INTELLIGENT VEHICLE COLLISION AVOIDANCE SYSTEM USING LIGHT AND SOUND SIGNALING

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ABSTRACT
This project describes an Intelligent Vehicle Collision Avoidance System with Light and Sound Signaling that uses Infrared (IR) sensors,light-emitting diodes (LEDs), and a buzzer to detect and prevent collisions between cars to improve road safety. By tracking the closing gap between them, the technology recognizes oncoming cars and turns on LEDs to alert drivers visually. It also signals to drivers to keep a safe distance when they see another car following too closely. When a vehicle's distance from another becomes dangerously close, the system sounds a buzzer to alert drivers and encourage them to take quick action to prevent collisions. This system's implementation provides drivers with real-time alerts, lowering the likelihood of collisions and encouraging safer driving.
Keywords: Intelligent Transportation System (ITS), fog, nighttime, glare reduction, microcontroller, proximity sensors, and adaptive methods.

INTRODUCTION
In the modern world, road safety is of utmost importance due to the rise in vehicle traffic and the potential for crashes, which pose serious risks to both drivers and passengers. The Vehicle Collision System Avoidance System Through Light and Sound Signaling project provides a creative way to address this issue and lessen the likelihood of accidents occurring on the road. Through the use of cutting-edge technologies, including buzzers, LEDs, and infrared (IR) sensors, this system gives drivers the ability to identify and warn in real time.
The Vehicle Collision Avoidance System Avoidance System's main goal The purpose of light and sound signaling is to monitor the space between moving vehicles in order to identify and avoid collisions. The system continuously measures the proximity of vehicles in the vicinity by integrating infrared sensors that are strategically positioned on both the front and rear of each vehicle. The technology turns on LEDs to visibly warn drivers as cars get closer to one another or pass each other, improving situational awareness and encouraging safe driving habits.

LITERATURE SURVEY:

Rajamani Krishna and David J. Anderson's book "Intelligent Transportation Systems: Smart Solutions for Traffic Congestion, Collision Avoidance, and Road Safety"
In their 2017 study, Krishna and Anderson investigate the use of intelligent transportation systems (ITS) as clever solutions to a range of problems in traffic control, collision prevention, and road safety. Adaptive cruise control systems, vehicle-to-infrastructure communication, traffic monitoring, and other ITS technologies and applications are all covered in their work. Road safety, congestion reduction, and traffic flow can all be improved with the help of Intelligent Transportation Systems (ITS), which utilize modern sensors, data analytics, and communication networks.

Manikandan and Prabakar's "Light-Based Vehicle Collision Avoidance System for Night-Time

Driving":
A light-based vehicle collision avoidance system is proposed by Manikandan and Prabakar (2018) and is specially made for driving at night. In low-visibility situations, their system lowers the danger of crashes by detecting and communicating the proximity between vehicles using cutting-edge lighting technology.

S. Deepa and A. Valarmathi's "A Review on Fog Detection and Warning Systems for Intelligent Transportation Systems":
An extensive analysis of fog detection and warning systems for intelligent transportation systems (ITS) is given by Deepa and Valarmathi (2021). Their research looks at a range of methods and tools, including cameras, sensors, and weather forecast models, that are utilized in fog detection. They also go into the use of visual displays, audio alarms, and vehicle-to-vehicle communication in warning systems to warn drivers of potentially dangerous fog situations.

EXISTING SYSTEM

Title: ACCIDENT DETECTION AND ALERT SYSTEM

These days, there are a lot of traffic incidents, particularly involving two-wheelers. Early medical intervention can save lives. In order to give emergency medical attention, this system attempts to notify the closest medical facility about the collision. To determine how bad an accident is, an accelerometer that is attached to the car detects tilt, and a heartbeat sensor on the user's body detects irregular heartbeats. As a result, the systems will decide and transmit the data to the smartphone that is linked to the accelerometer via GPS and GSM modules. Friends and the closest medical facility will receive text messages from the Android application on the phone. The application can save time and also provides the precise location of the incident.
This report presents a way to lower the nation's accident rate. There is an introduction to automated accident detection and alert systems. The major goal is to control the accidents by using wireless communications techniques to send a message to the police station, hospital, and registered mobile. When an accident happens in a city or anywhere else, the registered mobile phone receives the message via the GSM module faster. The Arduino is the brains behind the system, facilitating the message's transmission to various components. When an accident happens, the vibration sensor will go off, and the GSM module will send the information to the registered phone. The accident site's location can be determined with the use of the GPS device. The suggested Using GSM and GPS modules, the system will determine whether an accident has occurred and use registered cell numbers and nearby medical facilities to report the accident's location. A tracking system can receive the location and use it to cover the area's geographical coordinates. One of the main modules in the system, the vibration sensor, is able to identify the accident.

