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Accident Preventing System using Bumper Pulling Mechanism and Eye-Blink Sensor

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***Abstract*—Every day we hear news of accidents from every news service, and even with all the technologies out there, accidents still happen, today vehicle accidents are the leading cause of death and disability. The World Health Organization (WHO) estimates that around 4000 people die in road accidents in a single day, with more than 15% of these deaths in India, and many accidents go unreported. We are facing huge loss of life and damage to vehicles. Thus, to avoid any problem, we propose a system based on the ESP32s microcontroller, using an ultrasonic sensor to measure the distance between two vehicles, when the distance is less than a given threshold distance, by activating the so-called buffer parameter mean-while automatically controls the vehicle speed. A pre-safety measure to prevent accidents. This avoids the risk of collision due to speed, and our system also uses a blink sensor to warn the driver when the persons feel drowsy while driving. This system aims to provide at most care and precautions to both users and vehicles, ultimately reduces the chance of accidents occurrence and saves the lives of people who died because of road accidents.**

***Keywords*—Esp32s-micro-controller, eye-blink sensor, ultrasonic sensor, buzzer, vibration motor, led, and bumper setup.**

I. INTRODUCTION

India is a developing country, which is vast in population as the same time there are a greater number of people utilize the road for transportation purpose compared to other transportation medium as well as, the accidents occurrence chance is very high in India. There are more deaths reported by the road accidents compared to other cause of deaths and many go un-reportedly [1]. Accident Prevention System (APS) is an advanced technology that is designed to prevent accidents on the road. This project focuses on building a user-friendly vehicle that specializes in intruder detection in addition to short-range obstacle detection. When the distance is less than a given distance threshold. Thus, could improve car safety by predicting accidents before they happen, allowing more time to deploy safety technologies [2]. Motor vehicles safety is about avoiding accidents with vehicles or reducing the effects of accidents, especially on the human body, including the driver, passengers and pedestrians. On-board active safety systems use information from external environment of vehicle then system responds according to the pre-accident phase. On the other-hand a passive safety is provide by using bumpers, air bags and seat belts [3]. To overcome, all the drawbacks we proposed a system with the warning can be like a buzzer beep sounds, vibrations and LEDs we can alert the driver approaches to drowsy state and also a pre-safety parameter called bumper is activated when necessary to maintain a safe distance between the two objects. An eye blink sensor, as well as an ultrasonic sensor, are included in the suggested system. Ultrasonic sensor is used for distance measurement purpose in-order to calculate distance between the objects [4]. Moreover, the ESP-32 micro controller, which has a variety of uses including a dual processor, is used in place of the Arduino uno in the system as it now stands. We have created an informational message for the appropriate carers using IoT technology. This suggested system is entirely intended to avoid accidents by combining current technologies that are used to prevent traffic accidents while taking into account all potential accident situations.

II. OBJECTIVES

The main objective of our proposed system is to reduce the road accident occurrence chances and provide enhanced safety and security to the both users and vehicles. Following below are our aims of our proposed system.

1. To Reduce the road accidents occurred due to the over speed of vehicle.
2. To Provide pre-safety to the users and alerts the driver in the cases of collision occurrence conditions.
3. To Provide easy and safe driving to the people by automatically controlling the speed of the vehicle with less driver interactions.
4. To make driving easy even in foggy days.
5. To reduce the hazards incidents, occur due to the road accidents.
6. To provide enhanced safety and security to both the users and external safety to the vehicles by using current technologies.
7. To reduce the loss of life of people due to road accidents and to make transportation via road easily.

III. METHODOLOGY

In our proposed system we are designing our system with ESP32s micro-controller based it is the heart of our system and it is the control unit of our design. However, we use different components for the fulfillment of our design in-order to achieve accurate and satisfying results to reach our goals and objectives.

