AN IMPROVED DRIVER SAFETY MECHANISM USING IOT

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled **"AN IMPROVED DRIVER SAFETY MECHANISM USING IOT"** is the *bonafide* work of "**Shrinisha N. (185001148)**, **Sriprabha A. R. (185001167)**, and **Yaswanth V. (185001315)**" who carried out the project work under my supervision.
Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ABSTRACT

Accident is an unexpected event, typically sudden in nature and associated with injury, loss, or harm. Road accident is most unwanted thing to happen to a road user, though they happen quite often. Main cause of accidents and crashes are due to human errors. Our lives have been made easier by rapid rise of technology and infrastructure. The advance of technology has also increased transport risks, and road accidents become more common, resulting in substantial loss of life and property due to lack of proper emergency services. The purpose of our project is to prevent accidents due to driver's negligence. Various accident prevention strategies are being considered, such as detecting drunk and sleepy drivers and using signboards. Our project provides the best solution to the above shortcomings. We are pursuing functions such as alcohol detection, light ray control, sign recognition, fatigue detection, vehicle accident detection, and alarm warning.

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CHAPTER 1

INTRODUCTION

The number of automobiles has expanded dramatically as a result of the motor industry's development throughout the twentieth century. The chance of an accident rises as the amount of cars increases. Heavy congestion and a shortage of traffic separation are the leading causes of road accidents. As per the World Health Organization, India is the leading nation in terms of road accident fatalities (WHO). In the 2014-15 fiscal year, 13 million people perished in road accidents in India. These numbers are based on crash data that have been kept track of, albeit many incidents go unreported. As a result, the real number of accidents is larger than the data provided by the World Health Organization (WHO).

These days, we constantly hear about accidents are caused by drunk driving. Drunk driving is a particularly dangerous habit because it causes drivers' cognitive processes to become altered as a result of massive alcohol intake. According to a research released by the World Health Organization in 2008, drunk driving is responsible for 50–60 percent of all traffic accidents. In recent years, the incidence of traffic accidents caused by drunk driving has increased considerably. As a result, it is obvious that driving while inebriated endangers public safety.

During the night, the demand for headlights becomes even more important in order to prevent vehicles from colliding. The headlight, which aids the motorist by giving better visibility when driving in the dark, can also be the cause of several fatal accidents. The majority of vehicle drivers experience pain as a result

of the overly bright beam coming from vehicles approaching from the other way, which generates an instant glare in the driver's eye and temporarily blinds them. This has the potential to be the catalyst for a slew of tragic events.To avoid this problem, the driver must switch between high and low beams on the headlamp. When there are no light sources accessible at night, we normally favour high beam over low beam. The quantity of lighting provided by low-beam headlights is smaller than that provided by high-beam headlights.

To create a safe traffic system, each government imposes its own set of laws and regulations. For a safe journey, everyone, especially the vehicle driver, must follow certain laws and regulations. There are several types of traffic signs that can be found alongside highways. A good driver must pay attention to all of the road signs in front of him and behave accordingly. Things could get out of hand if this does not happen. Due to carelessness or human perception problems, a driver may miss all of the traffic signs in front of his vehicle. As a result, having an autonomous road sign detection and recognition system to aid the driver in ensuring safe travel is desirable.

Because the driver will be using so many controllers in the vehicle, keeping track of various sign boards such as school zones, speed limits, curved roads, crossroads, and other sign-related information would be extremely challenging. However, these notice boards are frequently misplaced. Instead, we send a warning to the driver about forthcoming signs from afar, and the car will receive this information before reaching that area, allowing for proactive action to be done to avoid mishaps. In most cases, road accidents are caused by insufficient driving skills.If the motorist is inebriated or drowsy, certain issues can emerge. The most common sorts of fatal accidents have been linked to the driver's

exhaustion. Drowsy driving happens when a driver becomes excessively tired while driving, making it difficult for the driver to remain awake. This frequently happens when the driver doesn't get enough sleep or is taking drugs. This can also happen if the driver has a sleep problem like insomnia. As a result, the driver is likely to suffer from mild cognitive impairment as well as delayed reaction times. In the most pessimistic case, the driver falls asleep, and the vehicle loses control.

The strong growth of technology and infrastructure has made our lives simpler. With the advent of technology, transportation hazards have increased, and road accidents are becoming more common, leading to substantial loss of life and property owing to insufficient emergency services. This technique might help save lives in remote areas when an accident has occurred and no one is accessible to report it. With this technology, an accident can be detected, and a life can be saved owing to the emergency services' quick response..

1.1 PROBLEM STATEMENT

This project is to develop an exclusive mechanism which helps in detecting and preventing the accidents caused by driver's negligence.

You may easily avert deadly road accidents if you know how to capture the driver's psychological condition. Drunk driving is the biggest cause of traffic collisions and accidents all over the world. An alcohol sensor gadget was used to fix the problem. When this sensor detects that the driver has consumed excessive amounts of alcohol, the automobile will cut off the engine. The LDR sensor is used to

regulate the high and low beams of light. The intensity of the light hitting this sensor is measured with this sensor. High and low beams are set up based on this to guarantee a good vision of the road. On busy highways, most of us are unconcerned by traffic signs, yet knowing the laws of the road is beneficial. To broadcast and/or receive signals, the RF transceiver module is utilised. This RF module might help you fix this problem. The technology can recognise accidents in a quarter of the time and provide basic information with a first centre in seconds, including geographic locations, time, and impact angle. Information about the accident is communicated to the patient's protector and the emergency services in the event of an accident. The majority of road accidents occur at night when drivers fall asleep behind the wheel. In addition, the project will include an EBM (Eye Blink Monitoring) system that will alert the driver if he or she becomes drowsy.

1.2 OBJECTIVE OF THE PROJECT

The number of people killed or injured in automobile accidents is steadily increasing. Several lives can be spared if victims are rescued in a timely manner. This research examines the numerous strategies presented for detecting and preventing accidents before they occur. We examined several accident detection and prevention measures. Various accident prevention techniques, such as the identification of intoxicated and tired drivers and the use of signs, were also explored. When people die in car accidents, they generally go unnoticed, especially at night. When an event is identified, information is communicated to emergency services so that aid may be provided as soon as possible. These systems have a number of advantages, including reducing the severity of traffic

accidents, pinpointing the exact position of the accident, and assisting with any rescue activities. The repercussions of accidents can be avoided by employing all of these methods.

1.3 SYSTEM REQUIREMENTS

The following are the requirements for a better driver safety mechanism:

• A real-time monitoring mechanism to ensure sleepiness detection accuracy.

• This application gives the best possible solution to substandard emergency services supplied in the event of a road crash.

1.3.1 Hardware Requirements

Arduino Uno, MQ2, LDR sensor, RF card and RF reader, buzzer, Webcam, Vibration Sensor, light source and power source, are the hardware requirements of the system.

1.3.2 Software Requirements

The language used for programming is Python and OpenCV is an image processing library which contains many inbuilt functions to make image processing easier.

1.4 CHALLENGES

To begin with, the goal of this experiment was to identify alcohol use by a percentage more than 30, but we were unable to do so because the ol components were mostly located in the air. As a result, we move on to the idea of various computations.

Second, we utilised the beam sensor to try to regulate the light beam in the automobile that the sensors were monitoring. However, the sensor's success rate will be determined only if this function is implemented on both cars.

Third, a disadvantage of sign detection is the usage of Google Maps, as numerous trips to a spot might lessen reliance on the map, and not all users / drivers are aware of this. Vehicles will move based on the map. Furthermore, utilising Google Maps necessitates obtaining Google's approval, which takes time.

1.5 REPORT ORGANIZATION

There are six chapters in all in this thesis. The following is how the rest of the thesis is organised:

The first chapter covers the system's introduction, problem description, objectives, system requirements, obstacles, and overall thesis summary.

Chapter 2 provides a complete analysis of the literature on alcohol detection, light beam detection, sign board detection, drowsiness detection, and accident

detection from past and contemporary research. The project's issue description and suggested system are described in Chapter 3.

The theoretical foundation for building the whole system, including all of the algorithms utilised, is explained in Chapter 4.

The implementation section is covered in Chapter 5. This chapter contains all of the results and explanations for the results from the whole development process.

Chapter 6 highlights the study to date and forecasts what may be done to enhance the system in the future.

CHAPTER 2

LITERATURE SURVEY

Phani Sridhar A. et al[1] employed a traditional approach instead of breath analyzers for ”Liquor Detection using Automatic Motor Locking System”, with the goal of reducing traffic accidents caused by inebriated drivers. They used a basic alcohol sensor (MQ3), however there was an interruption of intoxicated breath. Only when the individual enters the car and starts the engine is there a chance of discovery. The turbulent flow of timing pulses across the different special function registers of the micro-controller also contributes to the delay in response. This system is built on an RTOS architecture, with an RTS kernel ensuring that the system calls for a range of variables, which are then followed by life cycle stages. Finally, the sensor identifies the input through a human's breath once the system has been designed. In the following example, the sensor measures the amount of alcohol in the air and compares it to the set-in restrictions. If the established limit of alcohol intake is less than the amount of alcohol ingested by the individual, a system of activating relays is activated, which activates the automatic lock on the car, which stops the engine if it is running or unable to start.

Vrinda Hegde et al.[4] suggested ”IoT Based Alcohol Detection for Drivers” to prevent road accidents caused by drunken driving. They devised a system based on IoT and Raspberry Pi that displays the status of the driver while driving, indicating whether the driver is inebriated or not. This gadget is mounted on the vehicle's steering wheels. If the driver is confirmed to be inebriated, the vehicle's speed is reduced using a DC motor, and an alert is sounded through the buzzer to warn the

driver. They employed the MQ-3 (alcohol gas sensor), which has a conductivity that increases as the alcohol gas concentration rises. This suggested technology can identify inebriated drivers. When the sensor detects alcohol, it adjusts the DC motor's speed before turning on the buzzer. In this research, we used IoT to create an autonomous alcohol detection system in order to prevent road accidents caused by drunk driving.

In their study "IoT-Enabled Alcohol Detection System for Road Transportation Safety in Smart City," Stanley Uzairue et al[7] offered two Blood Alcohol Content (BAC) criteria that are set and tracked using a microcontroller. This device displays the results of the sensor system as it recognizes ethanol particles in the air in it and shows a warning message when it crosses the preset threshold of the LM358 Op Amp. A 12-volt battery powers the gear. The BAC levels and vehicle locations were shown on the LCD panel. The coordinates of the driver's position are provided by the GPS.A webpage is put up to show the monitoring employees the driver's BAC levels as well as the vehicle's location. The ATMEGA 328P with Wi-Fi module was used in the created system. The ADC and Wi-Fi Module link the embedded device to the internet. For monitoring, the alcohol sensor and GPS are coupled to an Arduino UNO board. The ADC transforms the sensor and coordinate readings to a digital value, which is then used to calculate the associated environmental parameter. When a suitable connection is established with the server device, the detected data (BAC levels and coordinates) is automatically communicated to the web server. In the future, one of the changes that might be made to this system is to make it smaller. The more compact the system is, and the more handy it is, the more likely drivers will adopt it. The alcohol sensor should be properly positioned to enable for easy reading of the driver's alcohol intake level with or without the help of the driving.

