# Smart Road Safety and Vehicle Accident Prevention System for Mountain Roads

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**Abstract -** *In the upgrading countries accident is the major cause of death. If we talk about dangerous roads in the world then all of them are mountain roads and curve roads. The intensity of the deaths are more in curved roads. In the mountain roads there will be narrow roads with tight curves. In such kinds of situations the driver of a vehicle cannot see vehicles coming from other side. Because of this problem thousands of people lose their lives each year. while we are talking about mountain roads here other side might be lead to a cliff. The solution for this problem is alerting driver about the vehicle coming from other side. One of the solution is proposed in this paper. We can alert driver by placing ultrasonic sensor in one side of the road before the curve and keeping LED light other side of the curve, so that if vehicle comes from one end of the curve sensor will sense the vehicle and LED light glows at the opposite side as Red. By looking at the Red LED light driver can become alert and can slow down the speed of the vehicle. And still if an accident occurs we can save the life of victim by giving medical assistance immediately. This can increase the survival chances of victim. but this can happen only when we know the exact location of accidental place. This paper presents an inexpensive but intelligent framework that can identify and report an accident to the family member. If in case accident occurs, button will get pressed and it will send message to the family members using GSM module and send location of the accidental place using GPS module.*

*Key Words*: **Arduino Nano and Uno, GSM module, GPS module, Ultrasonic sensor, Accidental place.**

## 1. INTRODUCTION

There are many dangerous roads in the world like mountain roads, narrow curve roads, T roads. In these some mountain roads will be very narrow and they contain so many curves. For example Kinnaur road in Himachal Pradesh, Zoji La Pass in the Himalayas, the Road of Death Bolivia, Fairy Meadows Road (Pakistan)[1]. Some roads have tight curve with steep climbing. In such kind of situation the driver of the vehicle is not able to see the vehicle coming from other side and this can be a cause of accident at mountain roads/hill roads[2].The main motive of this project is to find the accident spot of any place and make alert to family member through the GPS and GSM network. Accident detection and prevention system contains ultrasonic sensor for sensing objects and passing information to the Arduino nano. LED is connected Arduino nano which will blow as Red after detection of object and it will alert the driver of the vehicle

coming from the other side[3]. The GPS based vehicle Accident identification module contains GSM module and a GPS module connected to the Arduino Uno.GSM is used to establish cellular connection and GPS is used to trace the position of vehicle. Now-a-days it is tought to know that an accident has occurred and to locate accidental spot. There is no system available in the market for identification and intimation regarding an accident in previous. This project presents an automative location finding system of accidental spot using GPS and GSM-SMS services.



Fig.1.Accident due to curve roads

## SYSTEM DESIGN

This system is devided into two part, they are (accident detection and prevention) and Alerting the family members by sending message and location of the accidental place(Vehicle accident identification module).Accident detection and prevention system consist of Ultrasonic sensor(HCSR 04),Led lights(Red and Green) and Arduino Nano. Vehicle accident identification system consist of GSM module(SIM 900),GPS module(Neo 6M),Arduino Uno and Button. Ultrasonic sensor uses +5V DC supply. Its range is from 2 cm to100 cm. Detection and prevention design is done for sensing the vehicle or obstacle and to operate the LED by using Arduino 1.0.10 IDE tool which is open source software. Programming can be done by using embedded C or C++. Operating system that we used is windows 10. The LED light here we used is of Green and Red color uses maximum +5V DC supply.

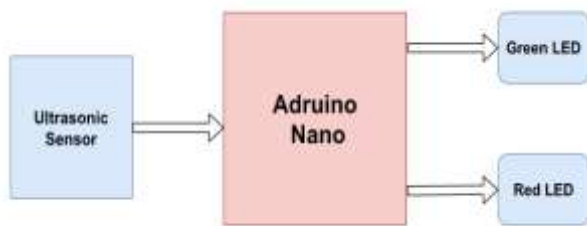**1. Accident detection and prevention:**



Fig. 2.Block diagram of Accident detection and prevention

**A. Ultrasonic sensor:**

Ultrasonic sensor(HCSR 04) uses +5V DC supply. Its range is from 2 cm to 100 cm. Ultrasonic sensor has 4 pins. They are +5V, VCC, GND, Trig pin and Echo pin. Here Trigger pin is output pin and Echo pin is input pin. Ultrasonic sensor sends the signal in the form of pulses from trigger pin. When this signal hit the object it will get reflected back and is received by the echo pin.

