CAR ACCIDENT PREVENTION SYSTEM

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ABSTRACT:
The leading cause of acquired brain and spinal cord injuries is traffic accidents, which also pose major public health issues and contribute significantly to the global burden of death and morbidity. Three sensors are used in CAPS: an alcohol sensor, an eyeblink sensor, and an ultrasonic sensor. The first alcohol smoke sensor indicates that the car is ready to drive and lets the engine start when the alcohol content is below the legal limit. An Arduino Uno is used to process the gathered data because inattentive driving can result in serious accidents. To counteract this, an eye blinking sensor is used, which allows us to detect eye blinking, as well as potential hazards. The sensor monitors time, detects drowsiness, and if there are no accidents, the driver is informed to take a break. The sensor continuously emits infrared waves, which the receiver then reflects and detects. The sensor's output is received by the Arduino board. After that, the car stops on its own, and the ultrasonic sensor SR04 is another crucial sensor that we use. This non-contact sensor aids in determining the speed and distance of an object. The ultrasonic sensor functions at the echo point of the sound wave. Furthermore, the car stops as soon as it detects an obstacle. The Arduino Uno processes the data, and measures are taken to guarantee that no accidents occur. The suggested method offers a workable and affordable means of enhancing traffic safety and reducing the frequency of auto accidents.
KEYWORDS: Arduino, drowsiness detection ,Intelligent Braking System, Object detection ,driver safety, Alcohol detection system, Vehicle control, DC motor .

1. INTRODUCTION:

Road safety has always been a priority. Signs, directional arrows and lanes have made following the rules much easier and have served as excellent guidance, but uncontrollable factors such as drunk drivers getting out mean accidents continue to occur[1]. Driving can be dangerous, especially if the driver feels sleepy or tired. Long journeys without rest breaks can worsen these conditions and lead to accidents. Drowsiness makes your eyes and brain less efficient, making it harder to concentrate on driving and increasing the risk of a collision. Prioritizing rest time and taking regular breaks is important to help drivers stay alert and focused on the road[2]. Driving while drowsy or under the influence of alcohol are the two main causes of traffic accidents and the resulting financial losses. For a decade, researchers have been working to develop systems to monitor driver sleepiness. However, many improvements have been made to driver safety[3]

A "vehicle accident," also known as a "traffic accident," occurs when a vehicle collides with another vehicle, a stationary object, a person, an animal, or both. "There are many road accidents that only cause injuries or damage, but there are also many that cause serious injury or even death. Many circumstances can lead to a car accident, and these events sometimes have legal consequences [4]. The self-driving cars use a wide range of technologies such as radio tracking and detection, lightweight optical devices, GPS, odometers and laptop vision. With a focus on autonomous vehicles, we have seen some of the most significant advances in automotive technology in the last decade. Self-driving cars have been in the news lately; Experts have been working on self-driving cars for almost 45 years. Self-driving cars are still in their infancy and require a wide range of technologies [5].

The article presents a new method for preventing traffic accidents by integrating an Arduino-based monitoring system with anti-collision technology. The aim of the innovative system is to prevent accidents caused by driver fatigue or drunkenness by monitoring their behavior using an alcohol sensor, an eye blink sensor and an ultrasonic sensor. The Arduino UNO serves as the primary control device in this project, is connected to the input/output modules and uses the built-in C language to

carry out the task at hand. The sensor's output correlates with alcohol content, and the study aims to use blink and alcohol detectors to prevent blackout incidents. The vehicle is equipped with an eye blink sensor and an alcohol detector, and the microcontroller module enables the conversion of analog signals into digital signals and control of the entire circuit. The vehicle's ultrasonic sensor effectively detects obstacles in its path, enabling distance-based automatic throttle control. The vehicle is powered by batteries and moves with DC motors. The heart of the project is the Arduino UNO, which is connected to input/output modules. To perform this task, program written in Embedded C was downloaded.

