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ACCIDENT PREVENTION SYSTEMBY USING BUMPER PULLING MECHANISM AND EYE BLINK SENSOR VIA EMBEDDED SYSTEM

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***Abstract*:** Road accidents continue to be a major concern in today's world, and it is essential to develop effective accident prevention systems. In this paper, we propose an accident prevention system that uses an eye blink sensor and a bumper pulling mechanism to detect and prevent accidents. The eye blink sensor detects the drowsiness of the driver and alerts them to take a break, while the bumper pulling mechanism is designed to automatically apply the brakes if the driver fails to respond. We tested the proposed system in a simulated environment and found that it was able to effectively detect drowsiness and prevent accidents.

***Keywords*:** Eye blink sensor, Ultra sonic sensor, ESP-32 Microcontroller, Bumper Pulling Mechanism, Buzzer

1. INTRODUCTION

The number of road accidents has been increasing steadily over the years, and it is crucial to develop effective accident prevention systems to reduce the number of accidents. In recent years, there has been a growing interest in developing advanced driver assistance systems (ADAS) to improve road safety. In this paper, we propose an accident prevention system that combines an eye blink sensor and a bumper pulling mechanism to detect and prevent accidents.The number of road accidents has been increasing steadily over the years, and it is crucial to develop effective accident prevention systems to reduce the number of accidents. In this paper, we propose an accident prevention system that combines an eye blink sensor and a bumper pulling mechanism to detect and prevent accidents.

A. Methodology

We developed a prototype of the accident prevention system that uses an eye blink sensor to detect the drowsiness of the driver and a bumper pulling mechanism to apply the brakes automatically if the driver fails to respond. The eye blink sensor was attached to the dashboard of the vehicle, and the bumper pulling mechanism was integrated into the braking system of the vehicle. We tested the system in a simulated environment using a driving simulator.

B. Objective

As the usage of vehicles is increasing drastically, the hazards due to vehicles is also increased. The main cause for accidents is high speed, drunk and drive, diverting minds, over stress and due to electronic gadgets. This paper deals with accident detection system that occurs due to carelessness of the person who is driving the vehicle. This introduces accident alerting system which alerts the person who is driving the vehicle. If the person is not in a position to control the vehicles then the accident occurs. Once the accident occurs to the vehicle this system will send information to registered mobile number.

2 .LITERATURE SURVEY

A. Accident Detection and Alert System with Arduino

As the usage of vehicles is increasing drastically, the hazards due to vehicles isalso increased. The main cause for accidents is high speed, drunk and drive, diverting minds, over stress and due to electronic gadgets. This paper deals with accident detection system that occurs due to carelessness of the person who is driving the vehicle. This introduces accident alerting system which alerts the person who is driving the vehicle. If the person is not in a position to control the vehicle then the accident occurs. Once the accident occurs to the vehicle this system will send information to registered mobile number. The controller used in this project is Arduinowhich is used for controlling all the modules in the circuit. The two major parts other than controller is GPS module which is used as a receiver and other module is GSM. To receive the coordinates of the vehicle GPS module is used and GSM will send the received coordinates to the user through SMS. When a person is driving the vehicle met with an accident then the vibrations of the vehicle is received by the vibration sensor and the sensor acts as a accident detection module which further send the information to the micro controller and the location of the vehicle is received through GPS module and the coordinates of the vehicle is send to the GSM module.

B. Eye Blinking Monitoring System for Vehicle Accident Prevention

The majority of car accidents are caused by bad driving : driver inattention, failure to merge or yield, speeding, racing, aggressive driving and failure to exercise care in passing. Accidents can be attributed to specific causes aside from poor driving itself include falling asleep, weather (snow, Ice or Rain, Fog); alcohol , drugs & drunk driving, driver distractions which includes cell phones, playing music; collisions with animals in the road usually deer, horses, cows and dogs etc.Basic electronics concepts have been used along with micro-controller to implement this system. Infra-red emitter & detector are used for monitoring the driver's eye, which will provide corresponding output according to the eye blink rate of the driver. The output of IR sensor is given to microcontroller where it is decided whether to sound the buzzer or not. The status of operation is displayed on the LCD, which is connected to the microcontroller. As the output of microcontroller is low to drive the buzzer, a driver IC is used to amplify the output of microcontroller. The sensor part of the EBM system is implemented using a goggle.These happen on most factors ifthe driver is drowsy or if he is alcoholic. Driver drowsiness is recognized as an important factor in the vehicle accidents. It was demonstrated that driving performance deteriorates with increased drowsiness with resulting crashes constituting more than 20% of all vehicle accidents. But the life lost once cannot be re-winded. Advanced technology offers some hope avoid these up to some extent. This project involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye isclosed means the output of IR receiver is high otherwise the IR receiver outputis low. This to know the eye is closing or opening position. This output is given to logic circuit to indicate alarm.

