road accidents in 55 accidents every hour in the given time period.

Road accidents in India, 2018

According to the Road Safety Annual Report 2018, after many years of continuous decline, the number of traffic fatalities rose by 1.6% in 2016, the last year with official and validated data, compared to 2015. Compared to 2014, the year with the lowest number of fatalities over the past three decades, the death toll was

up 5.6%. While 13 countries saw a reduction, only 18 registered an increase or stagnating numbers in 2016 compared to 2015.

The report further revealed that Highways are not the “biggest killers”. As per the report, 34.5 per cent accident deaths occurred on National Highways, while 27.9 per cent accident deaths took place on State Highways, while maximum percentage of deaths occurred on other roads (37.6). Giving insight into the cause of accidents, it further added, that speeding appears to be the biggest cause of concern.

This might increase to one death every three minutes by 2020 if there is no change in the current driving patterns.

## II. BASIC FRAMEWORK

The system is designed in such a way that the engine of the vehicle is stopped automatically in order to prevent the accident when the distance between the vehicles is very minimum which will cause accident.

Figure 1 shows all the interfaces used in the prototype of the system.

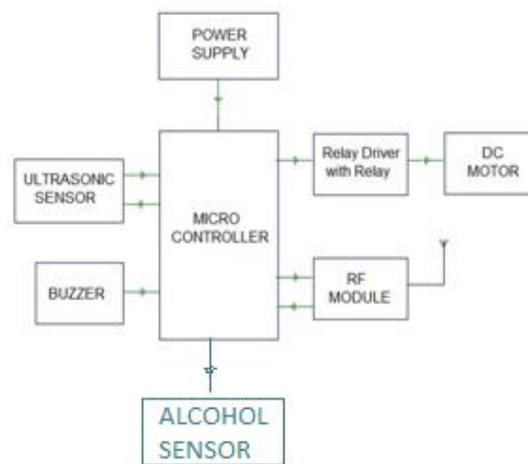


Fig. 1. - Block Diagram

## Working Description

This module consists of RF transmitter and RF receiver. The transmitter continuously sends signal to the RF receiver.

If the speed of the vehicle is low then the transmitter sends the signal 0, else if it is high it sends 1.

The system uses two relay drivers. One for power OFF/ON, the other relay driver is turned ON depending on the speed of the vehicle (whether it is low (0) or high (1)). The output of the relay is given as input to the microcontroller.

If the microcontroller receives the input as 0 (which means high speed), it enables the ultrasonic sensor.

After the sensor is enabled it begins to detect whether there is any obstacle (e.g. vehicle, pedestrian, animals, etc.) in front of the sensor which is mounted on the vehicle.

If any obstacle is detected then the distance between the vehicle and the obstacle is monitored by the ultrasonic sensor.

If the distance between the vehicle and obstacle is being reduced (less than 80cm)\* and still the speed of the vehicle is high then the buzzer is turned ON to alert the driver to reduce the speed.

If the microcontroller still receives the input as 0 (high speed) and the distance is less than 40cm\* the system turns off the engine automatically.



The output of the alcohol sensor is in the analog nature which should be converted into digital format. This is done by the analog to digital converter of the microcontroller unit. The microcontroller controls the entire circuit. When the measured value reaches the threshold (here it is 255) the microcontroller switches the ignition ON. Then relay cuts off automatically and buzzer produces sound.

\* In real time scenario if the speed of the vehicle is 100 kmph (27mps) and the detected distance between the vehicle and the obstacle is 250 meters then they both can collide with each other in 9 seconds approximately. Within this 9 seconds the buzzer is enabled as the initial step to alert the driver and then break is applied at regular interval of time to stop the engine.

At this stage the vehicle is prevented from the collision with the obstacle. Once the accident is prevented the driver can restart the engine and proceed further.

### III. OVERALL ARCHITECTURE

Figure 3 and Figure 4 shows the circuit diagram of the prototype.