1.1 . SIGNIFICANCE

The increasing number of vehicles on Indian roads has resulted in a high number of road accidents and fatalities. India accounts for 16% of all road accident deaths worldwide, despite having only 1% of the world's road vehicles. Drunk driving is a major cause of accidents, with 14,071 accidents occurring in 2017 due to drunk driving. To improve road safety, the Ministry of Road Transport and Highways is taking measures such as technology and engineering solutions, issuing laws against drivers who breach safety protocols, and observing Road Safety Week from 11th to 17th January every year. It is important to drive at slower speeds, wear seatbelts habitually, and avoid any activities that can be distracting while driving. Children should always sit in the rear seats to avoid serious injuries in the event of an accident.

2 . HARDWARE COMPONENTS :

2.1. MICRO CONTROLLER: The ATmega328 from the AVR family is the microcontroller board included in the Arduino UNO. In addition to a 16MHz ceramic resonator, there are 6 analog pins and 14 digital input/output pins. There is a reset button, a power jack, and a USB connection. Numerous libraries are available for its software, which facilitates programming.

2.2. BATTERY POWER SUPPLY (12V RECHARGEABLE BATTERY) : An energy accumulator with one or more electrochemical cells is called a rechargeable battery. Because of its reversible responses, it is referred to as a secondary cell. They are composed of numerous chemical combinations, such as lead–acid, Ni-Cd, NiMH, Li–ion, and Li–ion polymer, and they come in a variety of sizes and shapes. Compared to disposable batteries, rechargeable batteries are less expensive overall and have a less environmental effect. Although they cost more at first, they are more affordable to recharge and have a longer useful life.

2.3 . EYE BLINK SENSOR : The Eye Blink Sensor detects eye blinks using an IR-based sensor. It can be used to prevent accidents caused by unconsciousness through eye blinks. The sensor uses an IR sensor, comparator, and potentiometer to sense eye blinks, while the location of the iris is detected by one IR sensor.

2.4 . ALCOHOL SENSOR : It's critical to routinely calibrate and inspect alcohol detecting sensors to guarantee sensor accuracy and system integrity. Semiconductor sensor, MQ303A, is specifically designed for alcohol detection. It boasts high sensitivity and fast response times, making it an ideal choice for portable alcohol detectors. According to predetermined or modifiable relationships between resistance and gas load resistance, the sensor measures variations in voltage. The sensor usually requires a few minutes to reach a stable state during preheating, which minimizes fluctuation when the concentration of gas increases while it is operating. Alternatively, to facilitate stabilization, you can expose the sensor to a high voltage of 2.2±0.2V for 5–10 seconds before to testing.

2.5 . DC MOTOR : A DC motor is a machine that uses the interaction of magnetic fields and current-carrying conductors to transform electrical energy into mechanical energy. The opposite process, which an alternator, generator, or dynamo carry out, is the creation of electrical energy from mechanical energy. Electric motors of several kinds can function as generators and vice versa. A DC motor takes current and voltage as inputs and produces torque, or speed, as an output. The stationary stator and the revolving armature make up the two major components of a DC motor. Field coils, as the name implies, are coils of wire that are part of the stator. The core of the armature, which has an extended shaft that revolves on bearings, is encircled by coils of wire. The brushes create electrical

contact with the commutator, which is at one end of the armature, to transmit electrical current from the machine's stationary to rotating parts.

2.6. ULTRA SONIC SENSOR : Ultrasonic sensors, more commonly referred to as transducers but sometimes known as transceivers when they can send and receive, operate on a similar concept to radar or sonar, which assess a target's characteristics by deciphering the echoes of radio or sound waves, respectively. High-frequency sound waves are produced by ultrasonic sensors, which then analyze the echo they get back. In order to compute the distance to an object, sensors measure the time elapsed between transmitting a signal and getting an echo. Antennas for measuring wind direction and speed, channel or tank levels, and air or water speed can all be measured with this technique. A gadget that measures direction and speed makes use of several detectors to determine the speed based on the relative distances to air or waterborne particles. The sensor gauges the distance to the fluid's surface in order to determine the tank or channel level. Sonar, medical ultrasonography, burglar alarms, humidifiers, and non-destructive testing are some further uses.

2.7. L293D MOTOR DRIVER: An integrated circuit (IC) is a device that can operate two motors at once and is typically utilized in autonomous control systems. With the help of this motor driver integrated circuit, we can adjust the speed and drive a DC motor in any direction. An IC for twin H-bridge motor drivers is the L293D.