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3.1 BLOCK DIAGRAM AND CONSTRUCTION

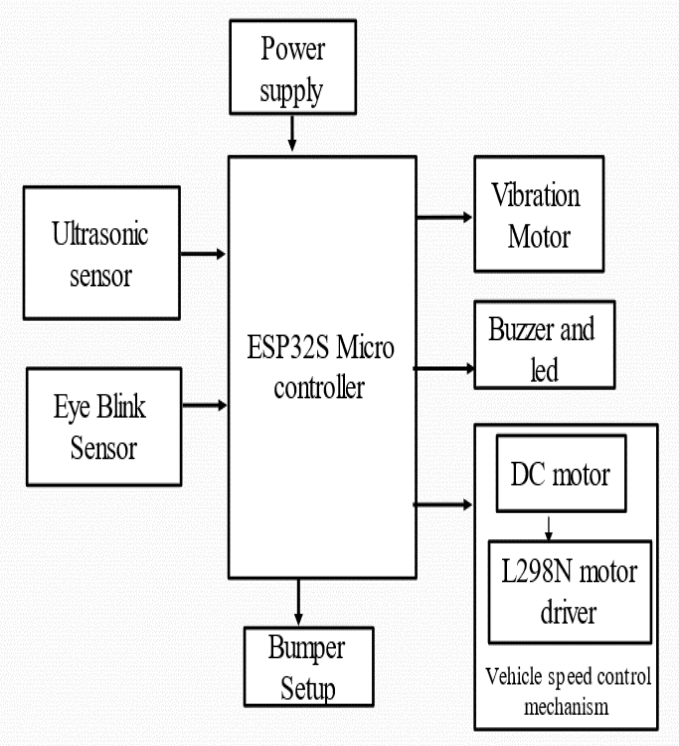

Fig 3.1 block diagram of proposed system.

The above fig 3.1 is the block diagram of proposed system which reflects the entire process and flow of our system as this is a system uses, when necessary, otherwise the technique will be switched off and does not affect the vehicle

3.2 COMPONENTS USED

We used several components in our project design such as ESP32s microcontroller, ultrasonic sensor, eye-blink sensor, bumper adjustment, vibration motor, buzzer, L298N driver, dc-motor.

3.2.1 ESP32s microcontroller

The ESP32 is a popular microcontroller that is widely used in a variety of IoT applications. It is developed by Espressif Systems, and it features a dual-core processor, Wi-Fi, Bluetooth, and many other peripheral devices. The ESP32 is based on the Xtensa LX6 processor and is capable of delivering up to 240 MHz clock frequency.Overall, the ESP32 is a versatile and powerful microcontroller that is widely used in IoT applications. Its built-in Wi-Fi and Bluetooth capabilities, low power consumption, and extensive peripheral support make it an excellent choice for a wide range of projects.

Fig 3.2.1 ESP32s microcontroller

When comparing the ESP32s microcontroller with other microcontrollers, one of its significant advantages is the built-in Wi-Fi and Bluetooth modules. Although some microcontrollers can add Wi-Fi via expansion cards or adapters, this is not native feature of the card, which increases the cost of the card. On the other hand, the ESP32s already integrates Wi-Fi and Bluetooth modules, making it a more cost-effective option for those who want to use these features. The ESP32 is also designed for low power consumption, making it ideal for battery-powered applications. It has a power management system that allows it to run in sleep mode and only wake up when needed, which can significantly improve battery life.

ESP32s has 34 digital pins. These pins are similar to Arduino digital pins and allow you to connect LED displays, OLED displays, sensors, buttons, buzzers, etc. added to our project. Most of these pins also support the use of pull-ups, pull-downs, and high impedance internal states.

Table 3.2.1 Specification of ESP32s microcontroller

Specifications	Range
Operating voltage	2.2 V to 3.6V
GPIO	36 ports
ADC	14 ports
DAC	2 ports
Flash memory	16 Mbyte
SRAM	250 Kbyte
Clock Speed	Up to 240 MHZ
Wi-Fi	2.4GHz
Sleep Current	2.5 uA

3.2.2 Ultrasonic sensor

An ultrasonic sensor is used for distance measurement purpose based on the echo signals.

Fig 3.2.2 ultrasonic sensor

3.2.3 Eye-blink sensor

An eye sensor, also known as an eye-tracking sensor or gaze tracker, is a device that can detect and measure the movements of a person's eyes.