”Night Time Vehicle Detection for Driving Assistance Light Beam Controller,” suggested P.F. Alcantarilla et al[12]. A BW micro-camera positioned in the windscreen region and facing ahead is used in this system. To assess light sources and recognise automobiles in photos, digital image processing techniques are used. The algorithm is both efficient and real-time capable. As a result, while there is no other traffic, high lights will be picked, and low beams will be selected when other cars are detected. A Black and White camera installed behind the windscreen within the camera-assisted vehicle obtains the input pictures from the vision system. The device runs on a Pentium IV 3 Ghz processor and records picture sequences that are 720 pixels by 480 pixels every frame. The amount of time it takes to process one input frame is determined on the road scene’s intricacy. They introduced a night time detecting computer system for driving assistance in this study.

In ”High Beam Light Controller for Vehicles,” Govindarasu S. et.al[15] established a workable model to govern the automated switching of a high beam to a low beam when two vehicles approach each other, as well as within city boundaries. They also recommended using an LDR sensor, which detects light from nearby vehicles and can turn off high beam lights. As a result, seamless clearing inside city borders is possible. The use of this gadget in existing automobiles would minimise the number of nighttime accidents. Drivers would be allowed to drive at any time of day or night. There will be no more eye difficulties caused by the vehicle’s high beam lights.

”Automatic High Beam Controller for Vehicles” by Mohammad Mahmudul Islam et al[20] presented an effective automatic regulation of vehicle headlamps based on the detection of headlights and taillights during nighttime traffic conditions.

The goal of this project is to automate the control of high and low beams. This effort will ensure that consumers save time and energy, even those who suffer from nervous illnesses. This project will not interfere with the beam's manual functions. The Transmitting and Receiving devices are both powered by a power supply unit. It provides +12V to the receiving device's relay switch and +5V to numerous sections of the transmitting and receiving devices. Signals are sent from the Transmitting Device to the Receiver Module. The LDR and IR-Rx start working after receiving signals, and the relay switch turns from high to low beam. When a vehicle gets a signal from another vehicle generating a high beam of light, "the Automatic High Beam Controller" may alter the car's high beam to low beam. If the opposing vehicle also has had this device, the high beam on the opposing vehicle will automatically convert to low beam.Even if it detects the presence of any surrounding item at the same time, the gadget will function. Furthermore, the rate of high-speed road accidents can be lowered by deploying this equipment.

"Detection and collision avoidance system for RF-based sign boards," This concept was proposed by Ravikiran Nayak et al[22], and it helps to solve the problem of drivers not being able to see the sign boards on the road. They employed two modules: an RF transmitter with an encoder for serial transmission of 4-bit parallel data, and a controller with an RF receiver with a Decoder, android, display, and other indicating devices. The front vehicle's distance is measured using an ultrasonic sensor. The code is constructed in such a way that it will have three levels of indication: critical, normal, and mid-range. When the car approaches a critical zone, an alarm is sent to Android, and the vehicle comes to a complete stop. In other zones, the controller will continually convey the vehicle's distance to the driver, i.e. it will just offer the driver an indicator. It's also crucial for controlling the speed of a DC motor. The implemented initiative will assist the

driver by informing him of impending events. The number of accidents may be minimised by utilising this method, and sign boards can be followed. When any vehicle or item enters the vehicle's critical zone, the vehicle will also stop. It may be able to assist prevent accidents to a larger level in the future, as most accidents occur when signboards are avoided.

"Automatic Road Traffic Sign Board Detection and Recognition System" was suggested by Gurjeet Kaur et al[26]. This study examines how to identify and recognise the contents of traffic sign boards. The data can assist the driver in ensuring smooth traffic flow and improving driving safety and comfort. A system to identify the traffic sign and inform the motorist automatically detects and recognises a road sign from the sign board. The technique for recognising traffic sign boards in this system consists of six fundamental components. Artificial Neural Network, Support Vector Machine, KNN Classifier, Intensity Threshold Variation, and Texture Classification are the approaches employed. Various environmental factors such as weather, changing lighting conditions, and partially visible sign boards make determining the meaning and purpose of road signs challenging. Several approaches and strategies have been discussed in this study that are primarily utilised for the detection and recognition of traffic sign board symbols, as well as a suggested system that is based on these new techniques and can be effective in reducing road traffic difficulties.

Anil Kumar Biswal et.al[32] proposed "IoT-Based Smart Alert System for Drowsy Driver Detection," in which they address a drowsy driver alert system that has been developed using such a technique in which the Video Stream Processing (VSP) is analysed using an Eye Aspect Ratio (EAR) and Euclidean distance of the eye. The face landmark method is also used to determine the

presence of eyes. When a driver's weariness is identified, the IoT module sends a warning message to the Raspberry Pi monitoring system, along with information on the effect of a collision and its position. Face movement and eye blink are measured to evaluate the driver's state in order to analyse distinct behavioural or visual-based attitudes. Through the use of a crash sensor and a Force Sensitive Sensor, this approach successfully detects a driver's tiredness as well as collision impacts caused by vehicle braking (FSS). The driver's sleepiness is determined by observing his or her EAR. This procedure determines whether the eyes are open or closed, and thus offers information on the website's collision impact.

Aayush Doshi et.al[40] identify the occurrence of an accident and send the co-ordinates of the accident, i.e. the latitude and longitude of the place, to the rescue squad in "Accilert – Accident Detection And Alert System." The system will consider an accident if the Accelerator suddenly accelerates and the Vibration Sensor detects a significant shift. As a result, the GSM Module and the GPS Module will be notified, and they will detect the position and send a message identifying the accident and the place where it occurred. This initiative aids in the provision of a workable solution to the inadequate emergency facilities. In this project, they want to create a system that can identify traffic accidents and determine their location using GPS. The sufferer will immediately be connected to the nearest emergency care unit through GSM interface, where he or she will get immediate medical attention. The vehicle speed will be slowed if it detects a car or other objects while travelling; nevertheless, if an accident happens, the vibration sensor will activate the GPS to locate the accident location. If no one is injured, the individual who was involved in the accident must activate the safety switch. No SMS will be sent to the emergency room in this situation. If no one presses the safety switch within 40 seconds, GSM will broadcast the

location and heartbeat status of the individual to the emergency care centre, as well as an optional cellphone number, with the message ” Accident detected”. Furthermore, when the vehicle is flipped or a fire is detected, it will send a message to an emergency care centre.

CHAPTER 3

PROBLEM DEFINITION AND PROPOSED SYSTEM

3.1 SYSTEM DESIGN

The components used in this system are Arduino Uno, MQ2 Sensor, LDR Sensor, RF Card and Reader, Power source, Light source

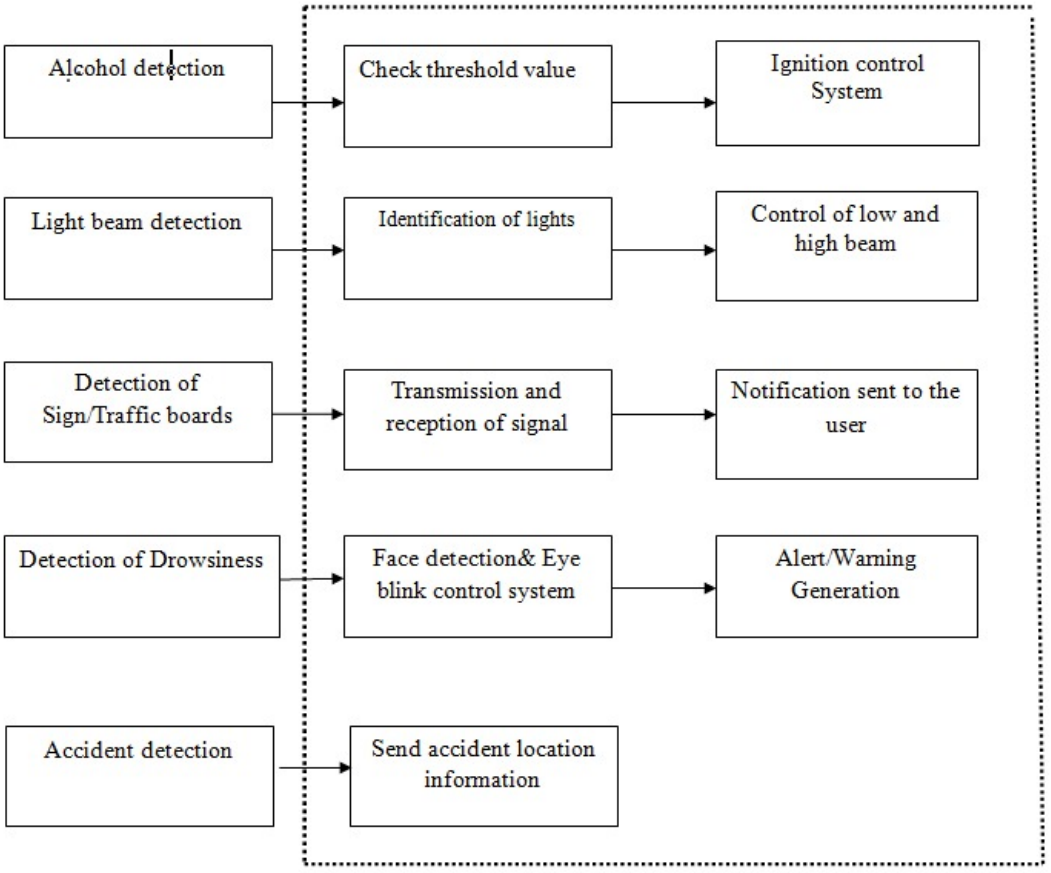

FIGURE 3.1: **Architecture Diagram for the Proposed System**

Alcohol is detected with an alcohol sensor in alcohol detection (MQ2). A particular quantity is set as the threshold value. The vehicle's ignition system is turned off when the threshold reaches a suitable value. LDR sensors are utilised in Light Beam Detection to intensify the beam of incoming cars. High and low lights are applied based on this sensor to ensure a good view of the road. Sign boards are recognised utilising an RF Card and an RF Reader in Sign Board Detection, and a notification is provided to the user (driver). Accidents are recognised and the location information is transmitted to the driver's relatives/guardians and emergency services in the event of an accident.

