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COLLISION AVOIDANCE HELPING SYSTEM FOR DRIVERS

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Abstract
This paper is used to enhance the driver assistance system for collision avoidance. The advanced driver assistance system (ADAS) is the most innovative technology in the auto mobile industry. Our paper focuses on the problem of road mishaps. Most road accidents occur due to driver negligence. The main purpose of our paper is to propose a method to avoid such accidents using advanced technology at a low cost. We focus on the functions of collision avoidance and liquor detection to give a suitable result for all the problems. We implemented this method using the Arduino UNO, along with the required sensors. The collision avoidance can be reduced by using a cruise control system using an ultrasonic sensor. The system alerts the driver when the oncoming cars are getting too close to the front cars. Using an alcoholic sensor, we can detect the liquor detection of the driver, respectively. With all these functionalities, there is a possibility to avoid accidents. There is future scope for our method by including additional features to reduce accidents.

1. INTRODUCTION

According to the WHO, 1.3 million people die each year due to road accidents. News of road accidents is very common these days. Even though there are some features to overcome accidents using airbags and seat belts. But these can be achieved after road accidents occur. So, we have been able to stop those accidents before they happen. ADAS technology helps drivers with safe driving.

Most road accidents occur due to human mistakes. ADAS schemes are automatic schemes that can be used to decrease the death rates by avoiding human mistakes.

Using this project, we can perform three functions, like collision avoidance. This can be achieved by detecting the object using an ultrasonic sensor. It transmits the sound waves that fall on the object and receives the signal back. If the distance to the object is less than the pre-set value, then the car will automatically slow down. The alcohol consumption of the driver can also be detected using the MQ3 sensor. The

LDR sensor is also used to detect the light intensity to determine whether the vehicle exists or not. It can also reduce accidents due to its glaring effect.

2. RELATED WORKS

In 2020, Shivam Kumar et al. proposed a method called the FCW method using CNN. That method can be used to avoid car accidents. It monitors the forgoing cars and measures the distance between the vehicles. If the vehicle is very close, then this method can avoid a collision by giving the audio signal to the driver. The distance can be calculated by the CNN camera, which will be located on the windshield to click rear-side images of the preceding vehicle. After capturing the images of the car, the images will be fed to the model. Next, after feeding those images into the model, it will then detect the distance between the cars. In the past, researchers used technologies like ADAS and FCW Systems, which are entirely dependent on hardware and cost-effective.

In 2020, Ashwini Gade et al. propose a method called the Intelligent Transport System. They implemented this method using the Raspberry-pi microcontroller through IP connectivity and with the required sensors to control the devices from other locations. They implemented the methods called the auto-lock system and the collision avoidance system. They reduce accidents caused by alcohol consumption, rash driving, and blind spots using these methods. They also protect the driver from unnatural gases present in the vehicle by using required sensors.

In 2020, Gopalakrishnan et al. propose a method called ADAS. They implemented it using RFID technology with the required sensors. Whenever the vehicle enters into an RF region, the speed of the vehicle can be controlled using RFID tags and readers to calculate the distance of front-going cars at a defined speed limit. Required sensors are also used to reduce collisions and crashes with walkers.

In 2019, Ashok Kumar proposed a method called "speed limit recognition using Beacon technology." This technology helps drivers to get notifications when the vehicle enters the region where beacon tags are placed, and Bluetooth should be enabled on the mobile.

In 2022, S. Jafar Ali Ibrahim, et al., proposed a method called SVM-Based cloning and jamming attack detection on IoT sensor networks. In the proposed technique, the base station can classify the nodes as cloned or normal by checking the distance measurements from IoT devices. The proposed SVM clone shows accurate simulation results with decreasing energy consumption and a false positive rate.

3. PROPOSED SYSTEM

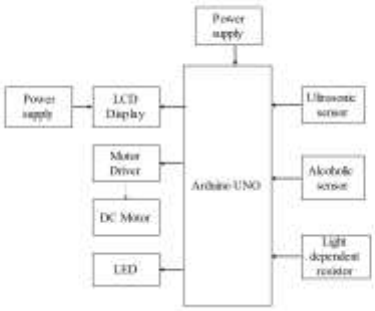

Figure 1: Proposed System Block Diagram

The various components and sensors are used to propose our method, integrated with the Arduino Uno microcontroller. The components are: Arduino Uno, IR sensor, LED, ultrasonic sensor, alcohol sensor, buzzer, LDR (light dependent resistor), LCD display, DC motor, motor driver, and power supply. The details of each sensor can be described as follows:

A. Ultrasonic sensor:

Ultrasonic sensors work by emitting sound waves at a frequency that is too high for human beings to hear. It is a four-pin module with pins for Echo, Trigger, Vcc, and ground, respectively. The sensor will transmit the waves that are reflected off any material, and the waves will be reflected back to the sensor. The reflected wave is then observed by the ultrasonic receiver as shown in fig. The SRF04 sensor provides a 2 cm to 400 cm non-contact measurement function. The ranging accuracy can reach 3mm.

