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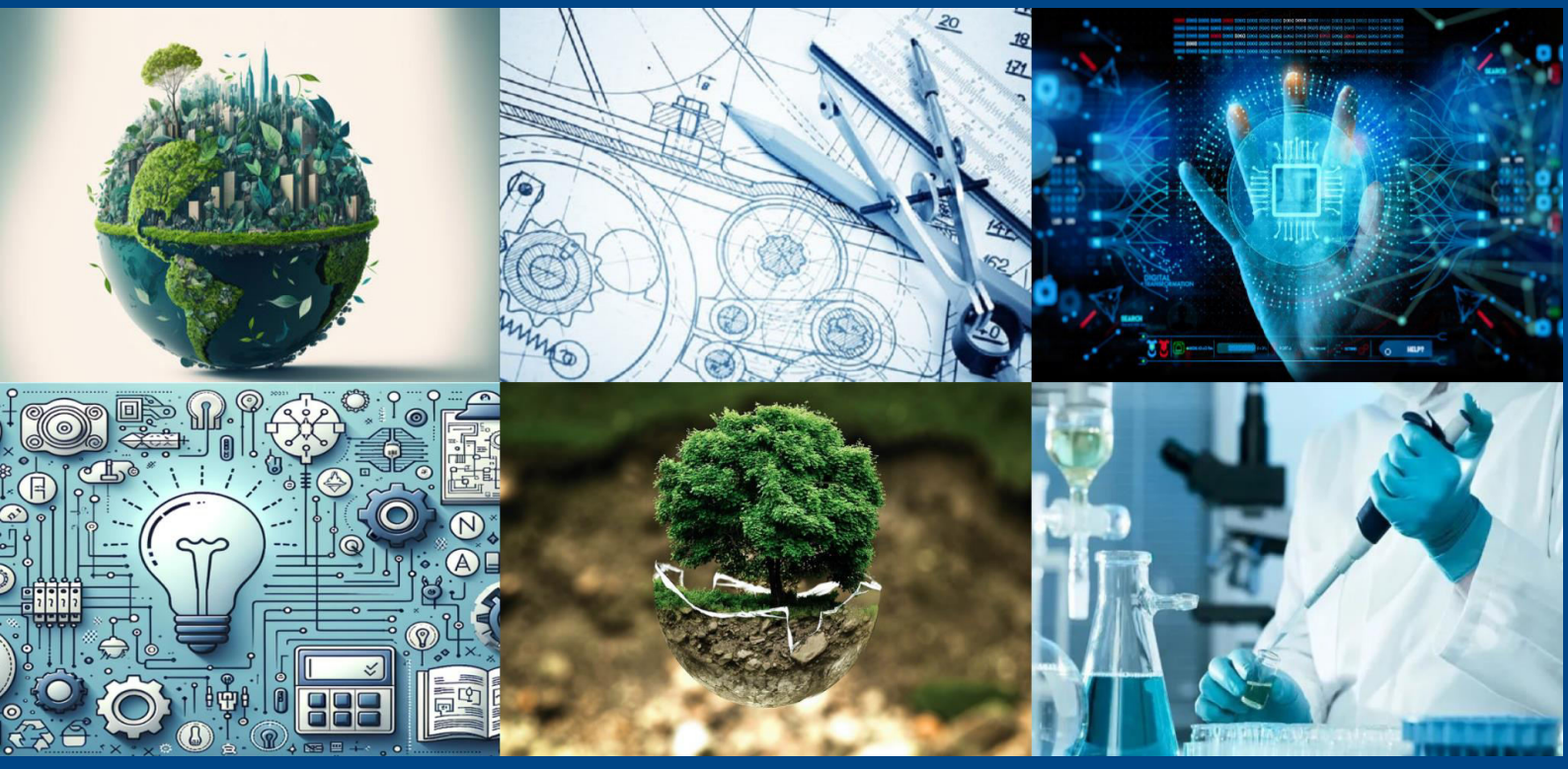