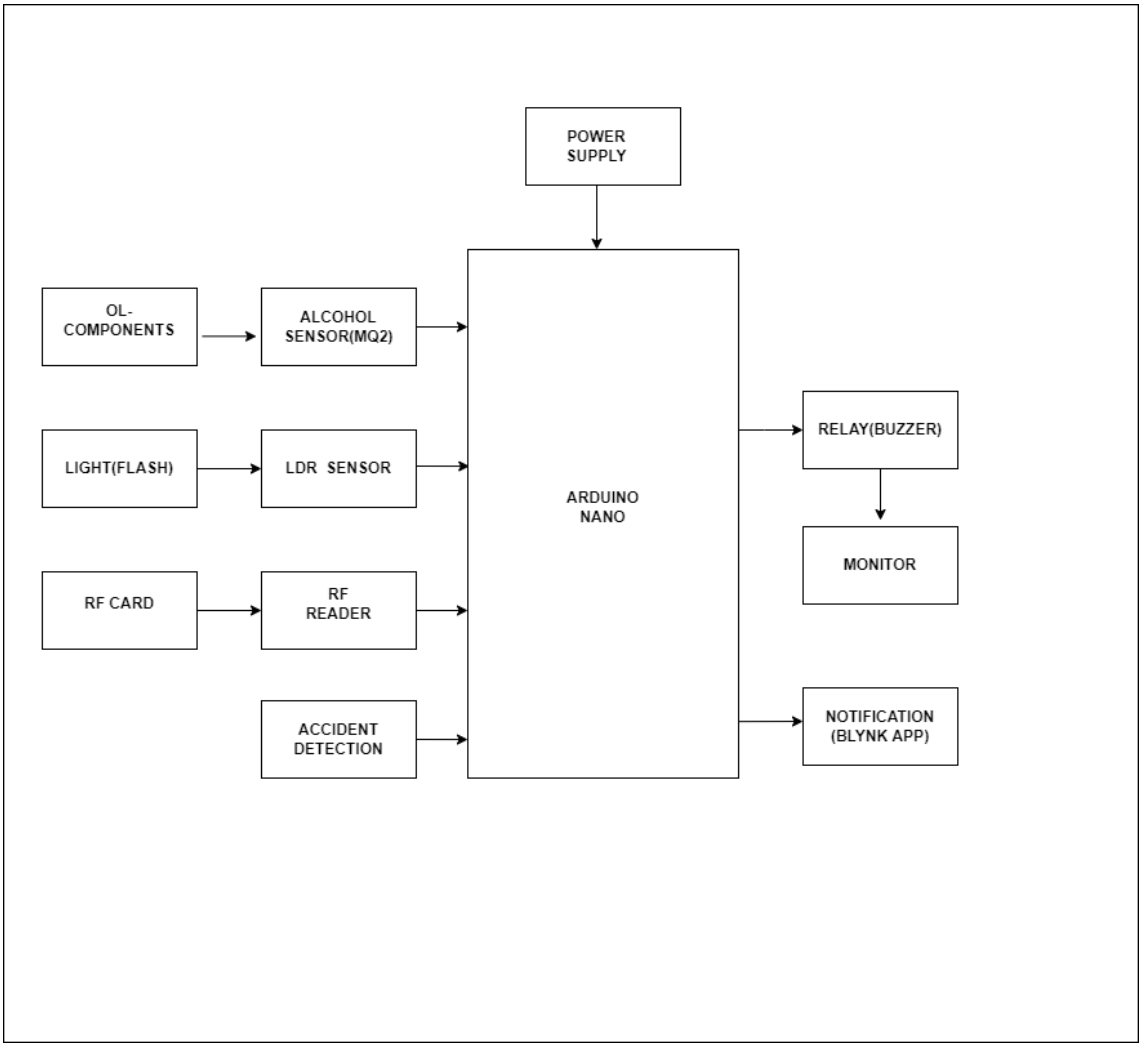

FIGURE 3.2: **Architecture Diagram for the Proposed System with Arduino Uno**

Power Supply from the transformer is directly connected to the Arduino Uno board in which all the sensors are integrted together to function as per the proposed system Figure 3.2 .

3.1.1 Arduino Uno

Arduino is a low-cost, open-source microcontroller that can be programmed, erased, and reprogrammed with ease. The Arduino nano has 14 digital pins, 8 analogue pins, 2 reset pins, and 6 power pins. It is programmed to control IDE, which may be downloaded from the official Arduino website. It may be powered by a USB cable or an external 9-volt battery that has a voltage range of 7 to 20 volts. It's a microcontroller that's similar to the Arduino Nano and Leonardo. The input voltage ranges from 7 to 12 volts, with a 5 volt working voltage. Arduino is frequently used to control traffic lights, but it may also be used for real-time control systems with variable timings, pedestrian lighting, and other uses.

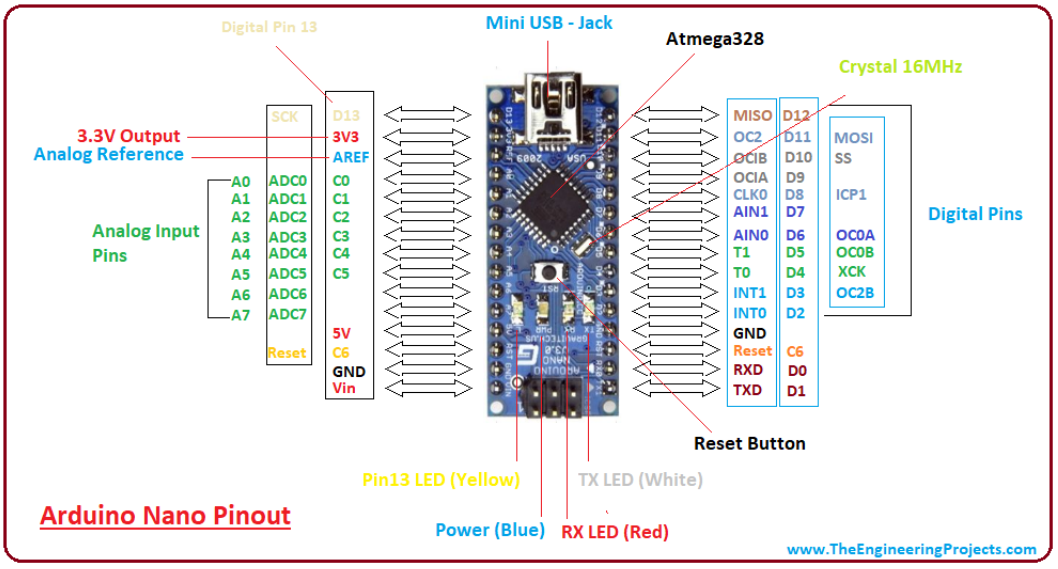

FIGURE 3.3: **Arduino Uno**

PIN	NAME	DETAILS
1	PC6	reset
2	PD0	Digital pin(RX)
3	PD1	Digital pin(TX)
4	PD2	Digital pin
5	PD3	Digital pin(PWM)
6	PD4	Digital pin
7	Vcc	Positive Voltage(Power)
8	GND	Ground
9	XTAL 1	Crystal Oscillator
10	XTAL 2	Crystal Oscillator
11	PD5	Digital pin(PWM)
12	PD6	Digital pin(PWM)
13	PD7	Digital pin
14	PB0	Digital pin
15	PB1	Digital pin(PWM)
16	PB2	Digital pin(PWM)
17	PB3	Digital pin(PWM)
18	PB4	Digital pin
19	PB5	Digital pin
20	AVCC	Positive Voltage for ADC(power)
21	AREF	Reference voltage
22	GND	Ground
23	PC0	Analog Input
24	PC1	Analog Input
25	PC2	Analog Input
26	PC3	Analog Input
27	PC4	Analog Input
28	PC5	Analog Input

TABLE 3.1: Pin Details

It may be charged by an Usb connection or an additional 9-volt battery that has a voltage range of 7 to 20 volts. It's a microcontroller that's similar to the Arduino Nano and Leonardo. The input voltage ranges from 7 to 12 volts, with a 5 volt working voltage. Arduino is frequently used to control traffic lights, but it may also be used for real-time control systems with variable timings, pedestrian lighting, and other uses.

3.1.2 Alcohol Sensor - MQ2

In safety systems, sensors are currently widely used. To detect smoke and fire, smoke detectors are employed. For the purpose of safety, they take the necessary precautions in a timely way. The MQ2 Sensor is a gas detection module that can detect hydrogen, liquefied petroleum gas (LPG), smoke, carbon monoxide (CO), and alcohol. It measures and collects data with great sensitivity and a quick reaction time. A two-layer fine stainless steel mesh surrounds the sensor in an anti-explosion network. It ensures that the heating element within the sensor does not produce an explosion because we are monitoring combustible gases. The analogue output voltage (at the A0 pin) of the sensor fluctuates in proportion to the amount of alcohol present. The amount of alcohol in the air causes the output voltage to grow. As the concentration falls, the output voltage lowers. The digital contact is raised when the gas concentration approaches the threshold. The sensor operates in analogue mode to determine the gas concentration.

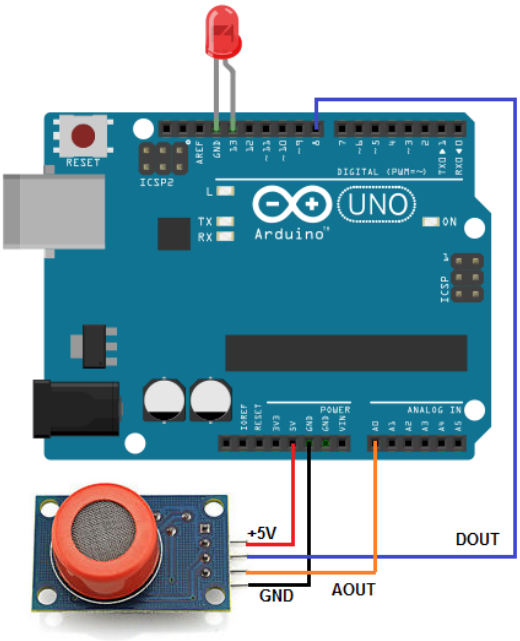

FIGURE 3.4: **Alcohol Sensor connected with Ardunio Uno**

3.1.3 Light Beam Sensor - LDR

A photo-resistor, also known as a light dependent resistor (LDR), is an electrical component that is sensitive to light. As light strikes on it, the resistance changes. The LDR creates an analogue voltage that changes in magnitude in direct relation to the intensity of the incident light when connected to VCC (5V). In other words, the stronger the light intensity, the higher the LDR's associated voltage. The LDR is connected to the Arduino's analog signal pin since it produces an analogue voltage.

The Arduino then converts the analogue voltage (between 0 and 5V) to a digital value in the range of (0-1023). If there is enough light in its environment or on its surface, the produced digital readings read from the LDR through the Arduino will be in the region of 800-1023.

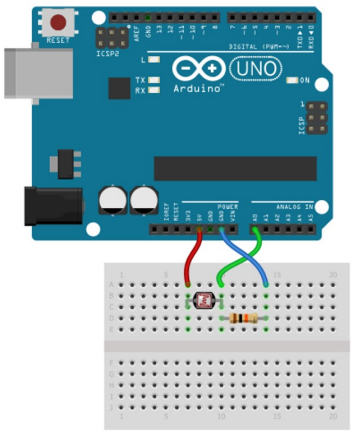

FIGURE 3.5: **LDR Sensor connected with Arduino Uno**

3.1.4 Sign Board Detection - RF Card and Reader

A radio frequency identification (RFID) reader that takes information from RFID tags that are used to track certain items. RFID tags are commonly used to allow everyday objects to communicate with one another and with a main hub, as well as to record their status. The reader receives data from the tag through radio waves.

