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# VEHICAL ACCIDENT PREVENTION SYSTEM FOR MOUNTAIN ROADS

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**Abstract -** Vehicle accident prevention system can be a major step in accident safety on mountain roads. In past 100s of accident and death on mountain roads, some even fall from the cliff which are not traced after that have been noticed. Such accidents not only cause loss of human life but also major loss financially not just to the individual but also the government. Mountain roads are narrow and any such accidents can force it to be closed for hours which can be a huge issue.

This project addresses the pressing issue of mountain road safety through the deployment of two strategically positioned ultrasonic sensors in U curves. The primary objective is to detect oncoming vehicles, precisely measure distances, and promptly activate warnings on the opposite side. By leveraging real-time data and proactive measures, the system aims to significantly reduce accidents in challenging terrains. The integration of red LED lights and a buzzer enhances visibility and auditory awareness. This innovative approach reflects a crucial step forward in accident prevention, particularly in mountainous regions, where traditional safety measures fall short.

## 1. INTRODUCTION

As the population grows, so do the chances of an accident happening. Today, the prevention of these accidents is a major concern. The fundamental cause of all of these accidents is negligence, the negotiation of safety measures, and so on. As technology advances at a faster rate, safety measures are also being modified, but accidents continue to occur. Mountain roads, narrow curve roads, and T roads are some of the world's most dangerous routes. The most perilous mountain routes are very small and contain many turns. In such cases, drivers may be unable to notice the car approaching from the opposite direction. The majority of road accidents occur at high speeds or when the driver is unaware of other vehicles approaching from behind, especially in sharp curves. The current method utilizes convex mirrors at curves to allow the driver to easily notice vehicles approaching from the other direction. This method works during the day but not at night. The biggest difficulty with curve roads is that the other end of the curve road cannot be seen by the driver due to impediments such as trees in the middle, which causes a high frequency of accidents. Sensors are installed at hairpin corners in the proposed system; they operate exceedingly well at night. The problem can be solved by installing sensors on each side of the bends. Sensors can also be calibrated to meet specific requirements. In the same way, the sensor on the opposite side of the curve provides a signal to the vehicle approaching from the opposite direction.

Fig1: Vehicle present on U Curve

## 2. PROBLEM STATEMENT:

Mountainous regions witness a disproportionate number of accidents, with U-curves serving as high-risk zones. Existing safety measures fall short, resulting in increased accident rates. This project identifies the pressing need for an effective preventive system, specifically tailored to the challenges of mountain roads, focusing on U-curves to curb accidents and enhance overall road safety.

Fig2: Crash on Curve roads

## 3. OBJECTIVES OF THE PROJECT:

The main objective of the proposed system is

- To develop an accident prevention system for mountain roads.
- To implement real-time warnings on the opposite side of U-curves.

## 4. OVERVIEW OF THE PROJECT:

At the heart of this accident prevention system lies the Arduino microcontroller, serving as the brain orchestrating the entire operation. This versatile microcontroller is chosen for its computational capabilities and flexibility, enabling seamless integration with various components.

The system employs the Arduino microcontroller to interpret this information and make real- time decisions. To enhance driver awareness.

The key to accurate distance measurement is the ultrasonic sensor, strategically placed in U curves.

This sensor emits ultrasonic waves and calculates the time it takes for them to return, providing precise distance data.

A buzzer is integrated, emitting audible alerts upon detecting an approaching vehicle.

Simultaneously, LED lights play a crucial role in providing visible indications.

A red LED activates when a vehicle is present, signaling potential danger, while a green LED illuminates when the road is clear, indicating safety.

This modular design ensures a cohesive system where the Arduino microcontroller acts as the central intelligence unit, processing data from ultrasonic sensors and triggering responses through the buzzer and LED lights. The system's reliability and responsiveness are thus maximized, offering an effective solution for accident prevention in mountainous roads.

The integration of these components underscores a holistic approach, combining computational precision, sensor technology, and perceptible alerts to significantly enhance road safety in challenging terrains.

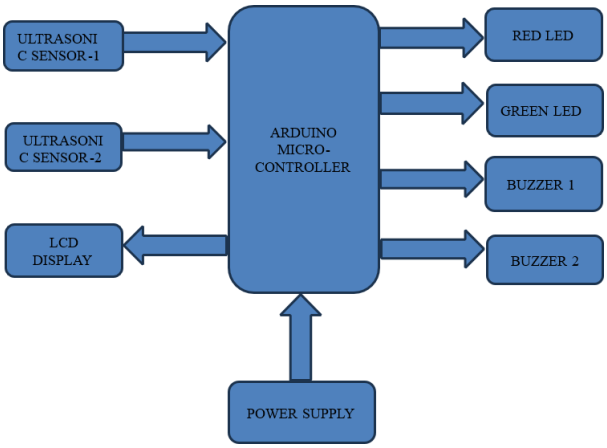


Fig3: Block diagram

The proposed system (Vehicle Accident Prevention System for Mountain Roads) is designed to reduce accidents happening in dangerous area like of mountain roads. If the vehicle is in very high speed, then it is difficult to control the speed of the vehicle and there are chances of falling to cliff. The solution for this problem is alerting the driver about the obstacle or vehicle coming from opposite side of the valley. This accident prevention system uses Arduino board, LCD Display Ultrasonic sensors, LED lights and buzzer.

By keeping Ultrasonic sensors in both side of the road before the curve and keeping the LED's & LCD Display above ultrasonic sensors. The ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about vehicle's proximity.

When two cars pass from the opposite side of a mountain curve reaching towards each other the ultrasonic sensor detects the vehicle coming from another side of curve. Then I2C module helps to display content ('Direction and Distance of Vehicle') in LCD display and it turn on the red led on one side of the road giving signal of danger, green led on another side of the road it shows road is clear then buzzer also turn on.

## 5. CONCLUSIONS

The implementation of an ultrasonic sensor-based accident prevention system in mountainous U-curves represents a significant advancement in road safety. The project's proactive approach, real-time responsiveness, and simplicity contribute to mitigating accident risks in

challenging terrains. Future enhancements may address limitations, ensuring continuous improvement in mountain road safety.

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