2.8 . LCD - LIQUID CRYSTAL DISPLAY: One type of passive display technology is liquid crystal display (LCD). This indicates that they utilize the ambient light in their surroundings rather than emitting any light. They use relatively little electricity to display graphics by adjusting this light. Because of this, LCDs are now the technology of choice when low power consumption and small size are essential. An organic material with a liquid form and a crystal molecular structure is known as liquid crystal (LC). The rod-shaped molecules in this liquid are typically arranged in a parallel array, and the molecules are controllable by an electric field. Twisted Nematic (TN) liquid crystals are the type used in the majority of LCDs today.

FIG . 1   Arduino UNO board

FIG . 2 Alcohol Sensor (MQ-3)

FIG .3   DC Motor

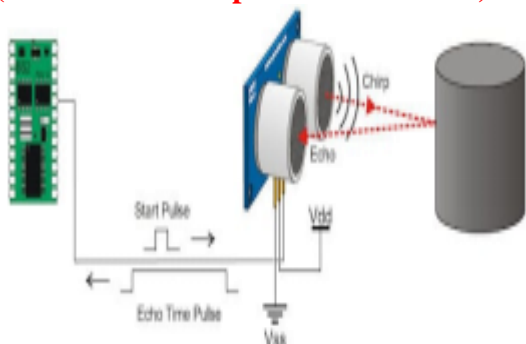**FIG . 4 Eye Blink sensor(IR sensor)**

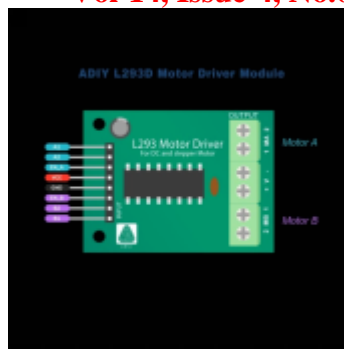**FIG . 5 Ultrasonic sensor with its module(SRF04)**   **FIG . 6 L293D DC Motor Driver**

3. METHODS AND IMPLEMENTATION:

3.1 Arduino IDE: To develop, compile, and upload code to Arduino microcontroller boards, utilize the intuitive Arduino IDE program. It offers a straightforward programming project interface, supports multiple programming languages, and offers a library of pre-written code examples. With its easy-to-use features, it's ideal for beginners and professionals alike in creating a variety of electronic projects.