FIGURE 3.6: **RF card**

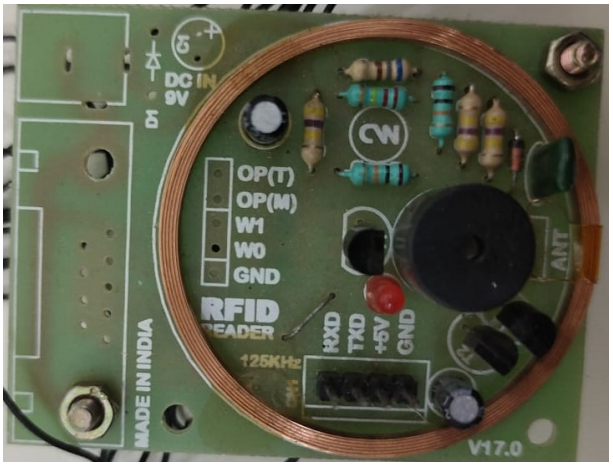

FIGURE 3.7: **RF Reader**

RFID readers scan the tags, which carry unique electronically encoded information. RFID tags are utilised in a variety of sectors, however they are most typically employed in security applications.

3.1.5 Relay-Buzzer

Relays are programmable electrical switches that may be controlled by Arduino or any other microcontroller. It is used to turn on or off equipment that consume high voltage and/or high current using a software.

Relays are electrical switches that use electromagnetism to convert modest electrical inputs into larger currents. Electromagnets are triggered by electrical inputs and create or change the existing circuits.

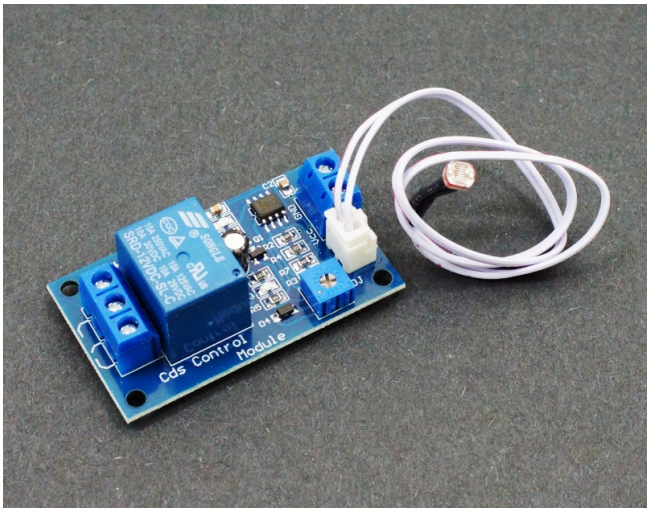

FIGURE 3.8: **Relay**

3.1.6 Accident Detection - Vibration Sensor

Vibration data is read by an IoT vibration sensor and sent to a cloud, user interface, or local server(s) for analysis. Vibration sensors can also be used to analyse data locally before transmitting it to a cloud service.

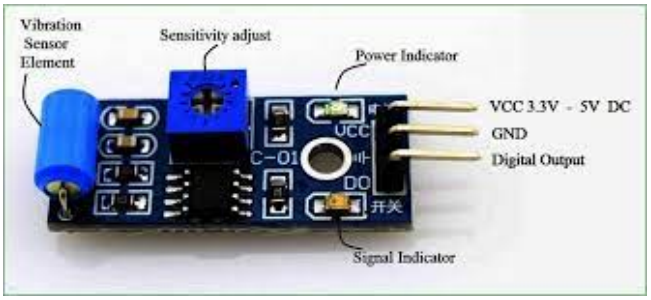

FIGURE 3.9: **Vibration sensor**

Vibration sensors are commonly used in rotational technology such as pump, engines, turbines, crushers, gearbox, gas turbines, conveyors bearing, wind farm gearboxes, wind farm generators, dryer sections (paper and pulp), oven and or kiln (mineral preparation), and hot rolling.

3.1.7 OpenCV

OpenCV is an open source computer vision toolkit that focuses on real-time image detection and is built for computational efficiency. OpenCV is more specialised, quick, and efficient than Matlab, making it a superior choice for a real-time detection system. It's written in efficient C and can handle multi-core CPUs. One of OpenCV's aims is to create an easy-to-use computer vision infrastructure that allows individuals to quickly construct very sophisticated vision applications. The OpenCV library, which has over 500 functions, covers a wide range of vision topics. Because machine learning and computer vision are commonly connected, OpenCV offers a complete Machine Learning Library (MLL).

CHAPTER 4

ALGORITHMS FOR PROPOSED SYSTEM

The proposed system has 5 features.

1. Alcohol Detection

2. Light Beam Detection

3. Sign Board Detection

4. Drowsiness Detection

5. Accident Detection

4.1 ALCOHOL DETECTION

As a driver, you must be aware of the legal limit for alcohol consumption. Any person whose blood contains alcohol in excess of 30 milligrams per 100 milliliters of blood, as determined by a breath analyzer, is regarded to be driving under the influence of alcohol. Alcohol sensors are used to detect the use of alcohol. A particular quantity is specified as the threshold. The vehicle's ignition system is turned off when the threshold reaches a suitable value.

When semiconductor particles are heated in air at a high temperature, oxygen is deposited on the surface, activating this sensor.

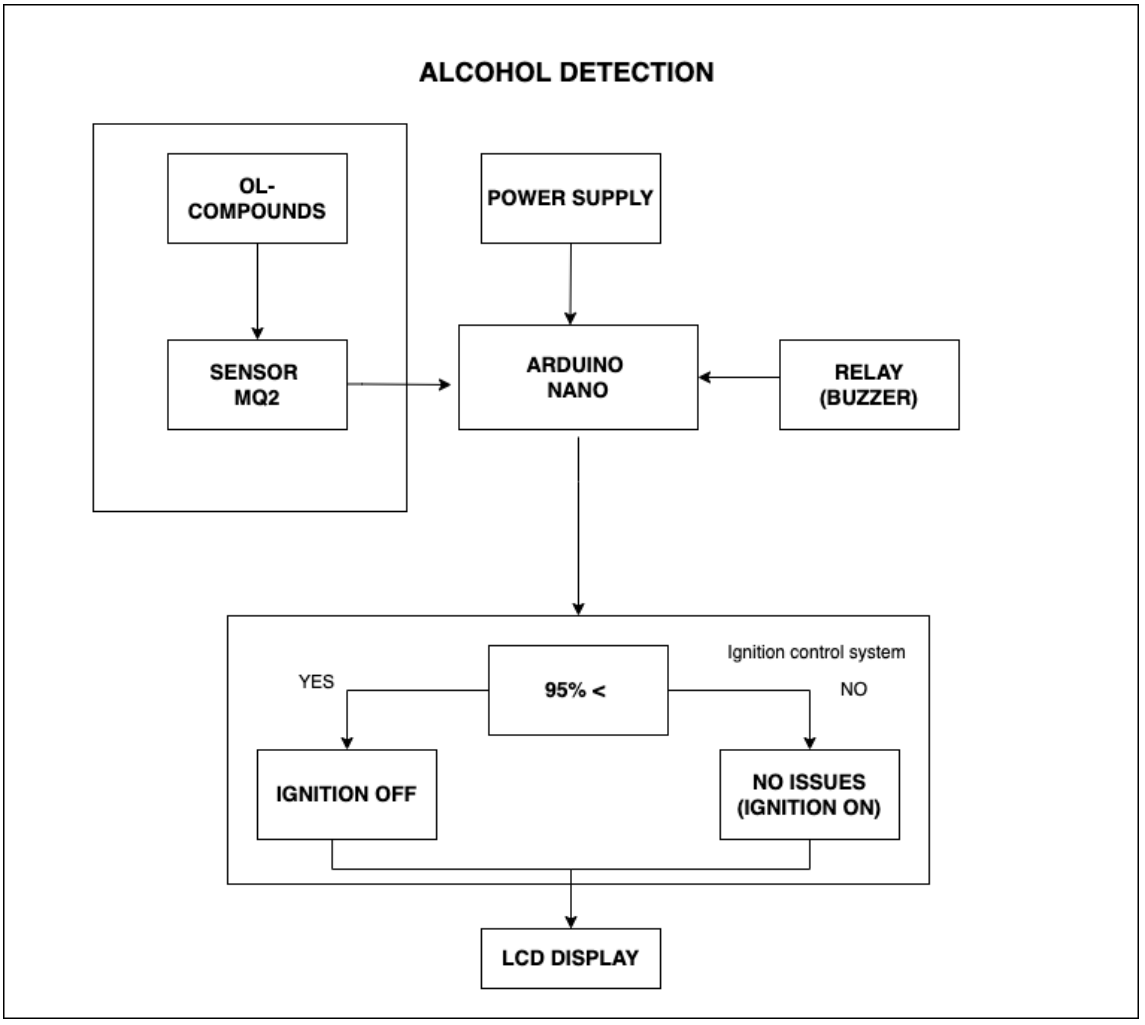

FIGURE 4.1: **Alcohol Detection**

In clean air, tin dioxide donor electrons are pulled to oxygen deposited of the sensing material. The flow of electric current is obstructed as a result of this. In the presence of reducing gases, the surface concentration of adsorbed oxygen decreases as it reacts with the reducing gases. After being hit with electrons, the tin dioxide allows electricity to easily pass through the sensor.

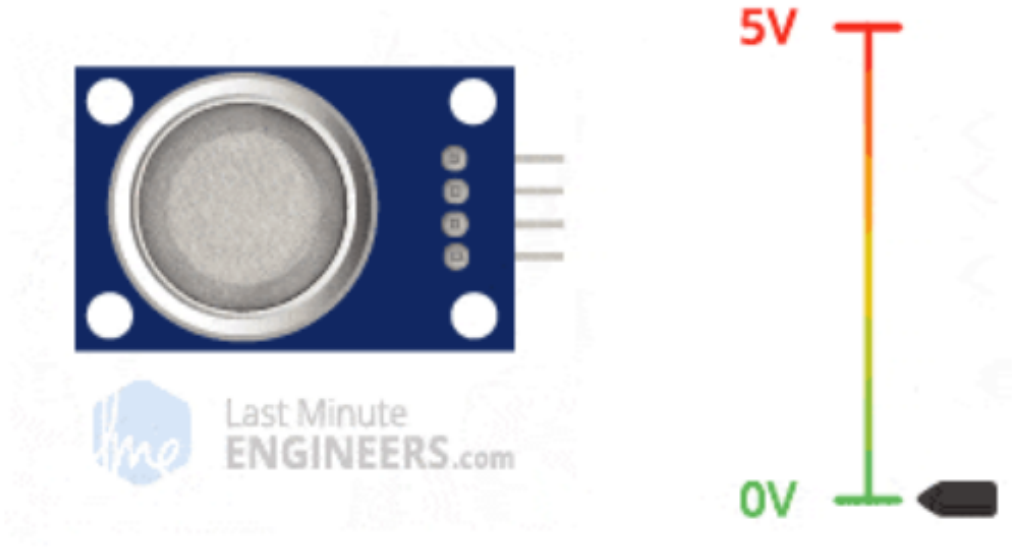

FIGURE 4.2: **The Alcohol Sensor output voltage of clean air.** (Source :Last Minute Engineers.com)