C. Bumper Pulling Mechanism for Vehicle Accident Prevention

The main work of this system is done by the ESP-32 micro controller. The output response of this Eye blink sensor, Ultrasonic sensor & Seat belt detector are given to the ESP-32 micro controller. This Eye blink sensor is having an IR transmitter and receiver which transmits IR rays through the eyes if, the eyes are closed the IR rays get reflected back and received by the IR receiver, this state is considered as low otherwise it is considered as high. This output is given to the ESP- 32 micro controller for the corresponding action done by the system. To execute the action of LDR sensor, the both corresponding vehicles are to be installed with the proposed system. Where the light of front coming vehicles may trouble the drivers eyes and may leads to the accident. The main functionality of this LDR sensor is to change the intensity of light of the front coming vehicles to prevent the accidents. A seat belt detector is used to continuously monitor the condition of wearing a seat belt by the driver. If thedriver is not in the condition of wearing a seat belt, then the corresponding action is done by the ESP-32 micro controller. By utilizing the IoT technologies we have been generated an information message to the respective care taker.

3. WORKING PRINCIPLE

The proposed system is included with an Eye blink sensor, LDR sensor, Alcohol sensor and a seat belt detector. And also, the Arduino uno in existed system is replaced with ESP-32 micro controller which is having wide range of applications such as dual processor etc. By utilizing the IoT technologies we have been generated an information message to the respective care takers. This proposed system is a combination of current technologies which is used to prevent the road accidents by considering all the scenarios which can lead to the accidents.

A. BLOCK DIAGRAM

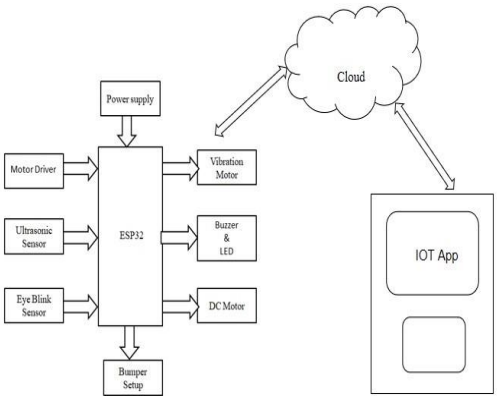

Fig. 1 Block Diagram

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4. EYE BLINK SENSOR

The eye blink sensor is an infrared sensor, it consists two parts. A transmitter and a receiver.The transmitter continuously emits infrared waves onto the eye.While receiver continuously looks for variations in the reflected waves which indicates that the eye has blinked. If the eye is closed that means it will give high output. If the eye is open then it will give a low output. This sensor module consists of the eye blink sensor frame, the IR sensor and a relay. The vibrator device is connected to the eye blink sensor frame which is to be worn by the driver. This vibrator vibrates whenever an accident occurs or the driver falls asleep.The frame consists of the IR transmitter which transmits the IR rays towards the driver's eyes and an IR receiver which receives the reflected rays when the eyes are closed. The relay provides the extra current required by this module and hence is also connected to the SST micro controller board.

Fig.2 Eye Blink Sensor

5. Ultrasonic sensor

Ultrasonic sensor are devices that generate or sense ultrasound energy. They can be dividedinto three broad categories: transmitters, receivers and transceivers.Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound.It is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound It is a very popular sensor which is found in many applications where it requires to measure distance and detect the objects.The Ultrasonic Sensor uses Ultrasonic waves to determine the distance of an object like Bats, hence it can be used as a distance measuring sensor. There are two Ultrasonic Transducers present in which one acts as a Transmitter which transmits a high frequency Ultrasonic signal and other acts as a receiver which will wait for the receiving of echo signal which gets reflected by any object in its path. The time between the two signals when divider by speed of sound gives us the distance of the object. Theoretically the sensor claims to have a measuring distance of 2cm to 400cm. However, a range up to 75-80cm can be easily achievedpractically.

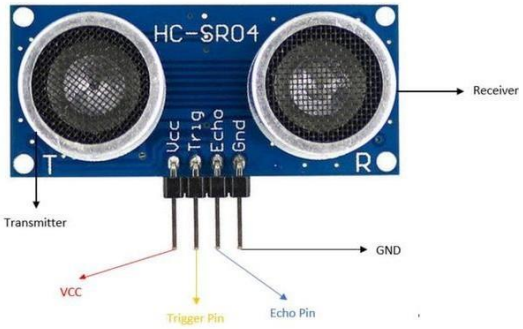

Fig.3 Ultrasonic sensor

6. ESP-32 Microcontroller

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espressif Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Tensilica's 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth.The good thing about ESP32, like ESP8266 is its integrated RF components like Power Amplifier, Low-Noise Receive Amplifier, Antenna Switch, Filters and RF Balun. This makes designing hardware around ESP32 very easy as you require very few external components.Another important thing to know about ESP32 is that it is manufactured using TSMC's ultra-low-power 40 nm technology. So, designing battery operated applications like wearables, audio equipment, baby monitors, smart watches, etc., using ESP32 should be very easy.