3.2 Embedded C: Embedded C is a specialized version of the C programming language designed for programming embedded systems. It prioritizes efficient resource usage and direct hardware control, making it ideal for developing firmware for microcontrollers and other embedded devices.
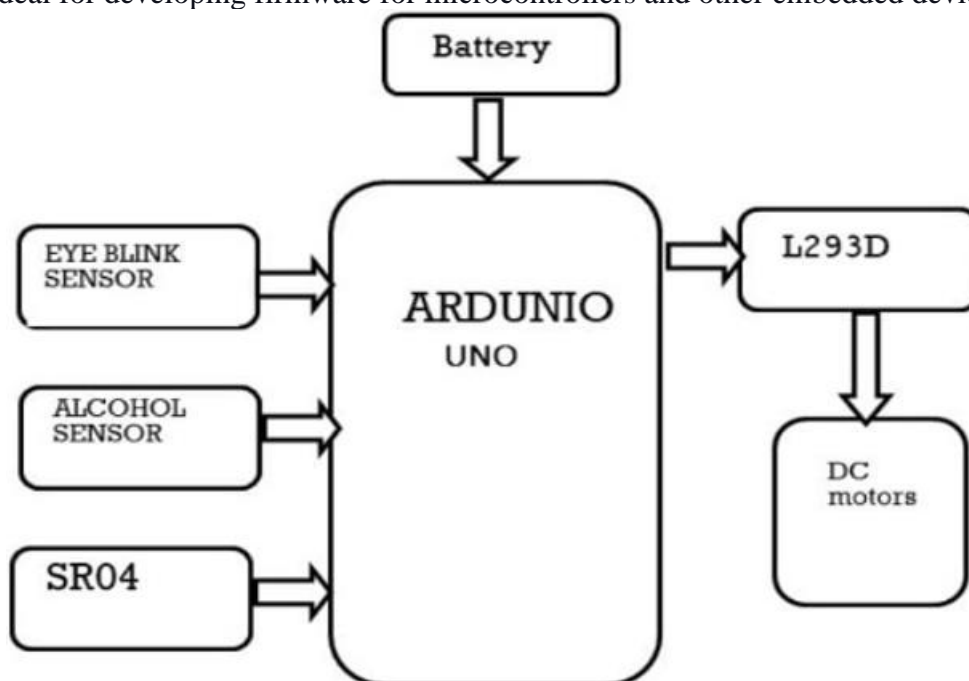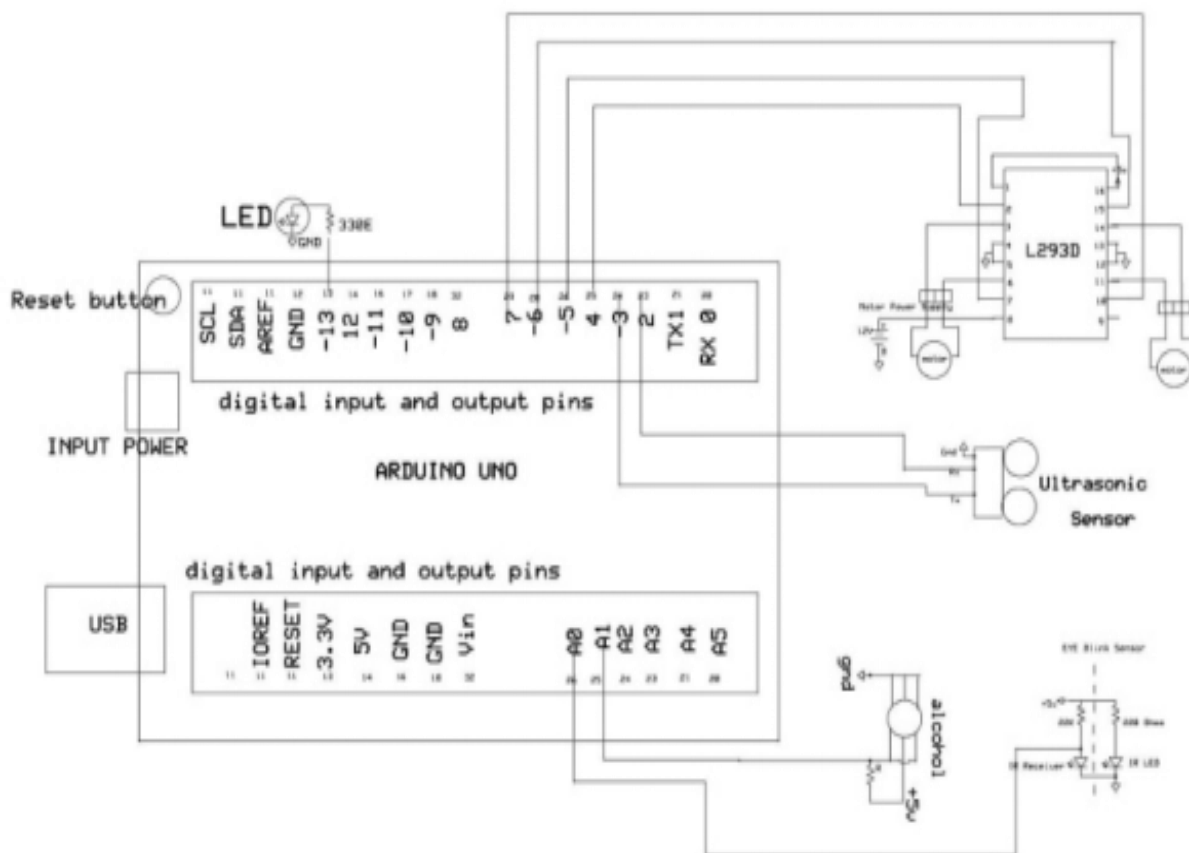

FIG 7 : BLOCK DIAGRAM OF CAR ACCIDENT PREVENTION SYSTEM

➢   This system is designed to monitor cars and provide information about their position and movements, particularly in the event of an accident.