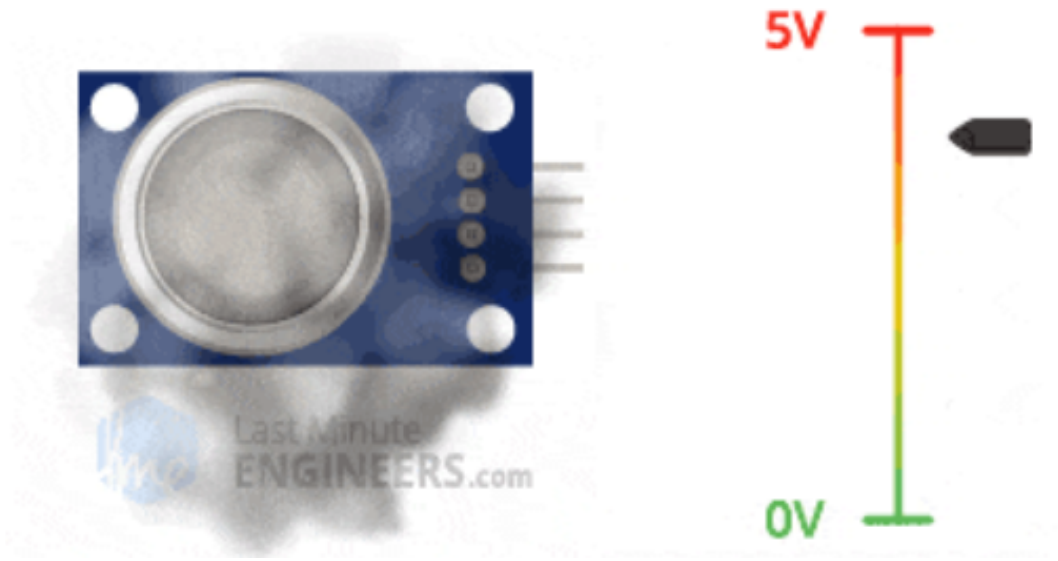

FIGURE 4.3: **The Alcohol Sensor output voltage of smoke.** (Source :Last Minute Engineers.com)

4.2 LIGHT BEAM DETECTION

An LDR is a component whose resistance varies depending on the amount of light it receives. They may now be employed in light sensor circuits as a result of this.

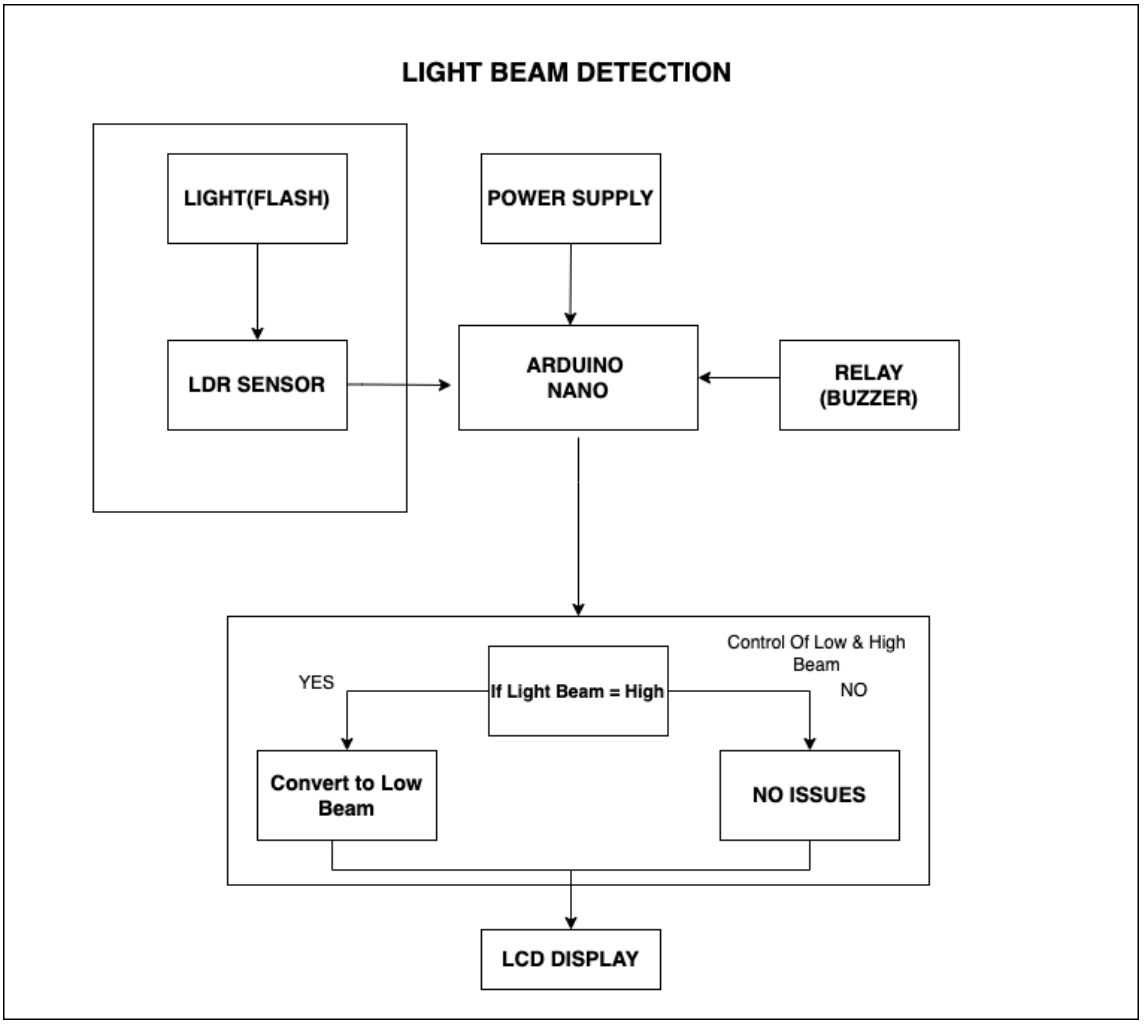

FIGURE 4.4: **Light Beam Detection**

It's used to enhance incoming vehicles' beams. High and low lights are applied based on this sensor to ensure a good view of the road. An LDR's operating principle is photo conductivity, which is nothing more than an optical phenomenon.

FIGURE 4.5: **Light's Low beam and High beam**

The conductivity of a substance improves when photons are absorbed by it. The particles in the valence band of the material rush to the valence band when light is shining on the LDR.

4.3 SIGN BOARD DETECTION

The two major components of an RFID or Radio Frequency Identification system are a transponder/tag fastened to an item to be identified and a transceiver, also known as an interrogator/reader.

A radio frequency component and an antenna produce a high-frequency magnetic waves in a reader. The tag, on either hand, is often a passive device, meaning it lacks a battery. It instead features a CPU for data storage and processing, as well as an antenna for collecting and delivering signals.

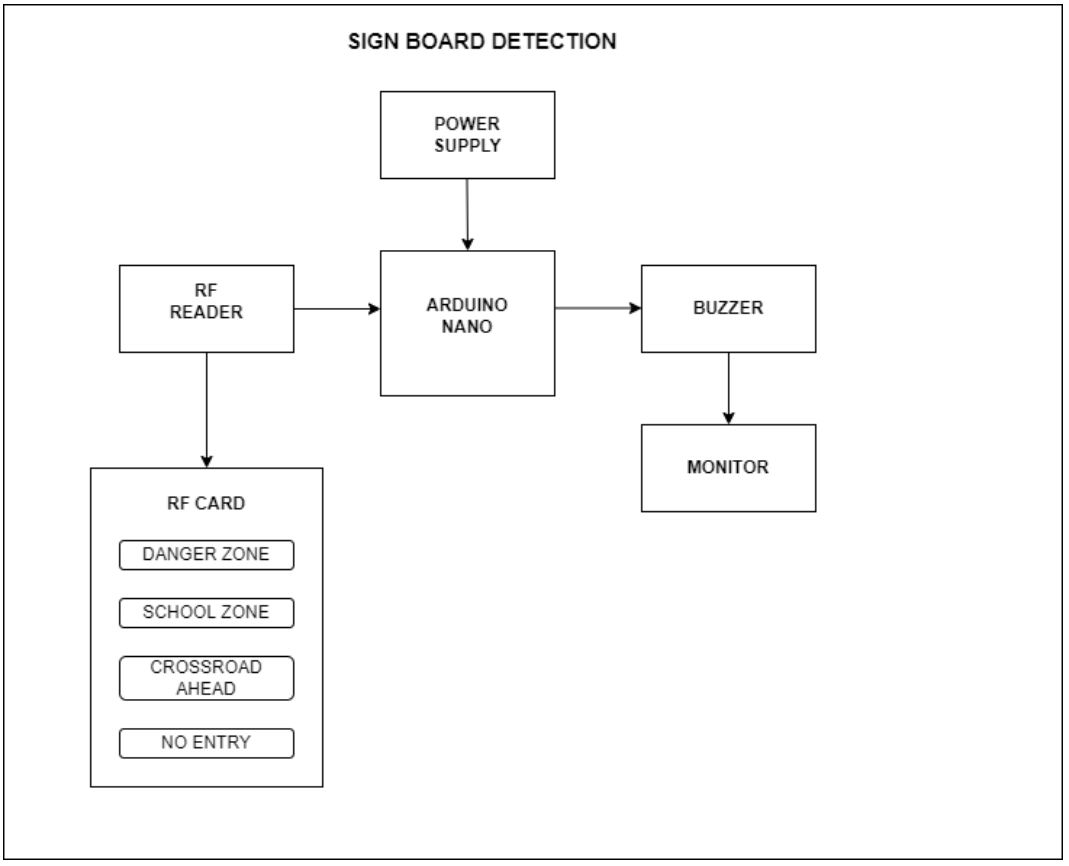

FIGURE 4.6: **Sign board Detection**

FIGURE 4.7: **Accident Zone**

To understand the text encoded on a tag, it must be placed close to the Reader. An electromagnetic field is created by a reader, which allows electrons to pass through the tag's antenna, powering the chip. The tag's powered chip sends the response

FIGURE 4.8: **School Zone**

second radio transmission to the reader, this time with the stored data.