Drawbacks of the existing System:

- A collision is possible if the driver ignores the warning and does not stop.
- A mobile device should always be present with people.
- Cannot guarantee complete security.
- The phone or automatic is broken or disconnected.
- There was no GPS signal when the crash occurred.

PROPOSED SYSTEM

The suggested plan incorporates ultrasonic sensors that identify obstructions and generate output in the form of buzzers and LEDs.

- To improve road safety, the suggested Intelligent Vehicle Collision Avoidance System makes use of IR sensors, ultrasonic sensors, a relay module, and an Arduino microcontroller.
- The technology alerts drivers in a timely manner when it detects the presence of other vehicles. The warning signals consist of a buzzer sound that activates within a 10-centimeter range, demanding immediate attention, and a red-light indication to alert drivers when vehicles get within 25–30 centimeters of one another. These signals are detected by ultrasonic sensors. Furthermore, infrared sensors are used to identify cars coming from the other direction.
- The relay module regulates the headlight transition from high intensity to low intensity, maximizing visibility without creating glare.
- The IR sensors activate when vehicles are directly opposite, signifying the necessity for adaptive lighting modifications.
- As the brains of the system, interpreting sensor data and coordinating the actions of the various components, the Arduino microcontroller temporarily activates the high beam signal upon crossing pathways to guarantee unambiguous communication between drivers. Our suggested solution integrates various technologies to drastically lower the probability of collisions and improve overall road safety, particularly in the event of nighttime and foggy driving circumstances.

Advantages of the proposed system

- There is no constant need to carry a cell phone.
- Mainly used to prevent accidents during accidents.
- Economical
- Sensor maintenance is simple; drivers are constantly alerted.
- During the night, light intensity will assist drivers without creating any disruptions.Easy maintenance of sensor.