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Vehicle Accident Prevention System using Multiple Sensors by using IoT

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ABSTRACT: Road accidents globally has raised concerns regarding driver safety. Mainly, accidents are caused by bad driving:driver inattention, speeding, racing, aggressive driving and also can be attributed to specific causes aside from poor driving itself includes falling asleep, drunk driving, vehicles coming from the opposite directions etc.So to prevent the accidents caused by these factors a solution is proposed. The aim of this project is to prevent the vehicle accidents by using multiple sensors integrated with IoT. Accidents due to drivers drowsiness can be prevented by using eye blink sensor. The driver is supposed to wear the eye blink sensor frame throughout the course of driving. If the driver has the blink for a couple of seconds to detect drowsiness, the buzzer emits a continuous sound to alert and LCD will display the warning message, if there is no response at that time the wheel speed will be reduced, then finally vehicle will be stopped. This includes an Ultrasonic sensor which is used to maintain safe following distance between vehicle thereby reducing the likelihood of collisions. An alcohol sensor which is used to detect the driver is drunken or not.Accelerometer is used to detect the sudden changes like rash driving. Also we can track the address by using GPS and notification sent to registered number by using GSM. This will helps in reduction of accidents caused by these factors, making travel safe for all.

KEYWORDS: Arduino Uno, Eye blink sensor, Alcohol sensor, Ultrasonic sensor,IoT,GPS,GSM.

I. INTRODUCTION

Road accidents are a significant global problem, causing millions of deaths and injuries annually due to different reasons and claim the lives of approximately 1.35 million people each year.The World Health Organization (WHO) projects that road traffic injuries will be come the third leading cause of global disease burden.Also results in significant economic losses, including medical expenses, lost productivity, and property damage.These incidents are a significant concern worldwide due to their profound social, economic, and health impacts. As urbanization accelerates and vehicle numbers increase globally, the frequency and severity of road accidents tend to rise, making it a critical issue for governments, communities, and individuals alike. Multiple factors contribute to the occurrence of road accidents, broadly categorized into human, environmental, and vehicular factors. Environmental factors includes Poor road conditions, inadequate signage, bad weather (rain, fog, snow), and poor lighting can increase the risk of accidents. Vehicular factors includes mechanical failures, faulty brakes, tire blowouts, and vehicle design flaws can also lead to crashes.Mainly, some of key con tributing factors of accidents are human error like drunk driving,reckless driving and driver behaviour like drowsiness.So to prevent the accidents caused by these human factors, this project has been developed.

II. LITERATURE SURVEY

Due to rapid growth of world population, the demand for vehicles has increased tremendously, resultantly problems of traffic congestion and road accidents has also increased. The general populations life is under high risk, if any accident occurs there a long reaction time which increments the number of deaths, therefore an automatic accident detection system must exist to overcome this situation. Statistics show that leading cause of death by injury is road accidents. Bhatti et al. [1] proposed a system that uses a network of sensors, GPS devices, and communication modules integrated into vehicles and roadside infrastructure.This system detects accidents promptly by monitoring parameters such as sudden deceleration, impact forces, or abnormal vehicle behaviour.This paper discusses how the Internet of Things (IoT) can be leveraged to improve accident detection and reporting mechanisms. It emphasizes the importance of real-time data collection and communication among vehicles, infrastructure, and emergency services.Once an accident is

detected, the system automatically sends alerts to relevant authorities, emergency services, and nearby vehicles, facilitating faster response times and potentially saving lives. There can be multiple causes of road accidents, some of them are, driver negligence due to drowsiness, driving while intoxicated, over speeding etc.Some systems focus on preventive strategy because at the end, goal is to save lives. This system particularly focuses on the safety of two wheelers and checks if the driver is drowsy [2]. Rao and Yellu et al. [3] proposed an IoT-enabled system designed to detect alcohol consumption in drivers before they start their vehicles.since 70% of the cases of accidents are due to drunk and drive . An alcohol sensor placed in the system, is used to monitor the contents of alcohol.A threshold is set and if the contents are more than the pre fetched limit, the car doesnot move.Priyanka et al. [4] proposed a system for the two wheeler safety for accident detection and reporting which contains location tracking. Chandran et al.[5] proposed a smart helmet prototype that leverages IoT technology to detect motorcycle accidents instantly and automatically notify emergency services and contacts with the rider's location. The system aims to increase rider safety by ensuring quick re sponse times in case of accidents.