4.4 DROWSINESS DETECTION USING OPENCV

The designed system works in 3 stages:

1. Image Processing

2. Drowsiness Detection

3. Alert Generation

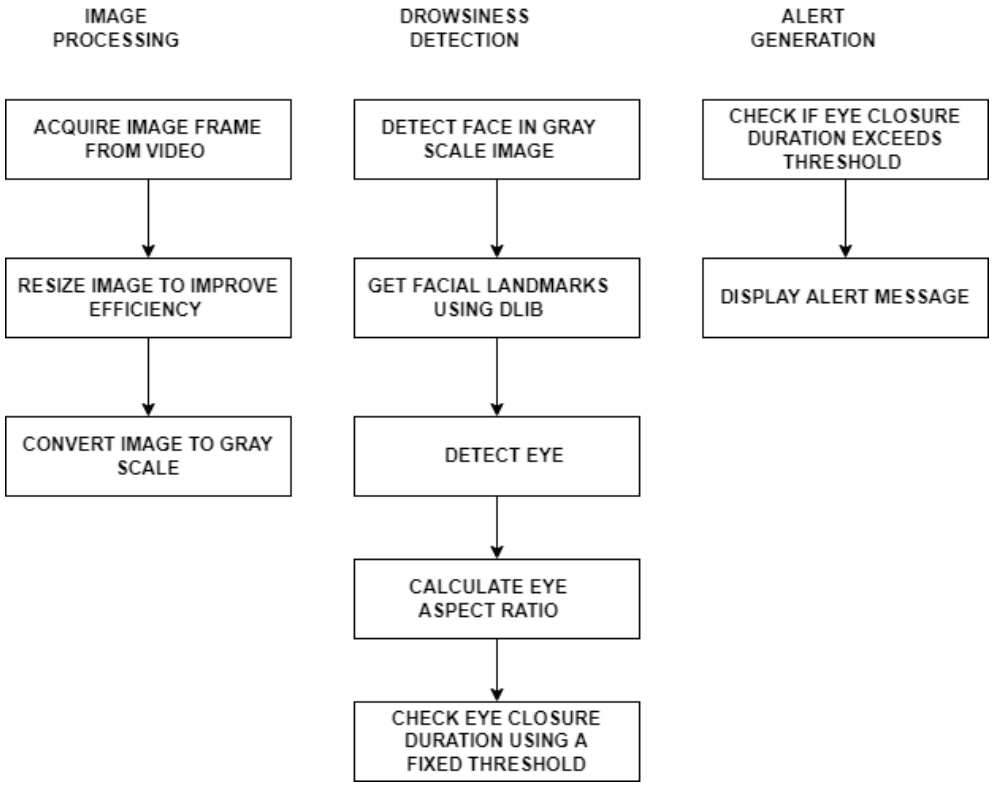

FIGURE 4.9: **Drowsiness Detection - Algorithm**

4.4.1 Image Processing

Pre-processing of the picture is done in Image Processing. The camera transmits a live video recording. After that, the visuals from the video are extracted. The number of frames to be taken per second is limited by a defined threshold.

We tried with a set of parameters to fix the amount of frames in this thesis. We discovered that when the number of frames per second increases, the processing speed decreases. Because we need to analyse a significant number of photographs and compare them for sleepy detection when the frame rate is high, we need to handle a huge number of images. The use of a high number of frames provides exceptional precision but slows down the operation. With fewer frames per second, accuracy suffers, but processing speed improves. As a result, we must choose an ideal value; in our instance, 10 frames per second appears to be both accurate and

speedy. The following step is to minimise the image's size. For face detection,

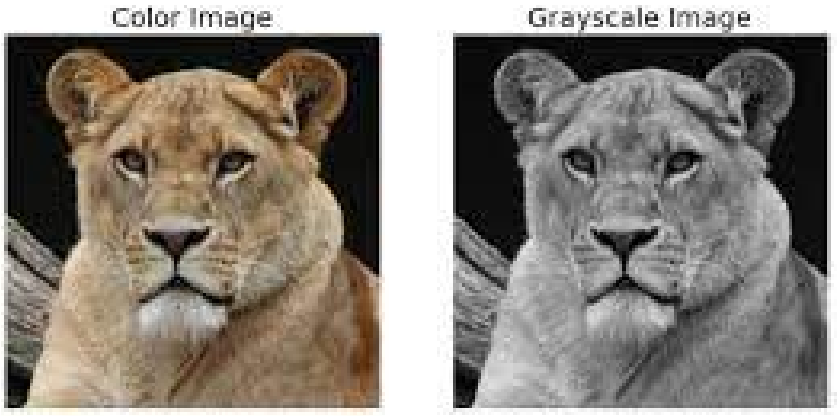

FIGURE 4.10: **Original Image vs Gray scale Image**

our system employs the Haar Cascade algorithm. When the image size is huge, a broad region must be searched for face detection, which takes longer. As a result, the image must be scaled.

Converting the enlarged image to grey scale is the final stage of pre-processing. Face detection is improved and the procedure is sped up when using a grayscale image.

4.4.2 Drowsiness Detection

The flowchart of the designed system is represented in Figure 4.11. THr refers to a fixed threshold. The main steps involved in detection of drowsiness are Face detection , Eye localization , Eye Closure Duration.

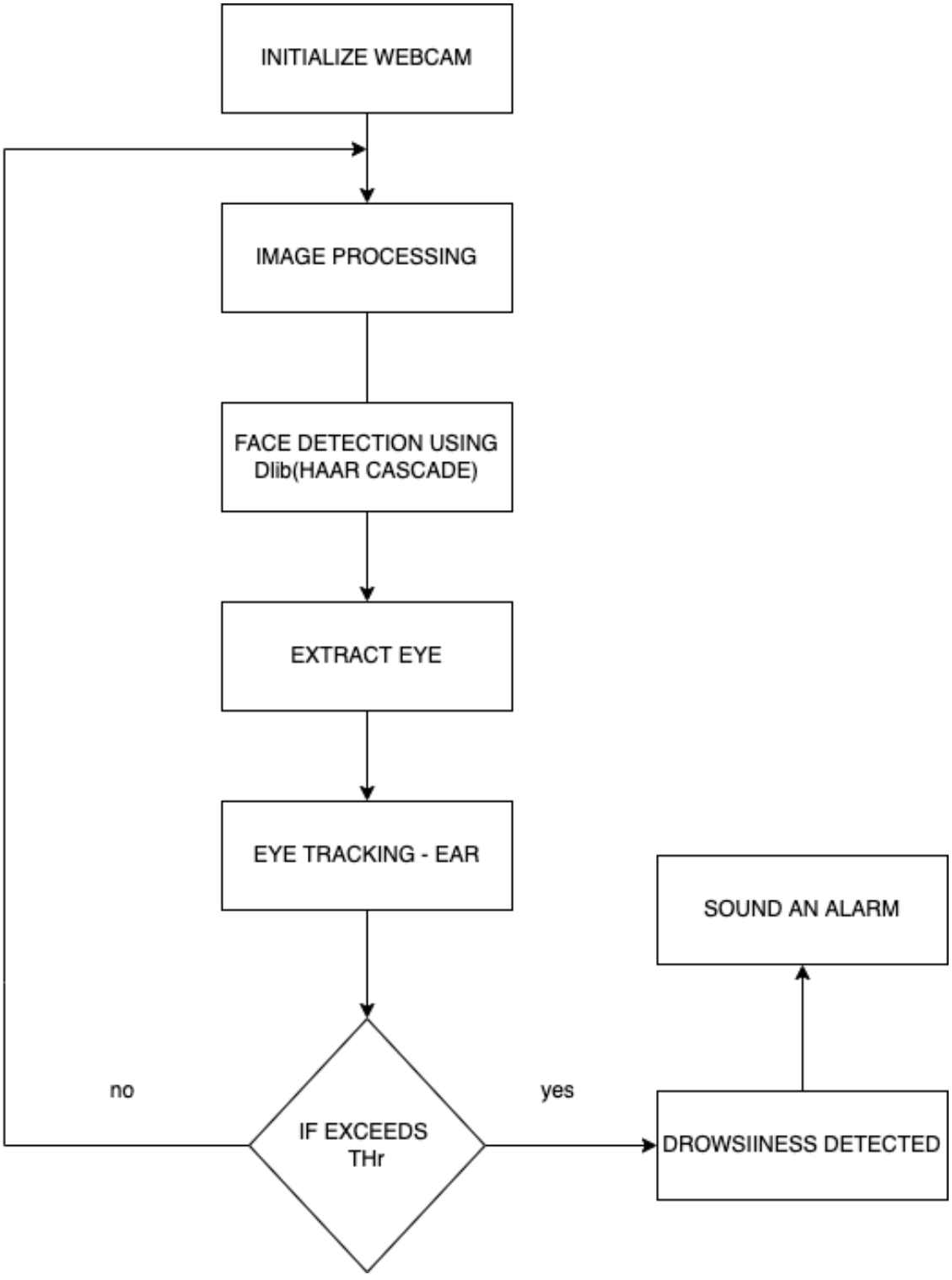

FIGURE 4.11: **Drowsiness Detection - flowchart**

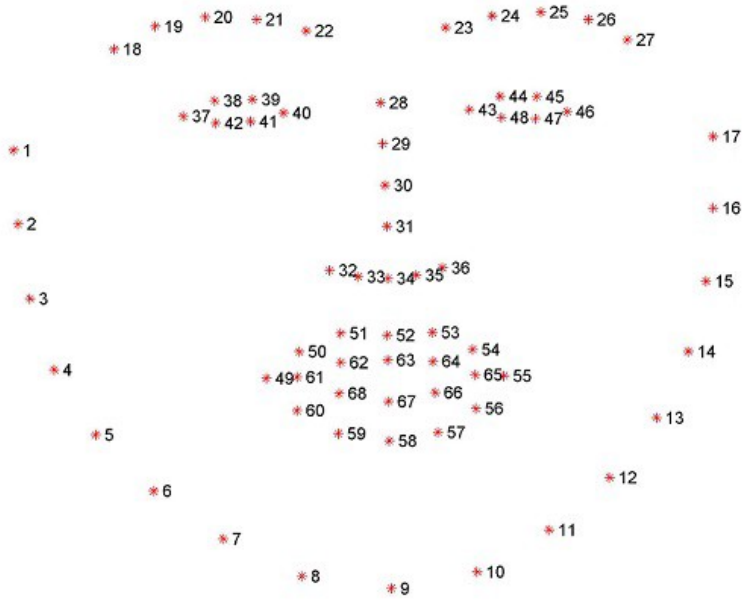

FIGURE 4.12: **Dlib Facial landmarks**

4.4.2.1 Eye Localization - Dlib

The problem of face region detection is a subset of the problem of form prediction. Given an input image, a shape predictor attempts to locate significant places of interest along a form (and typically a ROI that describes the item of interest). Inside the context of facial landmarks, our goal is to uncover key facial characteristics on the face using shape prediction algorithms. As a result, identifying facial landmarks requires two steps. The initial stage is to find the face in the image, then recognise the important facial structures on the face ROI.

As a training set, this method starts with a set of identifiable face landmarks on an image. The specific (x,y) coordinates of regions surrounding each facial component have been given in these photographs. After that, the probability of a pair of input features being separated is calculated.

4.4.2.2 Eye Closure Duration

Unlike previous image processing methods for determining eye closure length, which often combine Eye localization or Threshold to identify the whites of the eyes or Deciding if the white area of the eyes vanishes for a period of time, this new approach does not require any of these stages (indicating a blink).

The eye aspect ratio, on the other hand, is a significantly more elegant technique that uses a very simple calculation based on the ratio of distances between the eyes' facial landmarks. This method for detecting eye blinks is rapid, simple, and effective. Using the facial landmark detector, we can pinpoint critical areas of the face.

