

Mountain Road Accident Prevention System

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Abstract: This project presents a road turning accident prevention system using Arduino UNO, IR sensors, and LEDs, which helps improve road safety by detecting obstacles or vehicles at turns and providing real-time alerts to drivers. The IR sensors sense any movement or object in the turning path, and the Arduino UNO processes this data to control LED indicators that warn drivers about potential hazards. This system is cost-effective, easy to implement, and helps drivers take timely action, thereby reducing the chances of accidents and making roads safer.

Keywords: IR sensors

I. INTRODUCTION

Mountain roads are dangerous due to rough terrain, poor visibility, and harsh weather conditions, which increase the risk of accidents and make rescue operations difficult. To improve safety, a crash prevention system is necessary to reduce accidents and protect drivers and pedestrians.

This project proposes an accident prevention system using infrared sensors that detect vehicles and obstacles even in low visibility conditions like fog and snow. The sensors send real-time data to a control unit, which analyses it and provides alerts to drivers about potential hazards, helping to prevent accidents and improve overall road safety.

II. LITERATURE REVIEW

A. "Sensor Based Accident Prevention System"

Author: Aravinda B, Chaithra Lakshmi C, Deeksha, Ashutha K

This paper presents a sensor-based accident prevention system using an ultrasonic sensor and LED. The sensor is placed before the curve to detect vehicles, and the LED is placed on the opposite side. When a vehicle is detected, the LED glows to alert drivers about an approaching vehicle. This helps drivers slow down or stop if necessary. The system is useful for blind curves and can reduce accidents and save lives. It uses an ultrasonic sensor interfaced with Arduino UNO. This system is simple, low-cost, and easy to install in real-time road conditions. It is highly effective for improving safety on curved and mountain roads.

B. "Diminishing Road Accidents on Sharp Curves Using Arduino"

Author: Ranga Sreedhar Galla

This study focuses on reducing accidents on hilly and curved roads where visibility is low. At night, strong headlights from opposite vehicles also cause accidents. The system uses an ultrasonic sensor and LED to detect vehicles and alert drivers. When a vehicle is detected on one side, the LED glows on the other side, warning drivers and helping prevent accidents. This approach improves driver awareness and reduces the chances of collision in blind spots. It is especially useful in night-time and foggy conditions.

C. "Smart Road Safety and Vehicle Accident Prevention System for Mountain Roads"

Author: Kartik Venkata Mutya, Sandeep Rudra



This paper highlights road accidents as a major problem, especially in developing countries. Blind corners and rash driving are key causes of accidents. Millions of people are affected every year. The study suggests a simple and low-cost system to prevent accidents, which can be easily implemented and help reduce accidents and save lives. The proposed system is economical and suitable for large-scale implementation. It can significantly improve road safety and reduce accident rates in high-risk areas.

III. SYSTEM DESIGN AND METHODOLOGY

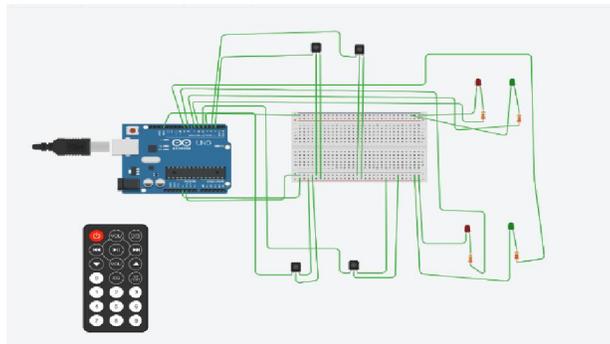
A. System Overview

The proposed system uses an Arduino UNO, IR sensors, and LED indicators to prevent accidents on mountain road curves. The IR sensors are placed on both sides of the road to detect approaching vehicles. When a vehicle is detected, the Arduino processes the signal and turns ON the LED on the opposite side to alert other drivers.

B. Working Principle

The system works on IR sensor detection. When a vehicle passes near the sensor, it sends a signal to the Arduino, which activates the LED as a warning. This helps drivers slow down and avoid accidents on blind turns and low-visibility mountain roads.

Block Diagram



IV. HARDWARE COMPONENTS

A. Arduino Uno

Arduino Uno is the main controller that processes signals from sensors and controls the system. It manages the warning signals for vehicle safety.

B. Infrared Sensors

IR sensors detect the presence of vehicles on both sides of the road. They send signals when a vehicle approaches a blind turn.

C. Jumper Wires

Jumper wires connect all components on the breadboard. They help in signal and power transmission.

D. Connection Wires

Connection wires provide proper electrical connections between components. They ensure stable power supply in the system.

E. Breadboard

Breadboard is used to assemble and test the circuit without soldering. It makes circuit design easy and flexible.

F. LED

LEDs act as warning indicators for drivers. They glow to show caution or danger and help prevent accidents.



Sr. No	Component	Specification	Purpose
1	Arduino Uno	ATmega328P Microcontroller	Main controller for processing sensor data
2	IR Sensor	3–5V operating voltage	Detects vehicle movement
3	Jumper Wires	Male-Male / Male-Female	Electrical connections
4	Connection Wires	Insulated copper wires	To connect components
5	Breadboard	Solderless board	To build/test circuit
6	LED	2v, low current	Warning(yellow), danger(red)

V. EXPERIMENTAL SETUP

The mountain road accident prevention system is designed using a base board to simulate a curved road where visibility is limited. In this setup, four IR sensors are placed on both sides of the road to detect vehicles approaching from opposite directions. These sensors are connected to an Arduino UNO through a breadboard using jumper wires, along with LED indicators for alert. When a vehicle passes near any sensor, it sends a signal to the Arduino, which processes the input and checks whether vehicles are coming from both sides at the same time. If such a situation occurs, the system turns ON the LEDs to warn drivers about danger at the blind turn. The entire setup uses a common power supply and ground connection through the breadboard. This system successfully detects vehicle movement and provides visual alerts, making it a simple, low-cost, and effective solution for preventing accidents on mountain roads.

VI. RESULT AND DISCUSSION

The system detects vehicles on a curved mountain road using IR sensors placed on both sides. When vehicles approach from opposite directions at the same time, the Arduino processes the signals and turns ON the LEDs to provide a visual warning.

This helps drivers become aware of danger at blind turns and reduces the chances of accidents. The system is simple, cost-effective, and reliable for basic accident prevention.

VII. CONCLUSION

The Arduino UNO-based road turning accident prevention system is an effective solution to improve road safety. It uses sensors and real-time alerts to detect vehicles and warn drivers, helping to reduce accidents, especially on blind turns and sharp curves. This system can save lives and minimize damage caused by road accidents.

Additionally, the system is low-cost, flexible, and easy to customize, making it suitable for wide use. It can also be improved by adding technologies like GPS and machine learning for better performance. Overall, this project is a simple yet powerful step toward safer roads and smarter transportation.

VIII. ACKNOWLEDGMENT

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