**B. Adruino Nano:**

The trig pin of ultrasonic sensor is connected to the digital pin 7 of Arduino nano and echo pin is connected to digital pin 8.VCC is connected to +5V and GND is connected to GND of Arduino nano. Red LED is connected to pin number 12 and green LED to 13 of Arduino nano. When sensor detect object, it sends signal to the Adruino Nano. Adruino process this signal and send signal to LED with Red LED indication.

**C.LED:**

Initially Green LED blows indicating that there is no obstacle at other side of the curve. If any obstactal comes between mountain and ultrasonic sensor Red LED blow for half minute indicating object at other side.
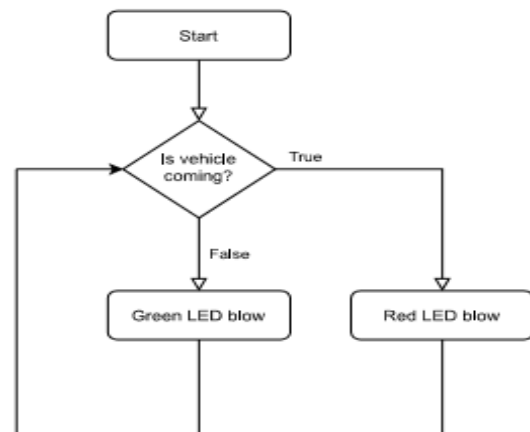


Fig .3. Flowchart for working principle of sensor based accident prevention system.

In the presence of vehicle the sensor senses the vehicle; the light will glow at the other end of the curve as Red for half Minute. In the absence of the vehicle the sensor will not sense and the light will glow as Green. This process repeats continuously.
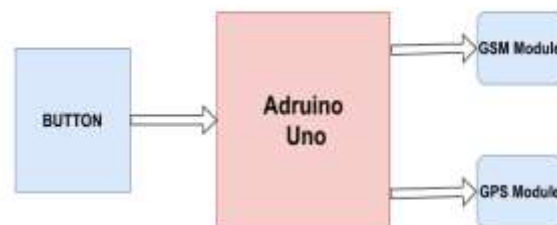
**2. Vehicle accident identification System:**



Fig.4.Block diagram of Vehicle accident identification system.

This device is placed at vehicle. It contains GSM module, GPS module Arduino Uno and Button.

**A. Button:**

We are using one button at the bonnet side of the vehicle .If accident occurs, this button will get pressed and it will send signal to Arduino Uno.

**B. Arduino Uno:**

Arduino will process this signal and it will send the signal to the GSM and GPS module indicating that accident has occured.

### C.   GSM module:

We have used Micro controller(Arduino Uno),GSM module(SIM 900) and button as show in fig 4. GSM module has 4 pins .They are VCC, GND, TX and RX. Here TX pin is output pin and RX is input pin. We are connecting TX pin of GSM module to pin no 7 and RX pin to pin no 8 of arduino uno and VCC and GND pins to respected VCC and GND pins of arduino uno. If in case accident occurs button will get pressed which is placed at bonnet side of vehicle. This will send the signal to the Microcontroller arduino uno. Microcontroller will process the signal and it will send the alert message ("Accident has occurred") to the respected stored number in coding.