The lips, eyes, brows, nose, and ears are all included. This also implies that we may extract specific facial structures by understanding the indexes of a certain face. Only the eyes are taken into account while detecting blinks. Each eye is symbolized by 6 (x, y) coordinates, beginning at the left-corner and working clockwise around the remainder of the region.

The Eqn. 4.1 displays the equation for the Eye aspect ratio.

$$EAR = (||P2 - P6|| + ||P3 - P5||)/2(||P1 - P4||) \tag{4.1}$$

Because there is only one set of horizontal points but two sets of vertical points, the distance among eye movement landmarks is calculated in the integrand of Equation 4.1, while the spacing between horizontal eye landmarks is computed in the divisor, with the denominator weighted appropriately.

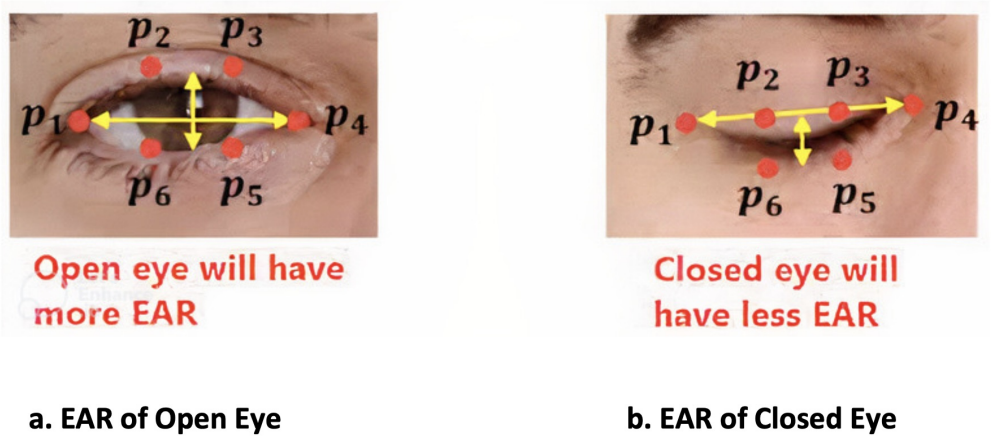

FIGURE 4.13: **Eye Aspect Ratio**

The eye aspect ratio remains generally constant when the eye is open, but rapidly drops as the eye blinks, as shown by equation 4.1. We can ignore image processing techniques and rely just on the ratio of eye landmark distances to determine whether or not a person is blinking.

4.4.3 Alert Generation

The length of time when the eyes are closed is measured. For eye closure ratio, a certain threshold value has been set. The eye is deemed closed if the aspect ratio is less than the threshold value. The driver is regarded to be sleepy if his or her eye is closed for a specified number of frames, such as five. To wake up the drowsy motorist, an alarm is produced. For mouth aspect ratio, there is also a threshold. The motorist is regarded to be yawning if his or her mouth aspect ratio exceeds the threshold number. For a specific time interval, another threshold value for yawn frequency is established. The motorist may be considered sleepy if the

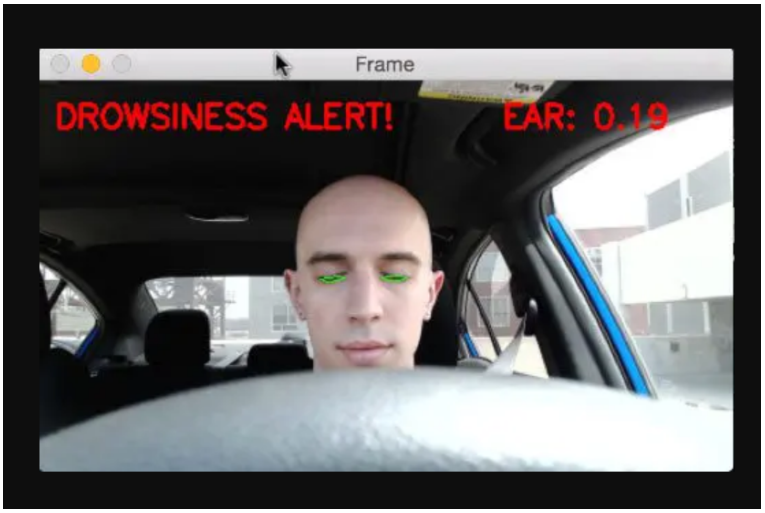

FIGURE 4.14: **Drowsiness Detection - alert**

frequency of his or her yawns surpasses that threshold value. To notify the driver of sleepiness, an alarm is sent out.

4.5 ACCIDENT DETECTION USING VIBRATION SENSOR

A vibration sensor is used to detect an accident. The emergency facility will be effectively utilised during traffic accidents using this way. There are three pins on the vibration sensor. On the right, we have Vcc. 5 volts will be connected somewhere. In the centre, we have GND, which is the same ground as the Arduino Uno. Then there will be a digital output that will provide a signal indicating whether or not vibration is being sensed, with a high or, in this example, a voltage equal to VCC indicating vibration and a low or zero indicating no vibration.

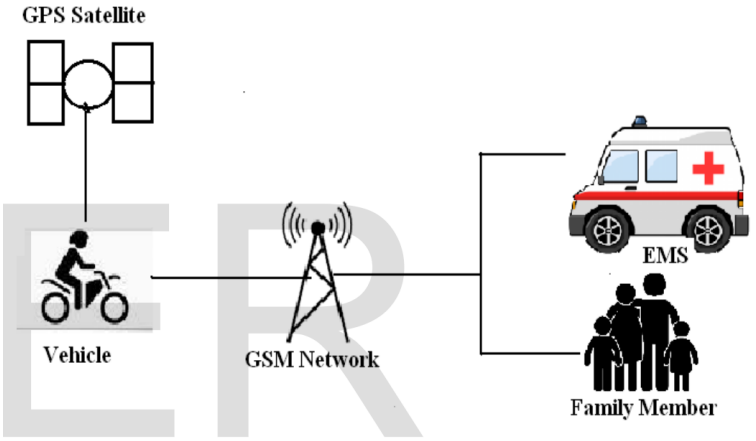

FIGURE 4.15: **Accident Detection**

If we need to change the vibration sensitivity, we must use the built-in potentiometer to select whether we want to be more or less sensitive to vibration.

CHAPTER 5

OUTCOMES AND RESULTS

The engine will automatically stop if the driver's breath alcohol concentration exceeds a specified threshold, and the car will only start if the sensor does not report the maximum alcohol amount. It employs an LDR sensor to detect a vehicle's high beam and lower it to a low beam for driver safety. Only when both methods are used does this strategy yield a success rate. The relay, as well as the power supply, beeps throughout this process, indicating that a high alcohol concentration or strong spark has been detected. In order to identify a signboard, we must first read input from an RF card using an RF Reader, after which distinct zones will be identified and presented on the monitor.We use a webcam to capture real-time videos in order to detect drowsiness.The videos are processed with OpenCV.This is where the real-time videos are processed. If a person's ocular movement is not identified for 5 seconds or longer in the data provided, an alert/warning message will be sent.

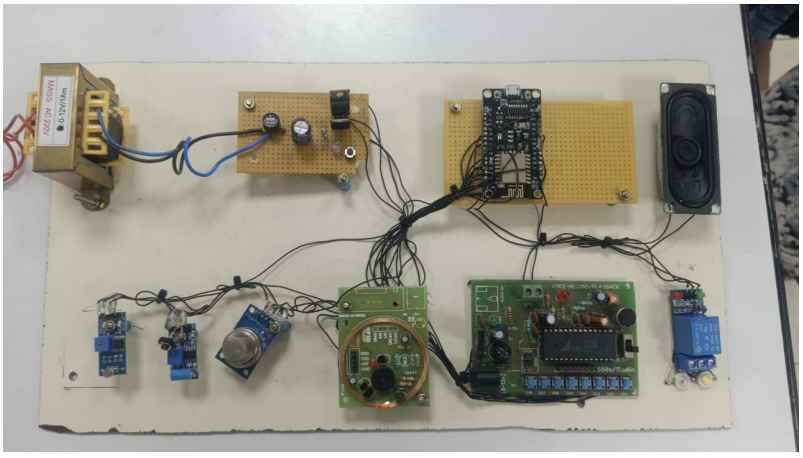

FIGURE 5.1: **DEVELOPED DRIVER ASSISTANCE SYSTEM**

The complete driver assistance system is shown in Figure 5.1.

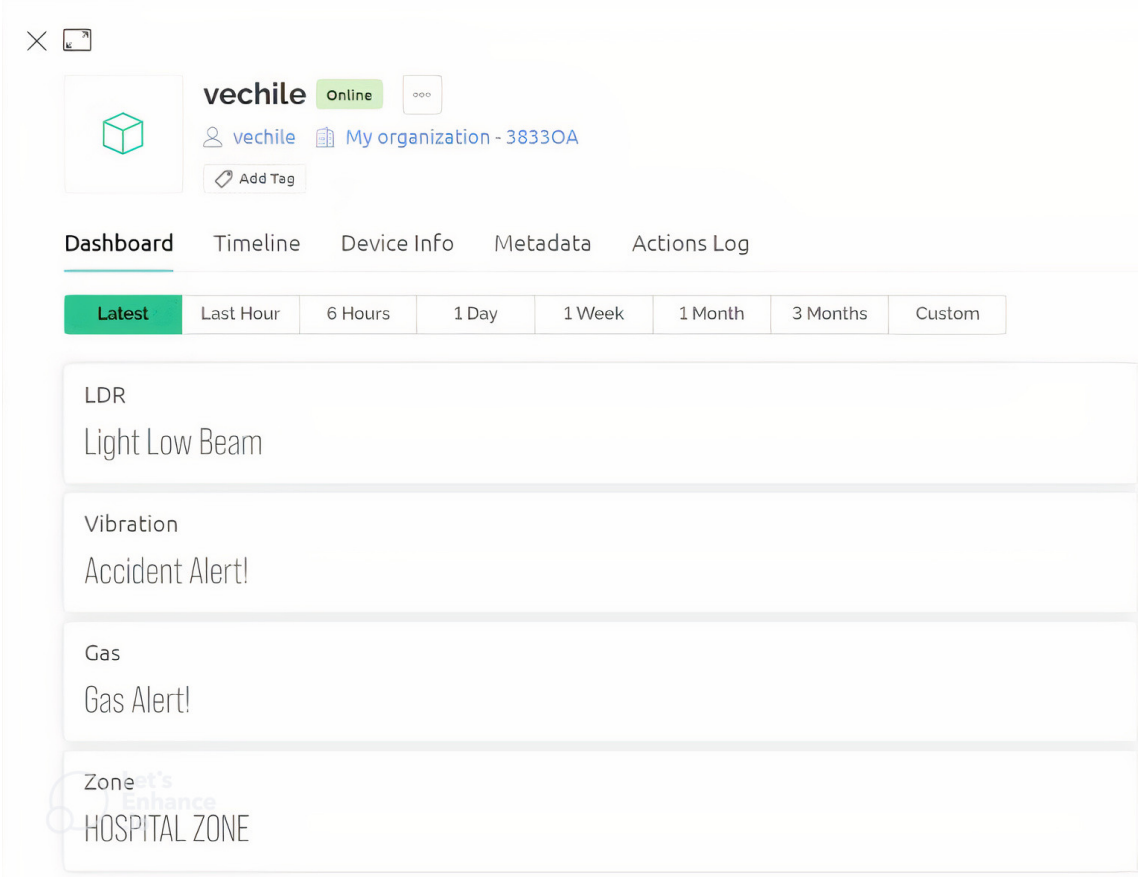

FIGURE 5.2: **OUTPUT - ALCOHOL IS DETECTED**

Using MQ2 Sensor Alcohol is detected.If the threshold value exceeds from a certain level, the ignition will switch off.