Syedul et al. [6] proposed a system which aims to automatically detect accidents and send real-time alerts (location, time, etc.) to emergency responders, reducing manual intervention and response time. Some studies show that weather conditions can also contribute towards the severity of an accident such as fog, rain, high winds. High winds can directly influence the vehicle which may deviate the vehicle from road, or indirectly due to obstruction dangers present on the roads such as trees, walls etc.This relation was represented in [7] proposed by Edwards.Road crashes can be seen as a collision between any on road vehicles, obstacles or pedestrians. The survival rate of victim is highly reliant on how long an ambulance takes to reach the site of the accident and then carry the patient to the hospital. In most cases of road accidents, the injuries are not severe and the life of the victim can be rescued, however due to late arrival of the rescue teams, the injuries turn deadly.Thus,the main goal is to identify where the accident occurred, send the information to the rescue teams in considerably less time, so that they can take the necessary actions, to save the life of victim [8] proposed by NayanKumar. Intelligent Transport Systems (ITS) based on Internet of Things (IoT) are getting popular and can be seen as a solution to improve the road safety. One effective technique to reduce traffic hazards and save precious lives could be to reduce the response time after an accident has occurred. Significant research has been carried out to address this issue and to minimize the response time following an accident. Berade and Patil et al. [9] proposed an approach uses limit switches to detect an accident, GSM (Global System for Mobile Communications) is used to send an alert message and location of accident is traced by GPS (Global Positioning System) module. Smartphone based systems that use an android app to detect vehicle crash are also proposed. These systems measure change of tilt angle by means of an accelerometer sensor, speed by means of GPS and send an alert on detection of accident.This was proposed by Faiz [10]. One technique focuses on using the accelerometer sensor, by monitoring the vehicle speed and report an accident as it reaches below the threshold point [11].

Accident prevention can be detected as the strategy or an approach, or actions taken to avoid or stop an accident before it occurs. Majority of the accidents occur due to human negligence. These factors are over speeding, traffic law violations, drunk driving etc. So controlling these factors can help to avoid accidents and save the precious lives.Patil et al. [12] proposed a system which can recover the vehicle using GPS and GSM after the accident. Eduku et al. [13] presented a solution to prevent traffic hazards by proposing a system which uses eye blink sensor and automatic braking system to slow down the car and bring it in the state of halt, if drowsiness is detected. Kasera et al.[14] presented a system to prevent accidents while driving in hilly areas. Since the roads on the hilly areas are very steep and curvy. To implement this mechanism, the system uses ultrasonic sensors.The system alerts the driver going on one side of the road about the vehicle coming from opposite direction.

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III. PROPOSED METHODOLOGY

This is the Layout of "Vehicle Accident Prevention System Using Multiple Sensors By Using IoT".Figure .1 illustrates the block diagram of the proposed model.The proposed system aims to detect and prevent the accidents caused by different reasons using multi ple sensors integrating IoT.The system utilizes Arduino as the controller to orchestrate the functionalities of the components involved.Below is the description of the layout: Eye Blink Sensor:This sensor detects the drowsiness of the driver by wearing a frame.If the eye blink duration greater than five seconds then it detects. Alcohol Sensor:The sensor detects the alcohol content that is driver is drunken or not.If the threshold value of the sensor exceeded ,then it detects. Ultrasonic Sensor:It is used to detect the obstacle or vehicle coming from opposite direction base on the measurement of distance between them. Accelerometer:It is used to detect the acceleration changes like rash driving ,tilt or to detect free fall. LCD:Connected to the arduino,the LCD screen displays the warning