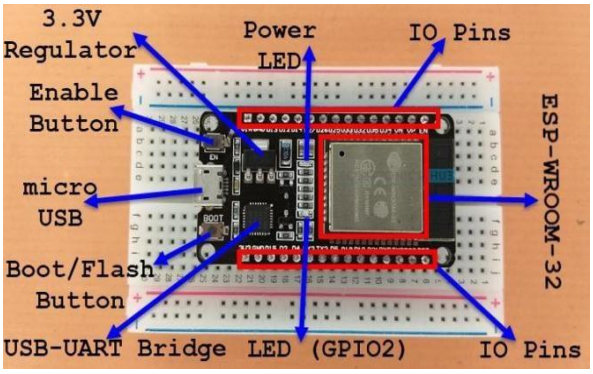

Fig. 4 ESP-32 Microcontroller

So, what third-part manufacturers do is take the ESP-WROOM-32 Module and design a break-out board for this module.One such board is the ESP32 DevKit Board. It contains the ESP-WROOM-32 as the main moduleand also some additional hardware to easily program ESP32 and make connections with the GPIO Pins.

7. RESULT

The required set up shows an eye blink sensor,ultra sonic sensor,seat belt detection .And to send a message regarding to driver condition in the vehicle to care takers by using blynk server.

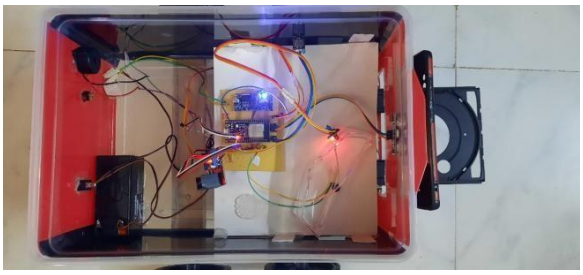

Fig. 5 Hardware component setup

When the micro controller reads the output of blink sensor(i.e.,person is indrowsiness condition).The micro controller done predefined action makes to control the motor speed and generates a alerting signal to wake up the driver from drowsinesscondition.And condition of the person is given like a message format to the care takersusing blynk server.

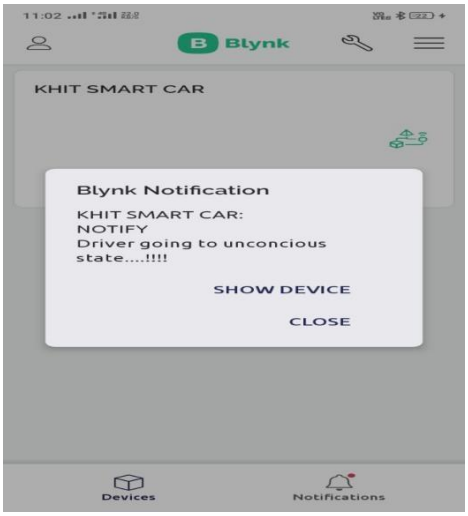

Fig. 6 Blynk app generates warning message to care takers

When ever the ultra sonic sensor detects any obstacle of the particular distance it pulls the bumper towards and reduces the damage of the vehicle and prevents the victim. When ever the bumper is activated the buzzer will ring and inform the driver to awake. The vibration motor is present in the bottom of the driver seat and vibrates continuously when ever the driver is awake and take care the driving.

Fig. 7 Ultasonic sensor detects the obstacle and pulls the bumper to avoid the damage

8. ADVANTAGES

- It provides safety to passengers in the vehicle as well as to the vehicle body.
- It reduces accident intensity and impact.
- This system increases the response time of vehicle braking by keeping safe distance between two vehicles.
- It reduces accidents that are caused due to the drowsiness

9. APPLICATIONS

- The prime purpose is to provide safety measures.
- It is used for Automatic parking.
- It can be used in wireless technology.
- The eye blink module of this project can be separately used for RFID detection in global industries.
- It can be used in image processing application by replacing sensor by camera module

10. CONCLUSION

Nowadays, people have become more prone to accident. So, we as an engineer need to take some action against this and provide the desired solution. For the safety of the human being some automation is made. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. Advanced technology offers some hope avoid these up to some extent. This project involves measure and controls eye blink using IR sensor. We can automatically turn on the bumper and park the vehicle by first using Automatic braking system, which will slow down the vehicle and simultaneously will turn on the parking lights of the vehicle and will detect the parking space and will automatically park the vehicle preventing from accident.

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