Fig eye-blink sensor

3.2.4 L298N Motor driver

A motor driver controls the speed, direction, and torque of an electric motor. It is typically used in applications where precise control of a motor's operation is required, such as robotics, automation, and electric vehicles.

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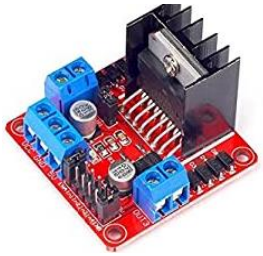

Fig 3.2.4 L298N motor driver

3.2.5 DC geared motor

DC geared motors are electric motors that use direct current to produce rotational motion. A geared motor is a motor that is connected to a gearbox, which reduces the speed of the motor's output shaft while increasing the torque.

Fig 3.2.5 DC geared motor

3.2.6 Bumper setup

A bumper can be arranged at front side or back side of the car or vehicle, apparently designed to allow the car to survive a crash without damaging the vehicle's safety and other systems [5]. They, cannot reduce injuries to vehicle occupants in high-speed impacts, but are increasingly to mitigate injuries to passengers struck by car or vehicle. Bumper structures are designed to prevent or reduce physical damage to the front or rear of passenger motor vehicles during an accident. They also protect other vehicle or car systems. A good car bumper design should ensure passenger safety and should be light in weight. At the same time the automotive parts should not be massive in terms of weight contributing to the increase in total the weight of vehicle. The most commonly used automotive vehicles are cars [6]. We have to be very careful in selecting bumper to the vehicle.

3.3 WORKING

The ESP-32s micro controller is responsible for this system's primary functions. The ESP-32s micro controller receives the input response from the eye blink sensor and the ultrasonic sensor. If the eyes of driver closed, or if the driver feels drowsy, the IR rays are reflected back and received by the IR receiver, and this condition is regarded to be low; otherwise, it is deemed to be high. This eye blink sensor has an IR transmitter and receiver that send IR rays via the eyes, for the matching action taken by the system, that is buzzer, LED and vibration motor activate. At the same time bumper pulling mechanism is a device that is installed on the front side or rare side of the vehicle. It works by using sensors to detect the distance between the vehicle and other objects in front of or behind it. If the distance between the vehicle and another object becomes too close that is the distance is below the threshold value and at the same time the speed of the vehicle is above the threshold value speed, the system will activate and pull the bumper, thus preventing a collision. Another, criteria in our design, is when the distance between the two objects is below the threshold value distance and the speed of the vehicle is below the threshold value speed then the speed of the vehicle is reduced when throttle valve is attached to pedal when it is pressed the valve works if maximum force applies the speed increases or minimum force applied less quantity of air and pressure supplied towards engine then speed is also accordingly [7]. Thus, speed is reduced to maintain a safe distance between the two objects, here in this, criteria only vehicle speed will be decreased there is no bumper activation all these criteria will execute only when the vehicle is in running mode does not affect the vehicle when it is in off mode. All the criteria in our proposed system works efficiently to overcome the drawbacks in the existing system by considering at most scenarios to reduces the road accidents and loss of life of people effectively.

IV. RESULTS

The project work on "ACCIDENT PREVENTING SYSTEM BY USING BUMPER PULLING MECHANISM AND EYE-BLINK SENSOR" has been successfully designed to prevent accidents and reduce the harmful effects of accidents due to excessive speed of vehicles and driver drowsiness. The result of our design can be described simply as when the driver feels drowsy, our system alerts the user with an audible signal, led and vibrations. The another, important technology in our design is to activate the bumper setup to guide a safe distance between vehicles to reduce traffic accidents due to over-speeding vehicles. Ultimately, our design help to overcome the adverse effects of accidents and provide external vehicle safety.