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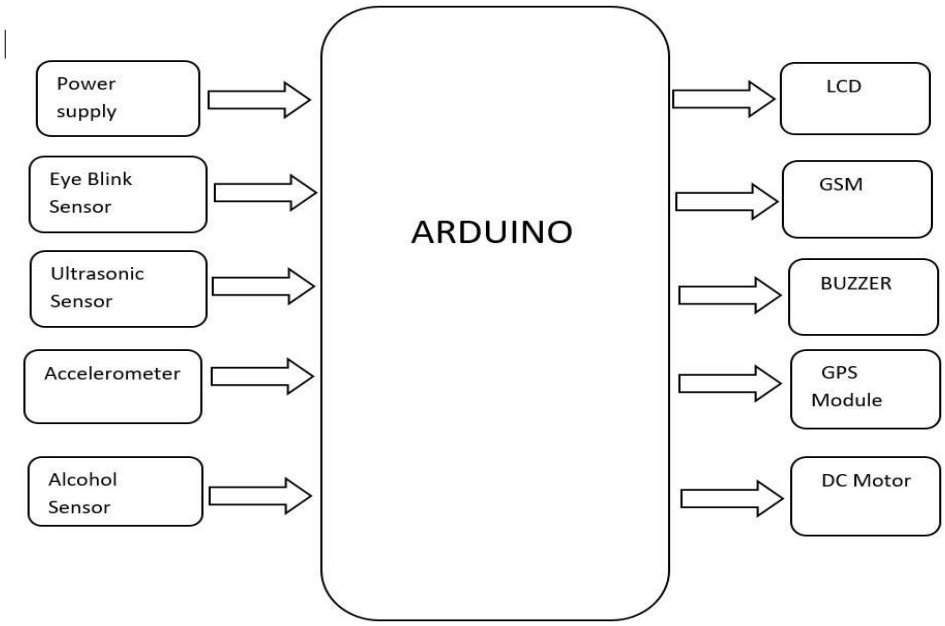
messages accord ing to the above sensors for the safety purpose. GPS:After the warning messages displayed on LCD,by using GPS we can track the location of the vehicle.It is useful for tracking. GSM:GSM technology is crucial in accident prevention systems because it enables real time communication and remote alerts, facilitating timely emergency responses. By using GSM, accident detection systems can immediately transmit alerts, including the accident location, to registered number. This rapid communication is vital for minimizing response time and maximizing the chances of saving lives. DC Motor:DC motors can contribute to accident prevention through their ability to control speed, position, and movement, particularly in automated systems and vehicles. They can be used in braking systems, speed control modules, and as part of robotic or autonomous navigation systems. Buzzer:A buzzer is an efficient component to include the features of sound in our system or project.It helps in giving alerts in the form of sounds.The advantages of a buzzer include the following.Simply Compatible,Frequency Response is Good,Size is small,Energy Consumption is less,The Range of Voltage usage is Large,Sound Pressure is high. The layout of the Vehicle Accident Prevention System Using Multiple Sensors by Using IoT illustrates a sophisticated system design to reduce and prevent the accidents.By using all these sensors information integrated with IoT,the system offers safety,accuracy for the drivers.The system monitors the driver's state and the vehicle's status in real time by integrating sensors, GSM and GPS modules.

Figure 1: Block diagram for proposed methodology



IV. WORKING

In this system, we worked on the prevention of vehicle accident after all the preventive measures applied if the occurences takes place the system detects it. After that the system automatically reports registered mobile without any time loss so that the casualty might not loss life due to late in rescue. The system is installed in the vehicle. As the preventive measures for vehicle accident the sensors like alcohol sensor, eye blink sensor and Ultrasonic sensor and accelerometer is installed and for reporting GPS module and GSM module are used. Motor (control switch) is used for engine control and buzzer, lcd etc. are used for warning during prevention. All these devices are interfaced with the central controller Arduino Uno unit. Alcohol sensor helps us in detecting if the driver is drunk or not. If driver is over drunk the vehicle provides warning and the engine stop functioning. Eye blink sensor is used for detecting the eye blink, if a driver gets sleepy, he gets warned. Ultrasonic sensor helps us in detecting the obstacle and vehicle coming in opposite direction.Accelerometer detects the occurrence of accident and sends signal to the con troller for further functioning. GPS module provides the location, speed, time and date of the certain place where the vehicle is in the real time. If accident occurs, the accelerometer detects it and location of accident is obtained using GPS, and finally sends