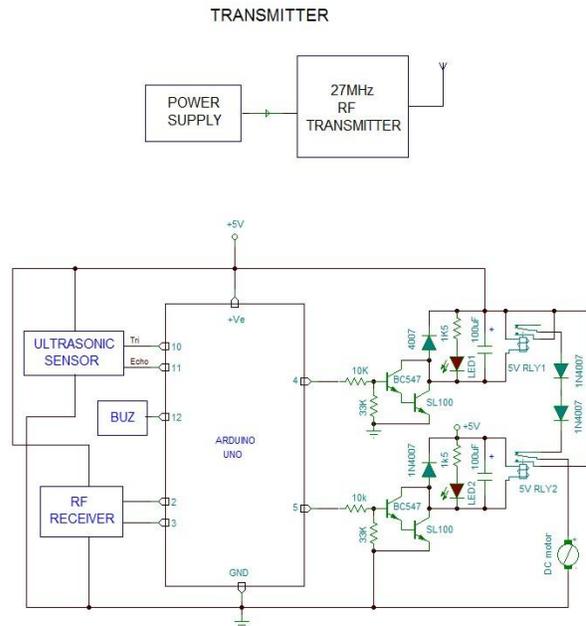


Fig. 3 – RF Transmitter and Receiver

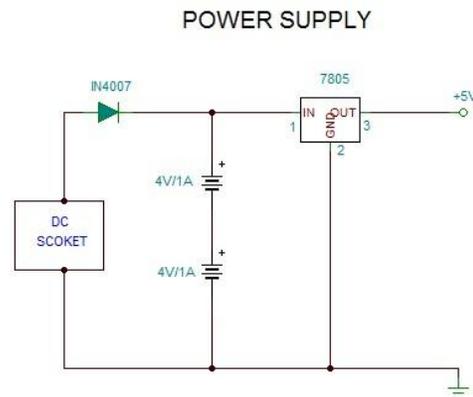


Fig. 4 - Battery

#### A. ATmega328 and Arduino

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (shields) and other circuits.

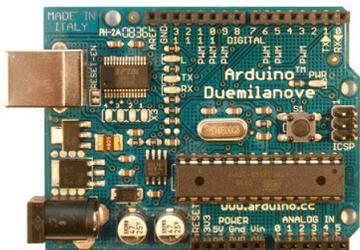


Fig. 5- Arduino Board

The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

**B. BC547 Transistor**

A BC547 transistor is a negative-positive-negative (NPN) transistor. Like all other NPN transistors, this type has an emitter terminal, a base or control terminal, and a collector terminal. In a typical configuration, the current flowing from the base to the emitter controls the collector current.

**C. HCSR04 ultrasonic**

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.

*The basic working principle of ultrasonic sensor:*

1. Uses IO trigger for at least 10us high level signal.
2. The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
3. IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

$$\text{Test distance} = (\text{high level time} \times \text{velocity of sound} (340\text{M/S}) / 2.$$



Fig. 6 - Ultrasonic sensor

**D. DIODE-1N4007**

- High Current Capability and Low Forward Voltage Drop

- Surge Overload Rating to 30A Peak
- Low Reverse Leakage Current

**E. Light Emitting Diodes (LEDs)**

It is a p-n junction diode that emits light when activated. When a suitable current is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.

**F. Voltage Regulator LM7805**

Voltage sources in the circuit may have fluctuations resulting in not providing fixed voltage outputs. The voltage regulator IC maintains the output voltage at a constant value.

**G. Relay**

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power.

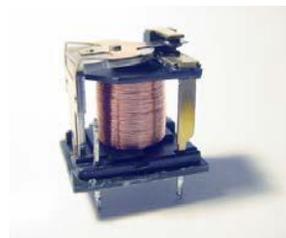


Fig. 7- Relay

**H. Alcohol Sensor**

This module is made using Alcohol Gas Sensor MQ3. It is a low cost semiconductor sensor which can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. The sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. It's conductivity increases as the concentration of alcohol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs. This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.



Fig 8-MQ-3 Alcohol Sensor

#### IV. FURTHER IMPROVEMENT AND SCOPE

- 1) A driver safety mechanism, which will consist of an emergency switch, which when pressed, will send the GPS coordinates of the vehicle with a “HELP” message to the nearest control room.
- 2) Using gas sensors to monitor the air quality inside the vehicle, as hazardous gases and suspended particulate matter may cause adverse effects on the driver. This system can be used to alert the driver, in case any hazardous gases are found.
- 3) Further testing and calibration to make the system suitable for the Indian roads.
- 4) Integration of the system with the existing safety systems present in a vehicle.

#### V. CONCLUSION

Most of the road accidents are caused by the reasons mentioned in this paper. So, there is a pressing need of implementing such a system in every vehicle, so that road accidents can be prevented, making our drive safer.

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