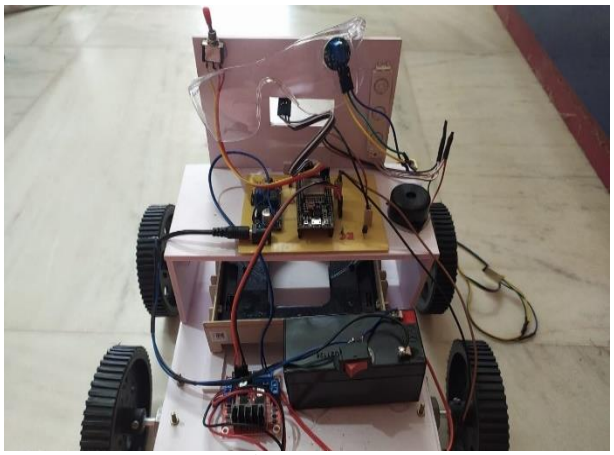

Fig 4.1(a) Assembled of proposed system with all components

All the components are assembled together with proper connections and wiring to work properly and effectively in order to provide satisfactory results as shown in above fig 4.1 (a).

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In the fig 4.1.(b) shown below alerts the driver with audible signals like buzzer beep sounds, LEDs, and with vibration motor when the driver feels drowsy while driving. So that it helps in focus of driver to be careful and with full attention to have easy and safe driving.

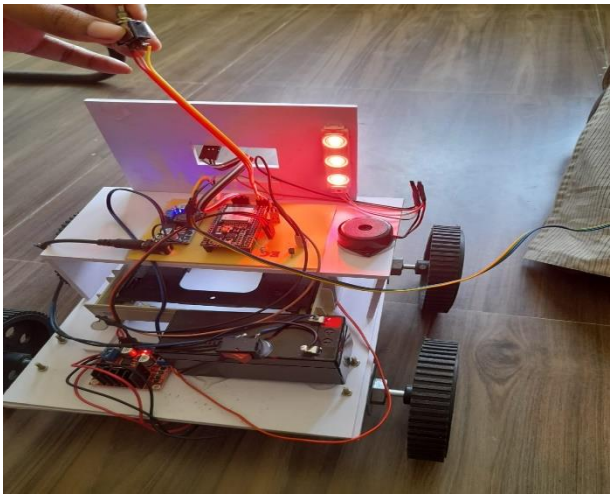

Fig 4.1 (b) alerting the user with led, buzzer and vibration motor when driver feels drowsy

And another technique in this proposed is activation of bumper setup and controlling the speed of vehicle when given threshold values of speed and distance are not maintaining. Let's have a look in to below fig 4.1.(c) here the bumper is activated when it comes closer to another object at the same time the speed of the vehicle is also stopped in order to avoid collision occurrence environment to achieve satisfying results and to save the life of users like drivers, passengers and also provide external safety to our vehicles. In order to reduce un expected incidents due to excessive speed of the vehicle and also due to the driver carelessness sense at sometimes.

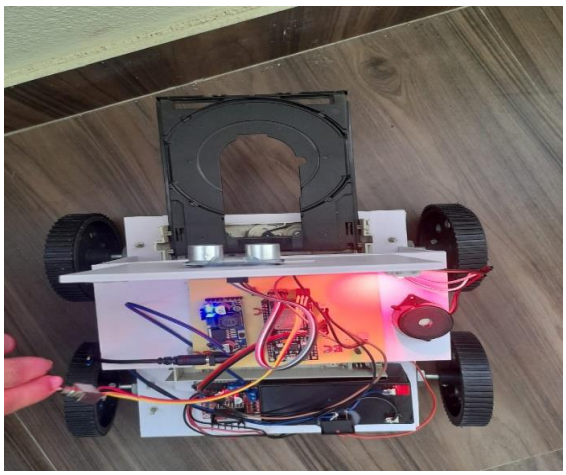

Fig 4.1 (c) Activated bumper to prevent collision between two objects

V.CONCLUSION

In conclusion, the accident-preventing system using a bumper-pulling mechanism and an eye blink sensor is a promising solution for enhancing road safety. The system uses a bumper-pulling mechanism to apply brakes to a vehicle when it comes too close to the vehicle in front, and an eye blink sensor to detect drowsiness or fatigue in the driver and alert them to take a break. The system can be easily integrated into existing vehicles, and the cost of implementation is relatively low. The system can potentially reduce the number of accidents caused by human error, such as distracted driving and drowsy driving, and save lives. However, there are some limitations to the system. With further research and development, the system can become an essential component of modern vehicle safety systems.

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