Multiple Speed Control Techniques to Reduce Vehicle Accidents

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Abstract: Road accident has been a major problem in India in recent years. An automatic speed control system is proposed to reduce road accidents by controlling the speed of the vehicle automatically. The designed system includes a sensor unit, a microcontroller unit and a functional unit. In the sensor unit, different sensors are used to perceive information to control the speed of vehicles. This functional unit is mainly based on an electrical throttle control mechanism. Finally, the microcontroller is used for taking decisions regarding the speed control of vehicles. This system shows a good prospect for speed control of the vehicles. Thus, it can be able to reduce vehicle accidents.

Key Words: Color based speed control, Reduce accidents, Road Safety

I. INTRODUCTION

Many accidents are partially caused because of rush driving by the drivers. Due to the high speed of the vehicles, drivers lose control of vehicles and accidents occur. A driver assistance system in every car is a solution for avoiding accidents related to high-speed driving. A prime example of driver assistance systems is cruise control (CC), which has the capability of maintaining a constant user-preset speed The main idea of the proposed system is to design a speed control system where the vehicle can adjust the speed depending upon the speed limit of the road. If a driver drives a vehicle at a high speed on a road where speed is limited, then the system will automatically decrease the speed of the vehicle by obtaining information from color strips painted on the road.

II. LITERATURE SURVEY:

Survey Paper 1:"Implementation of a Speed Control System Using Arduino" Rakan Bashir - To tracking multiple vehicles together across multiple tracks using radar unit for speed control system using ultrasonic sensor, an Arduino board and a webcam

Survey Paper 2: "Automatic Speed control of vehicle using video processing" R.D.Thomberd,P.M.Swant- To develop an Automatic Speed Control System using video processing for vehicles using Speeded up Robust Features (SURF) algorithm in MATLAB Simulink software.

Survey Paper 3: "Multi Sensor Based Vehicle Control and Safety System" G.Sanjay kumar,Y.Jagadish,M.Vasu - To identifying obstacles and preventing collisions, using various sensors, the robot gathers data from the surroundings Using ultrasonic sensor for detecting obstacles and IR sensor can track and quantify the distance between the road and the vehicles.

Survey Paper 4: "Automatic vehicle speed control system in a restricted zone" Sanjana Srabanti- To reduce the occurrence of accidents in speed restricted zones the vehicle speed was controlled using Zigbee wireless communication technology and speed encoder sensor.

Survey Paper 5: "Integrated Real-time Vehicle Speed Control System using RFID and GPS" Adarsh A,Arjun C,Koushick S- To avoiding road accidents that occur due to over speeding by incorporating an automatic speed regulation system into the vehicle using RFID transceivers, RFID tags and a GPS module.

III. EXISTING MODEL:

An automatic cruise control system works on the technology of an Ultrasonic sensor. It controls the vehicle based on the front object's distance. But in our proposed concept, we have updated this above technology with a new feature using the color sensor. It is very accurate and helps to avoid road accidents. In Integrated Real-time Vehicle Speed Control System using RFID and GPS technique has some limitations in certain situations which in turn affect the accuracy and efficiency of the system. In our proposed technology using a microcontroller, functional unit and sensor unit, the different sensors are used to perceive information to control the speed of vehicles. This functional unit is mainly based on an electrical throttle control mechanism, which is accuracy and economic. Finally, the system shows a good prospect for speed control of the vehicles. Thus, it can be able to reduce vehicle accidents

IV. PROPOSED METHODOLOGY:

The proposed automatic speed control system using sensors can assist in reducing road accidents in an effective way. Different roads need different speed limits. Firstly, the starting point and the exit point of a speedlimited road are painted with different color strips. Each color carries a color code which is used to set a different speed limit. When a vehicle enters the starting point of a speed-limited zone of a highway road then the color sensor located below the car bumper detects painted color on the starting point. The color detecting sensor sends the color code to the microcontroller unit (MCU) to activate the speed limiting system. MCU then sets a speed limit on the car depending on the color. The car cannot go above that speed limit. When the vehicle reaches to exit point then the color sensor detects the color of the exit point to deactivate the system and the vehicle has no restriction of speed.