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the information by the help of GSM module. The message obtained in mobile phone consists of the location of the accidental place in the form of google map link which will help to reach the casualty in time and rescue the lives.

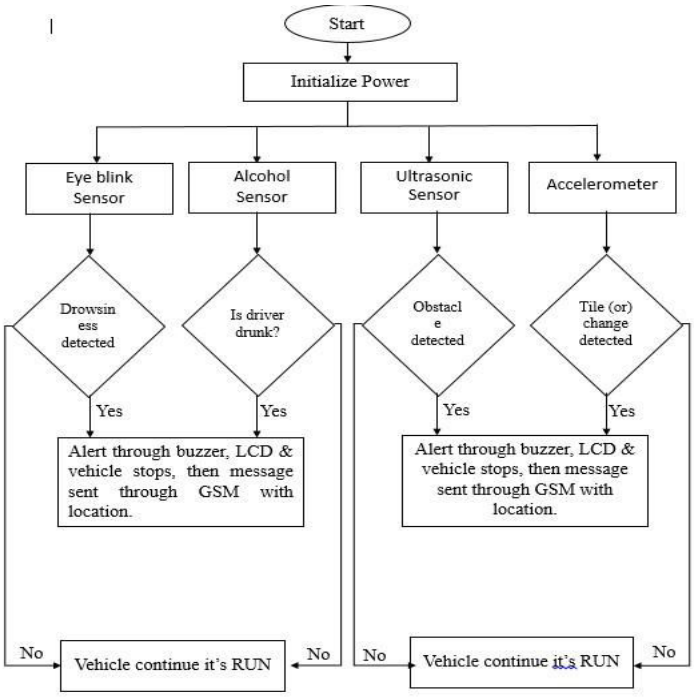

Figure 2:WorkFlow

V. RESULT AND ANALYSIS

Step 1: To showcase the capabilities of this system,final output is as shown below.Figure 3. explains the connections of the hardware system.

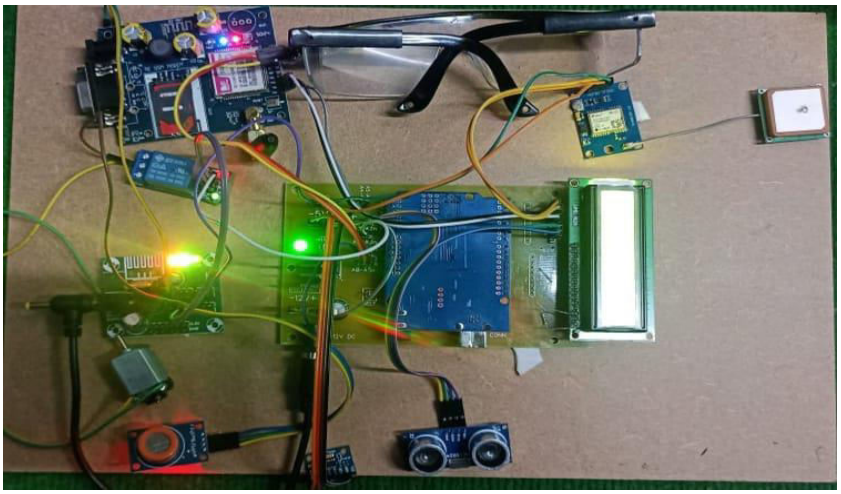

Figure 3:Connections

Step 2: Connect the Arduino board to a power source to provide power to the system.