➢   CAPS integrates various sensors such as ultrasonic sensors, eyeblink sensors, and alcohol sensors. The Arduino Uno processes this data and triggers appropriate responses to prevent accidents.

➢   The vehicle is now ready for driving when the first alcohol sensor finds the alcohol concentration below the threshold, allowing the engine to start.

➢   The eye blink sensor constantly sends infrared waves which are reflected and detected by the receiver. As the eye blinks the output of the sensor goes high.

➢   Ultrasonic sensor is a non-contact type of sensor used to measure an object's distance and velocity. When an obstruction is detected by the car's ultrasonic sensors, the speed of the vehicle automatically decreases.

➢   Car batteries also play a crucial role in stabilizing the voltage within the vehicle's electrical system. They act as a buffer, preventing voltage spikes and drops that could potentially damage sensitive electronics.

FIG. 9 : SCHEMATIC DIAGRAM OF CAR ACCIDENT PREVENTION SYSTEM
The interfacing portion of each component with the microcontroller and sensors is explained in this schematic design, which also considers the interfacing of sensors with the Arduino Uno microcontroller.
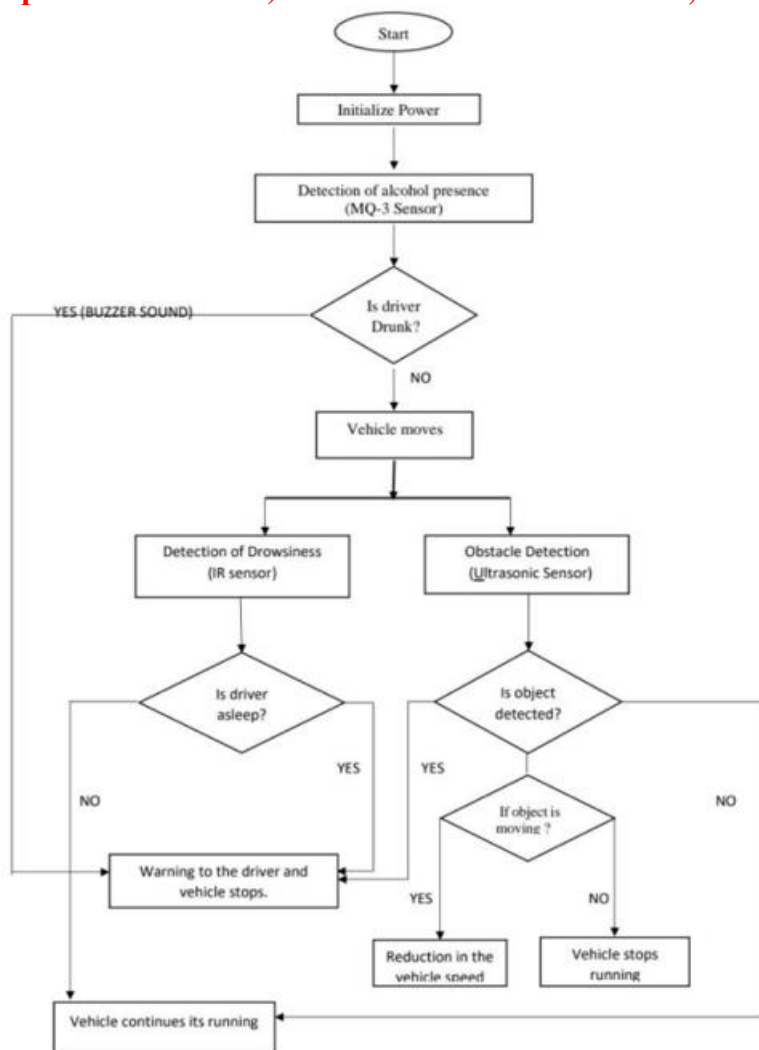
FIG 8 : FLOW CHART

4. ANALYSIS AND RESULTS:

This technique uses ALCOHOL and Eye Blink to reduce accidents caused by unconsciousness. The sensors detect the driver's eye blinks and gauge the amount of alcohol in his breath whenever he starts the car. The Arduino is interfaced with eyeblink, alcohol, an ultrasonic sensor, DC motors, and the L293D motor driver. Arduino will continuously monitor the sensors for alcohol and sleepiness.