### D.   GPS module:

We have used Microcontroller(Arduino Uno),GPS module(NEO 6M) with button as show in fig4.GPS module have 4 pins. They are VCC, GND, RX, TX. Here TX pin is output pin and RX pin is input pin. We are connecting TX pin to the TX pin and RX pin to the RX of Microcontroller arduino uno.VCC and GND pins are connected to VCC and GND of Microcontroller arduino uno. If in case accident occurs button will get pressed this will send the signal to microcontroller arduino uno. Microcontroller will detect the location of the place using GPS module and it will send to the respected stored numbers.
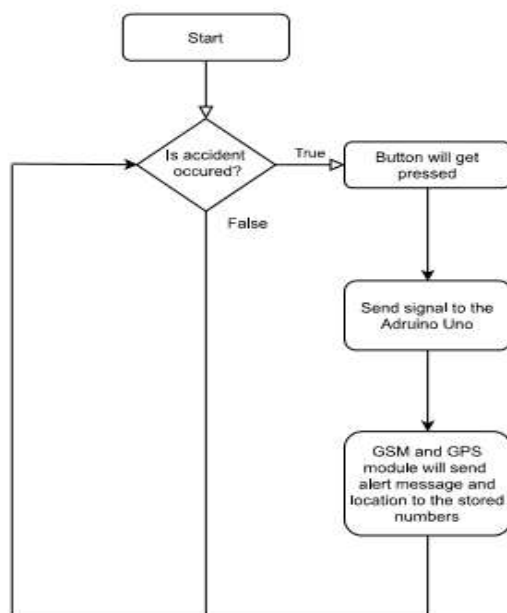


Fig .5.Flowchart Vehicle accident identification module.

In the above flow chart as explain if accident occurred, button will get pressed and it will send signal to Arduino Uno. Arduino will process this signal and using GSM and GPS module it will send alert message and location to the respected stored numbers.

## 2. LITERATURE SURVEY

**1. Aravinda B, Chaithralakshmi C, Deeksha, Ashutha K** [1] from their report, it is concluded Accident prevention in U-turn, S-turn, hilly Ghats and mountain roads using modern sensor technology, Which uses Aurdino UNO, Ultrasonic sensor, RF module LED etc.

**2. R.Saranya, R.Arun Kumar** [2] This paper conclude that, Accidents may takes place in various factors drunk and driving, Texting while driving, Speeding, Distractions, Sleeping while driving. Among Drowsiness is reason for most of the accidents.While driving at the speed of 100km/hr. driver falls sleepy within 4 seconds the buzzer will enables.

**3. Ranga Sreedhar Galla** [3] has studied the basic aim of their paper is to reduce accidents on hilly and slippery roads. In curve roads the other road end of vehicle cannot seen by driver. At night time accidents may happens by intensity of head light from opposite side of vehicles. Also, the light intensity problem occurs both curved roads and mountain roads; Thousands of people lose their lives. The solution for this problem is alerting the driver about the vehicle coming from opposite side. This is done by keeping an ultrasonic sensor in one side of the road before the curve and keeping a LED light after the curve, so that if vehicle comes from one end of the curve sensor senses and LED light glows at the opposite side.

**4. Kartik Venkata Mutya, Sandeep Rudra** [4] has studied that road traffic accidents are being recognized as a major public health problem in numerous countries with alarmingly increasing fatalities in developing countries. Careless driving as a result of excessive waiting and blind corners is attributed as one of the most important factor for all road accidents. An estimated 1.2 million people lose their lives in road traffic crashes every year, and another 20 to 50 million are injured. A docile, economical mechanism to prevent these road accidents is the need of the hour. It is hoped that the mechanism presented in this article would help in alleviating this concern especially in correspondence with large vehicle accidents on highways by being easily implemented in low and middle income countries.

## 3. ADVANTAGES

1. Avoid accidents in curve roads, mountains roads and hill roads.

2. Saves thousands of lives.

3. Easily implementable.

4 .Fully automated (No person is required to operate).

5. Installation cost is very less.

## 4. FUTURE WORK

1. We can make application to store data in the arduino microcontroller.

2. Arrangements to protect the sensor from being damaged in critical places.

3. Decrease the size of unit so that it occupies small place and easily kept in narrow roads.

## 5. CONCLUSION

The motive of this paper is to decrease the number of accidents in curve roads. This is done by alerting the driver by means of LED light which glows when vehicle comes from the other side of the curve. The vehicle is detected by the help of Ultrasonic sensor which is interfaced to the microcontroller Arduino Nano. and Still if accident occurs then alerting family member by sending message and location of the accidental place using GSM module, GPS module and Arduino Uno. By this we can save thousands of lives in the curve roads.