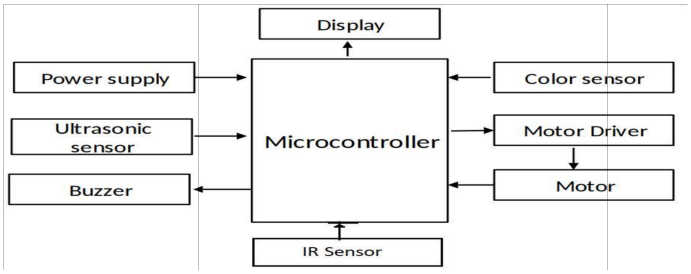

Figure 1: Block Diagram

Fig. shows the basic components of the system. The microcontroller is connected to the IR sensor, Color sensor, Ultrasonic sensor, and motor driver. The motor driver is connected with DC motors. Here the microcontroller takes inputs from a color sensor, ultrasonic sensor and IR sensor and then the microcontroller gives the command to the motor driver and LCD display mechanism for speed control of a vehicle by measuring the distance from the front vehicle of the road. When the vehicle starts, the ultrasonic sensor begins to measure the distance of the front vehicle and sends it to the microcontroller. The microcontroller measures the distance between the vehicles and takes a decision based on the distance.

6. Composition for Impose Version:

A. Working of Module:

The ESP32 is a powerful microcontroller that can be used for a wide range of applications, especially in the field of IoT (Internet of Things). Here's a general overview of how the ESP32 works. When powered on, the ESP32 initializes its hardware components, such as the processor cores, memory, and peripherals. The ESP32 runs a bootloader program that is responsible for loading and starting the main application code. The bootloader may also handle tasks such as firmware updates and recovery from errors. Once the bootloader has completed its tasks, the main program code starts running. This code is typically written in C or C++ and is responsible for controlling the behavior of the ESP32.

B. Carving of ESP32:

Carving of ESP32 typically refers to the process of creating physical designs or models of the ESP32 microcontroller for manufacturing purposes. This process involves creating detailed specifications and designs that specify the dimensions, materials, and manufacturing processes required to produce the ESP32.

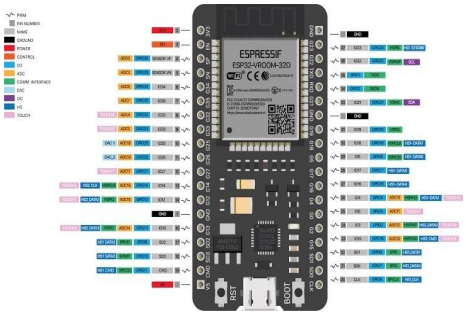

Figure 2: Pin Configuration of ESP32

ESP32 is created and developed by Espressif Systems, a Chinese company based in Shanghai, and is manufactured by TSMC using their 40 nm process. It is a successor to the ESP8266 microcontroller

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C. TCS3200 Color Sensor :

Figure 3: TCS3200 Color Sensor

The TCS3200 color sensor is composed of an array of photodiodes with red, green, blue, and clear filters. It can detect and measure the intensity of light across these different color channels. The TCS3200 sensor contains an 8x8 array of photodiodes. These photodiodes detect the intensity of light falling on them. Each column of photodiodes is covered by a different filter: red, green, blue, or clear (no filter). This allows the sensor to measure the intensity of light in each of these color channels separately.

D. Power Supply:

Power supply refers to a device or system that provides electrical energy to an output load or circuit. In the context of electronic devices and circuits, a power supply is essential for converting AC (alternating current) voltage from a mains power source into DC (direct current) voltage suitable for powering electronic components: There are various types of power supplies, including linear power supplies, switched-mode power supplies (SMPS), and uninterruptible power supplies (UPS). Each type has its own advantages and applications. Power supplies often include voltage regulation circuitry to ensure that the output voltage remains stable even when the input voltage or load changes. This is important for the proper operation of electronic devices. Some power supplies also include current limiting features to protect the circuit from excessive current that could damage components or cause overheating. The efficiency of a power supply refers to how well it converts input power into output power. Higher efficiency means less wasted energy, which is important for reducing power consumption and heat generation Power supplies are rated based on their output voltage and current capacity. It's important to select a power supply with the appropriate voltage and current ratings for your application.