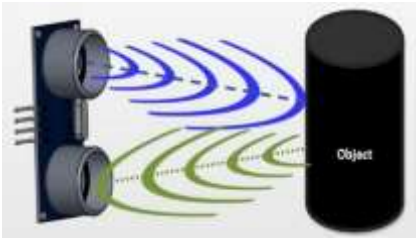

Figure 2: Ultra Sensor Working

Figure 3: Ultrasonic Sensor

B. LCD Display

An LCD display is used to display the outcomes of all sensors. It is better than LED and other displays. It also depletes less power than other displays.

Figure 4: LCD Display

C. Alcohol sensor:

An alcohol sensor is used to identify the presence of alcoholic gas in the air and produce an analogue voltage as an output reading. Here we used this sensor to identify whether the driver consumes alcohol or not. If the driver's consumption of alcohol is over a particular limit, then the system will not be in a power state, so accidents can be reduced. Alcohol sensors are easily interfaced with the Arduino boards and the microcontroller board.

Figure 5: An alcoholic sensor

D. Arduino Uno:

The Arduino Uno is an open-source platform. It is easy to implement both hardware and software, and many Arduino projects can be done easily.

Figure 6: Arduino Uno Board

The Arduino board takes the input values from the sensors and actuates the actuators based on the values obtained. It has a CPU along with MU. It sends the

output signals to turn on and off the output devices. It can be used in various domains.

E. LDR:

An LDR sensor is used to detect incident light by calculating the intensity of light. The unit gives the output a high when the incident light is present and a low if the incident light is not present. It means by this we can identify whether there is the presence of light or not. If there is light, we can reduce our light intensity there by reducing the accidents due to the glaring effect.

Figure 7: LDR

3.1 WORKING METHOD

The micro controller can collect data from the IR sensor, ultrasonic sensor, alcoholic sensor, and LDR sensor.
An IR sensor can be used to check whether the vehicle is moving in the same lane or not. It can read the data and check if a vehicle moves to a different lane, then it can track the lane, otherwise it can adjust to the same lane.

The alcohol sensor reads the data and if it is detected that the driver has consumed alcohol, then it immobilises the vehicle. Otherwise, it makes the vehicle free to move.

An ultrasonic sensor reads the data by generating sound waves. It transmits the signal from the transmitter, and the signal falls on the object and reflects the reflected signal back. If the object is detected at a distance of 20m, it again checks if it is present at a distance of less than 3m. If it is, then the vehicle stops moving. Otherwise, the vehicle moves in its normal mode.

If the input value is greater than the threshold value, the light intensity is higher, indicating that a vehicle is present, the low beam is on, and the high beam is off.

4. RESULTS AND DISCUSSION

Here the figures describe the results. Figure 8 describes the complete implemented module. Figure 9 describes the normal mode of a module whose distance is greater than the predefined threshold. Figure 10 describes the slow mode of the module

whose distance is less than the predefined threshold. Figure 11 describes an object nearer to the vehicle with its low beam on. Figure 12 describes the detection of alcohol.

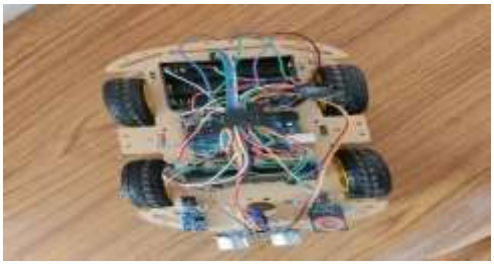

Figure 8: Complete Module

Figure 9: Normal Mode

Figure 10: Slow Mode

Figure 11: Near Vehicle with low beam on

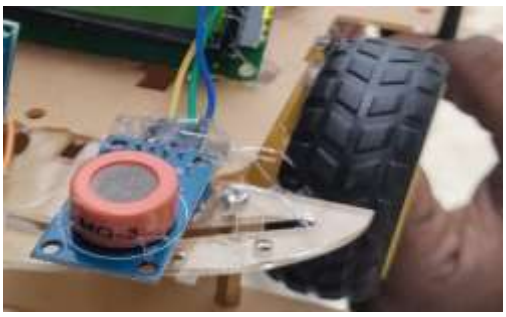

Fig. 12: Detection of Alcohol

5. CONCLUSION AND FUTURE SCOPE

The adaptive cruise control system is an essential part of our system to control the speed of the vehicle. This system also helps to avoid mishaps from collisions between the vehicles. An alcohol detection system can also be implemented to reduce road accidents. In the future, lane change detection can be included with road surface segmentation. Stereo vision can also be implemented for accurate estimation of front-going vehicles.

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