System Block Diagram

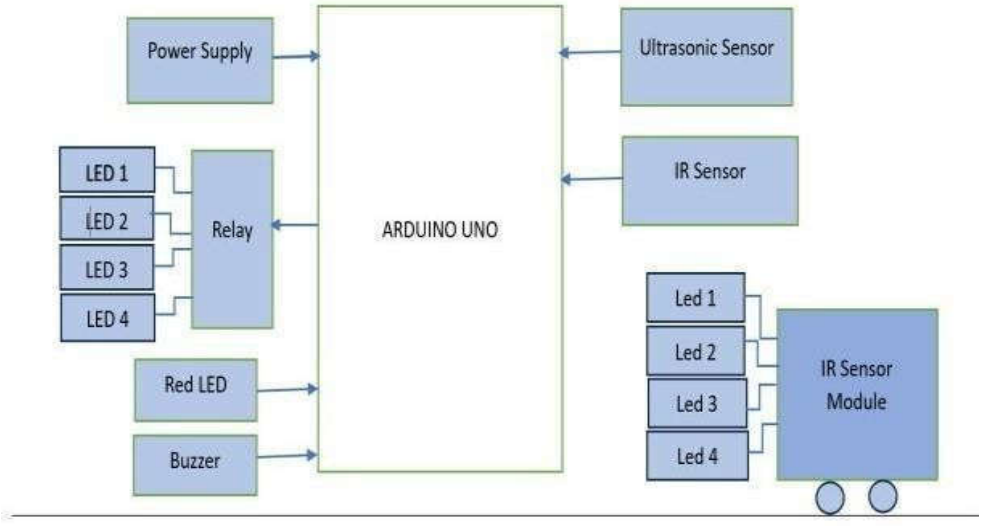

Fig 1.System Architecture

RESULT ANALYSIS

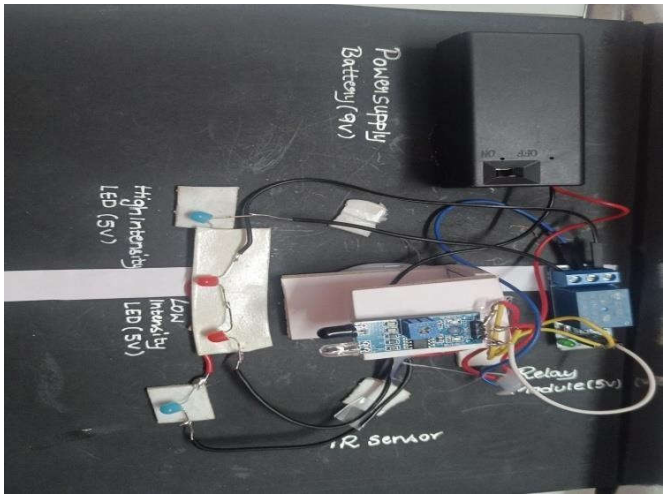

Fig 2: Power supply, relay and IR sensor connections

Fig 3: During Night Time

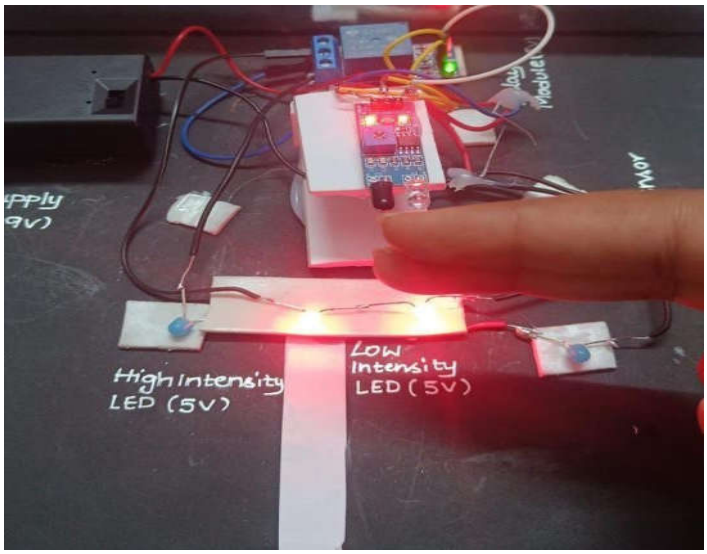

Fig 4: Checking for obstacles

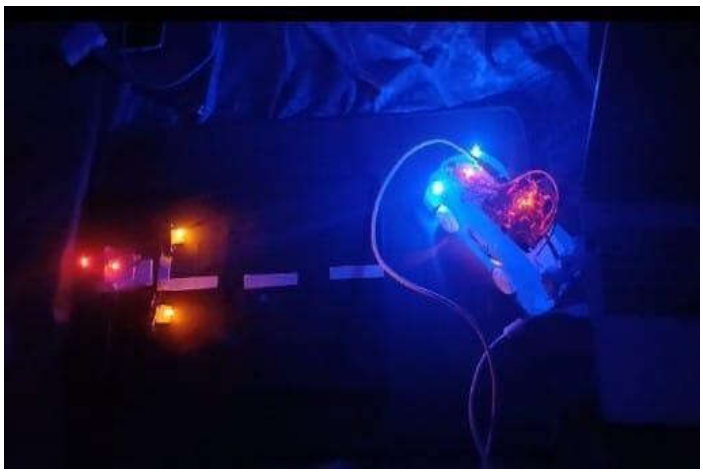

Fig 5: High intensity lights during night time

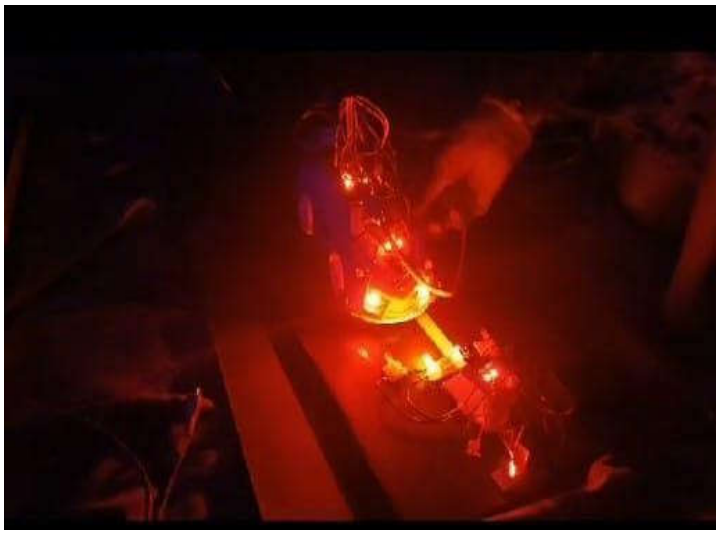

Fig 6: Low intensity lights during night time.

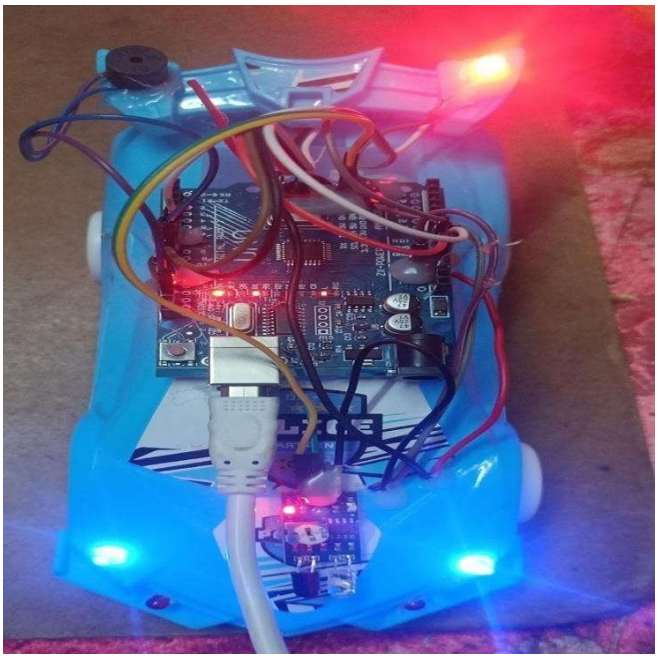

Fig 7: Arduino connection in vehicle.

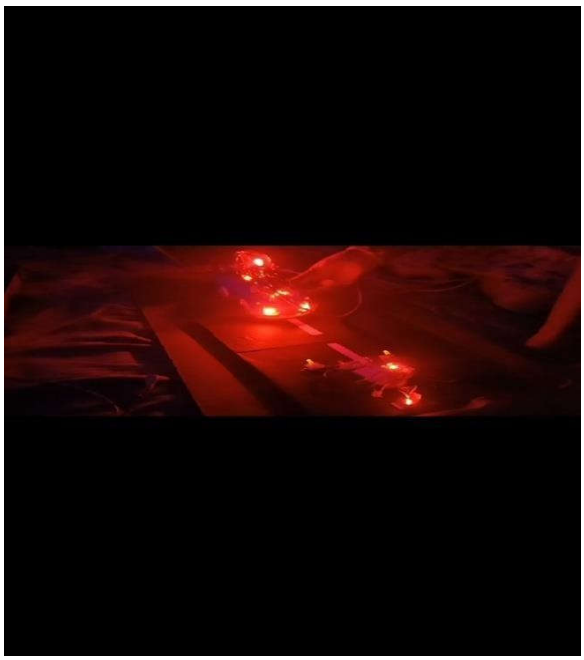

Fig 8: Intensity of lights during night time.

CONCLUSION

In summary, the suggested intelligent vehicle collision avoidance system is a viable way to improve road safety by combining adaptive techniques with light and sound signaling to efficiently communicate vehicle proximity and reduce the likelihood of collisions. The system attempts to give prompt warnings and clear communication amongst drivers by incorporating multi-sensory cues such as buzzer noises, adjustable headlight intensities, and red-light indications. This would ultimately reduce the likelihood of collisions and improve overall road safety. This novel strategy could greatly increase road safety for both drivers and passengers with additional development, application, and broad acceptance.

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