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Figure 4:Initial Values

Step 3:After the system is on, alcohol sensor detects if the driver is drunk or not. If he is over drunk the system provides warning and the engine of the vehicle stop functioning.After that location detects and sents through GSM.If no alcohol is detected then the vehicle starts properly or does not stop running. Eye blink sensors detects whether the driver is drowsy or not. If the driver is asleep the system warns him with alarm and display warning message on LCD and stops the vehicle. Accelerometer detects the occurrence of accident by tilting axis or rash driving and sends signal to the

Figure 5,6,7:Alcohol Detection,Drowsiness Detection,Acceleration Values

controller for further functioning.The acceleration values along X-, Y- and Z- axis from the accelerometer sensor can be used to detect tilt, free-fall, and dynamic motion of an object.

Step 4:After the combining of sensor information and giving alert sounds through buzzer and warning messages on Lcd display.Additionally by using GPS we can find location and through GSM get notified message with location to registered number.This will helps in saving time.

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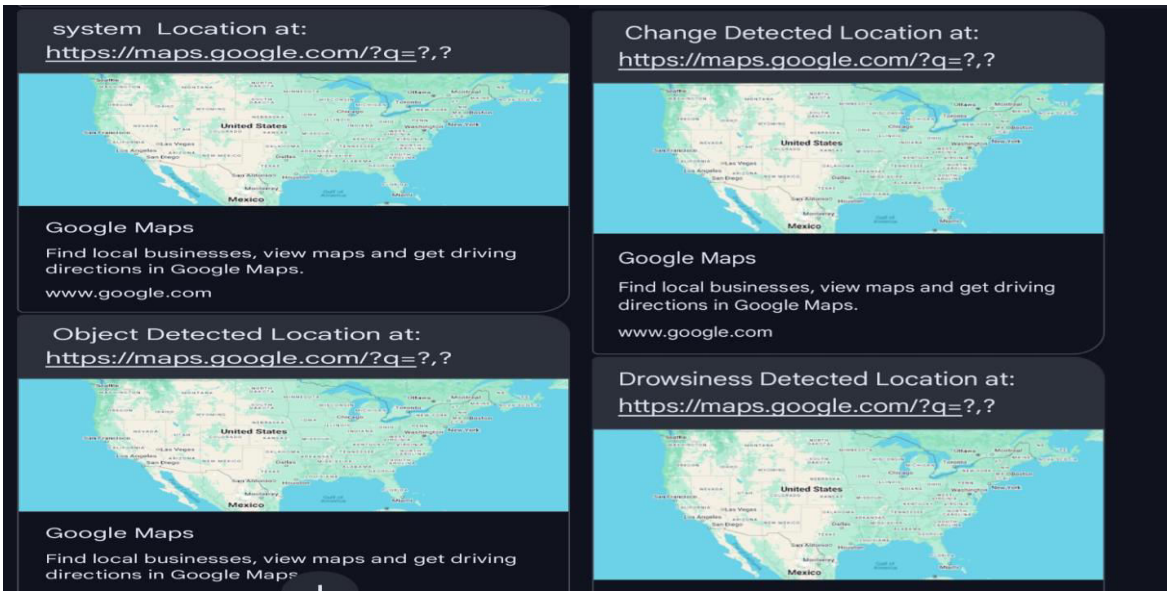

Figure 8,9:Notifications through GSM

VI. CONCLUSION

The number of casualties associated with road collisions is growing rapidly. If victims are rescued in due time, several lives may be saved. This project can be made further more innovative by adding use of DSP processor makes the system more suitable for the faster processing data.Night vision or near infrared camera can be used that can be work even in low light condition .Also, this model can be made with a digital image processing technique make the user not wearing a frame with eye blink sensor until the driver is in driving mode. The integration of these systems with vehicles would be somehow expensive yet will give various advantages. However, the systems we discussed were all reliant on some kind of hard ware or software based technology and there is a possibility that those sensors or devices can themselves be destroyed in the accident and can generate eroneous readings and results. So such frameworks are required which are less reliant on some kind of hardware or software.

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