CASE - 1: Alcohol Detection: When the Arduino detects the alcohol, the results of the vehicle will stop the vehicle ignition automatically, and the buzzer indication and displayed in LCD.

FIG . 10 LCD output as alcohol detection

CASE - 2: Drowsiness Detection: When the Arduino detects drowsiness, the results of the vehicle will stop the vehicle ignition automatically and buzzer indication and display in LCD .

FIG . 11 LCD output drowsiness detection

CASE - 3: Obstacle Detection and reduction of speed: The car will slow down and come to a halt when it detects an impediment, regardless of whether it is moving or not. The output will be shown on an LCD.

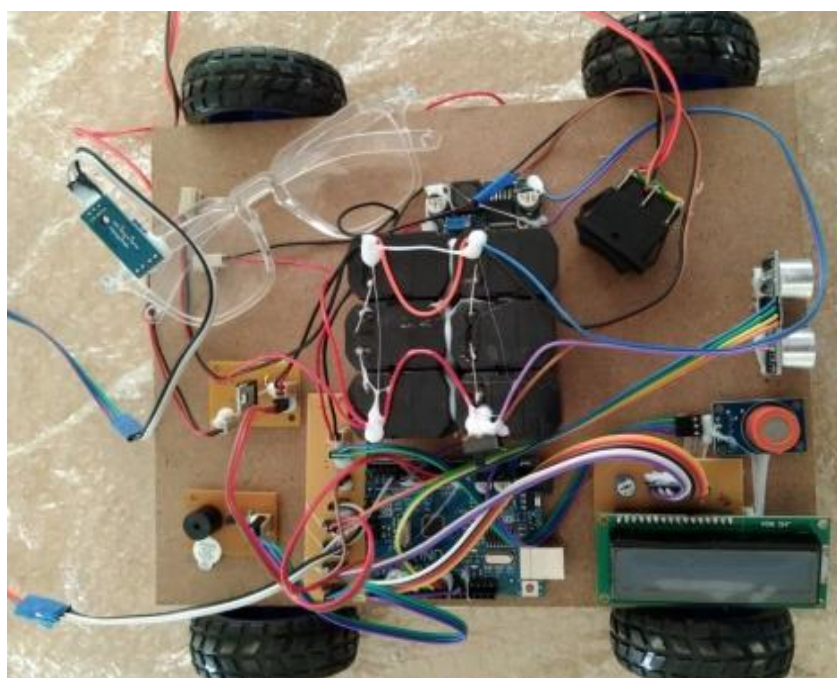**FIG .12 & 13 LCD output as Speed Reduction and Obstacle Detection**

FIG . 14   TOP VIEW THE PROJECT

5. FUTURE SCOPE:

This project prevents mishaps and alerts the user. This system makes driving easier for the driver. This system includes an eye blink sensor to detect eye blinks in addition to a microcontroller-based monitoring system. For future scope, this system notifies the preset numbers by SMS when the eye

blinks rapidly due to sleepiness. Through the use of a GPS receiver, the vehicle's location is determined. Both during the day and at night (dark light), this device performs admirably. You can preprogramme the phone numbers that this should be contacted. When the rate of eye blinking is extremely rapid, we can also turn off the ignition system (DC motor). The LCD shows the vehicle's location as well as its blinking rate.

6. CONCLUSION:

We successfully implemented our project, Accident Prevention by Eye Blinking Sensor and Alcohol Detector. With its ease of implementation in automobiles, this device offers numerous advanced capabilities that are necessary in today's world. As a result, we can lower the number of drunk driving and sleepiness-related auto accidents, making these detectors extremely important. Additionally, it can be utilized in workplaces, educational institutions, and public spaces like libraries and hospitals. We demonstrate the hardware programming of the microcontroller in this project, which enables the use of an alcohol sensor and an eye-blinking sensor.

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