E. Ultrasonic Sensor:

Ultrasonic sensors are electronic devices that calculate the target's distance by emission of ultrasonic sound waves and convert those waves into electrical signals. The speed of emitted ultrasonic waves traveling speed is faster than the audible sound. There are mainly two essential elements which are the transmitter and receiver using the piezoelectric crystals, the transmitter generates sound, and from there it travels to the target and gets back to the receiver component.

F. L298N Motor Driver:

The L298N consists of two H-bridges, each capable of driving a DC motor bidirectionally. This means that you can control the rotation direction (clockwise or counterclockwise) of the motor as well as its speed. The IC also includes built-in protection diodes for back EMF (electromotive force) suppression, which helps to protect the circuit from voltage spikes generated by the motor during deceleration.

V. RESULT AND DISCUSSION

The L298N consists of two H-bridges, each capable of driving a DC motor bidirectionally. This means that you can control the rotation direction (clockwise or counterclockwise) of the motor as well as its speed. The IC also includes built-in protection diodes for back EMF (electromotive force) suppression, which helps to protect the circuit from voltage spikes generated by the motor during deceleration. Measure the accurate speed of the car. An additional ultrasonic sensor is used in front of the car to measure the distance of the front cars. If any car comes to a distance that can cause accidents, then the ultrasonic sensor senses the distance and sends a signal to the Microcontroller Unit (MCU) to control the speed of the car accordingly. A microcontroller located in the car receives information obtained by these sensors. After that, that information is processed, and the decision is made with an efficient algorithm regarding the speed limit of the car or vehicle. The braking system and throttle system of the car or vehicles will be adjusted depending on the decision

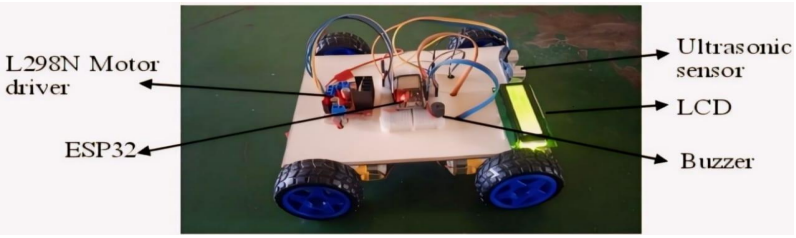

Figure 4: Proto Type -Top View

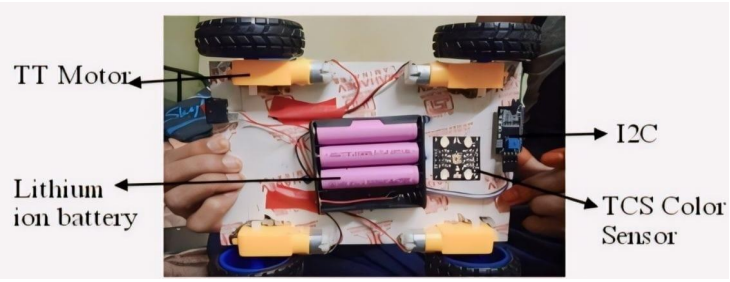

Figure 5: Proto Type – Bottom View

VI. CONCLUSION

A typical road having colored stripes is implemented and the vehicle runs on this road. The speed of the vehicle loaded with the proposed control system is monitored and car speed is adjusted according to the predefined speed limit. This idea can assist human drivers to drive safely in difficult road circumstances. The prototype is implemented successfully. The design of this automatic speed control system is suitable for a country where road accidents happen frequently. The results suggest that the automatic speed control system can be used to prevent any unexpected road accidents and improve the safety of the occupants of the vehicle.

- If Red color detected, Vehicle Speed limit is 50% of its maximum speed.
- If Blue color detected, Vehicle Speed limit is 75% of its maximum speed.
- If Green color detected, Vehicle Speed limit is up to maximum speed.

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