LDR Sensor used to control and detect the light beams.If high beam is detected from the opposite vehicle then our vehicle will automatically turn to low beam.

Vibration Sensor is used to detect the accident occur on the road sides.

As shown in Figure 5.9 drowsiness is detected when person's eye is closed for 5 consecutive seconds. Drowsy is displayed when the driver's eye remains closed in for more than 7 consecutive frames.

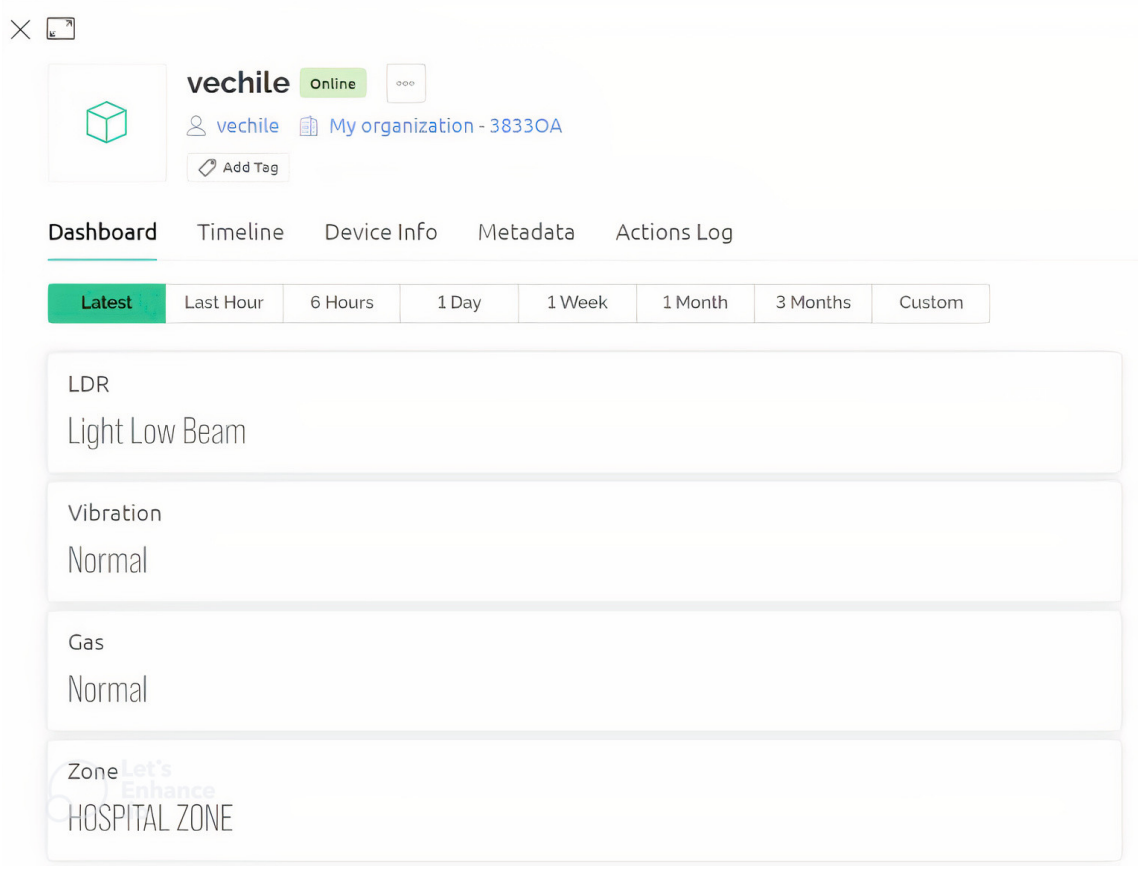

FIGURE 5.3: **OUTPUT - LOW BEAM IS DETECTED**

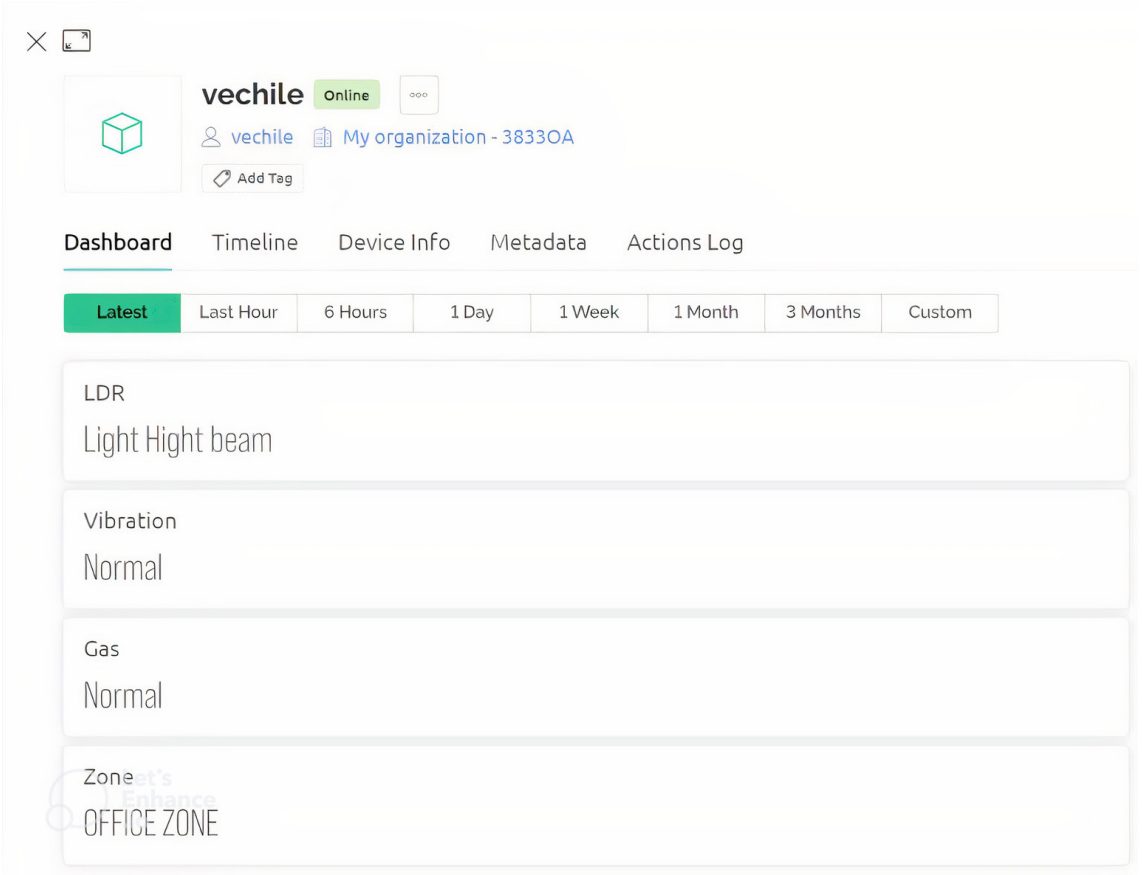

FIGURE 5.4: **OUTPUT - OFFICE ZONE IS DETECTED**

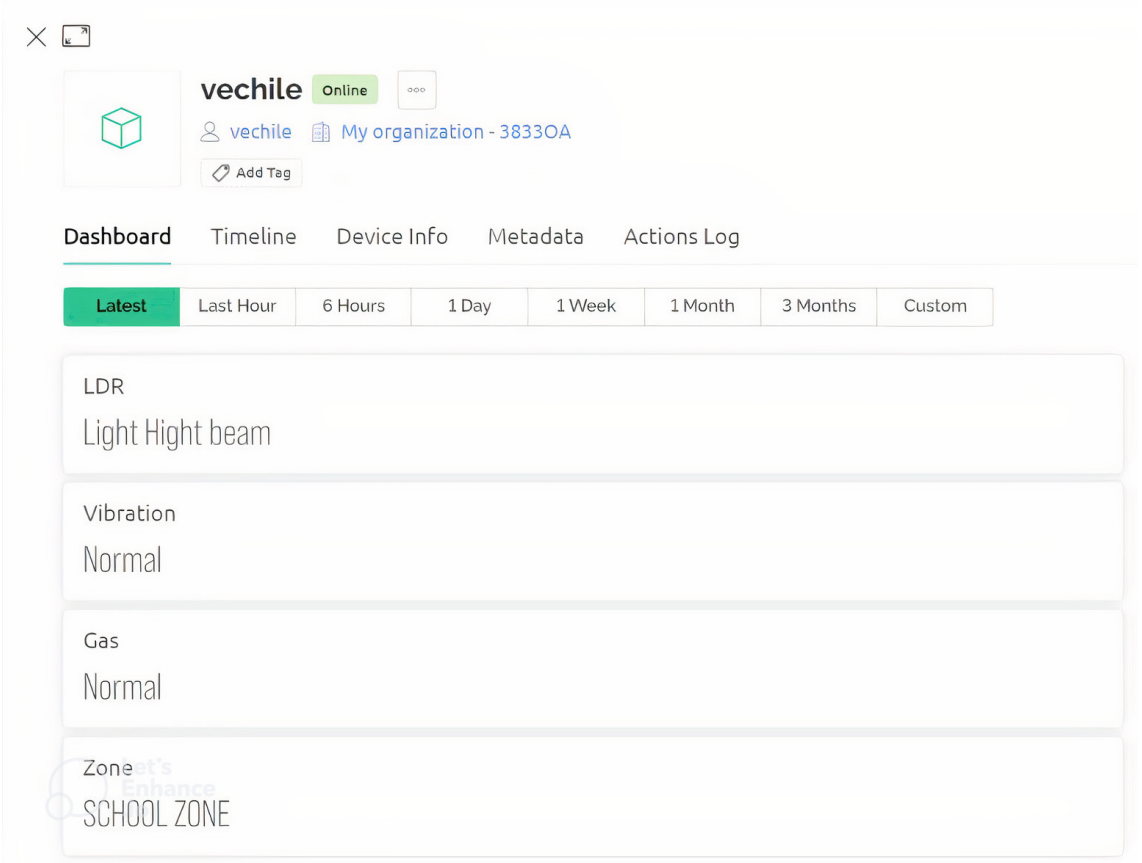

FIGURE 5.5: **OUTPUT - SCHOOL ZONE IS DETECTED**

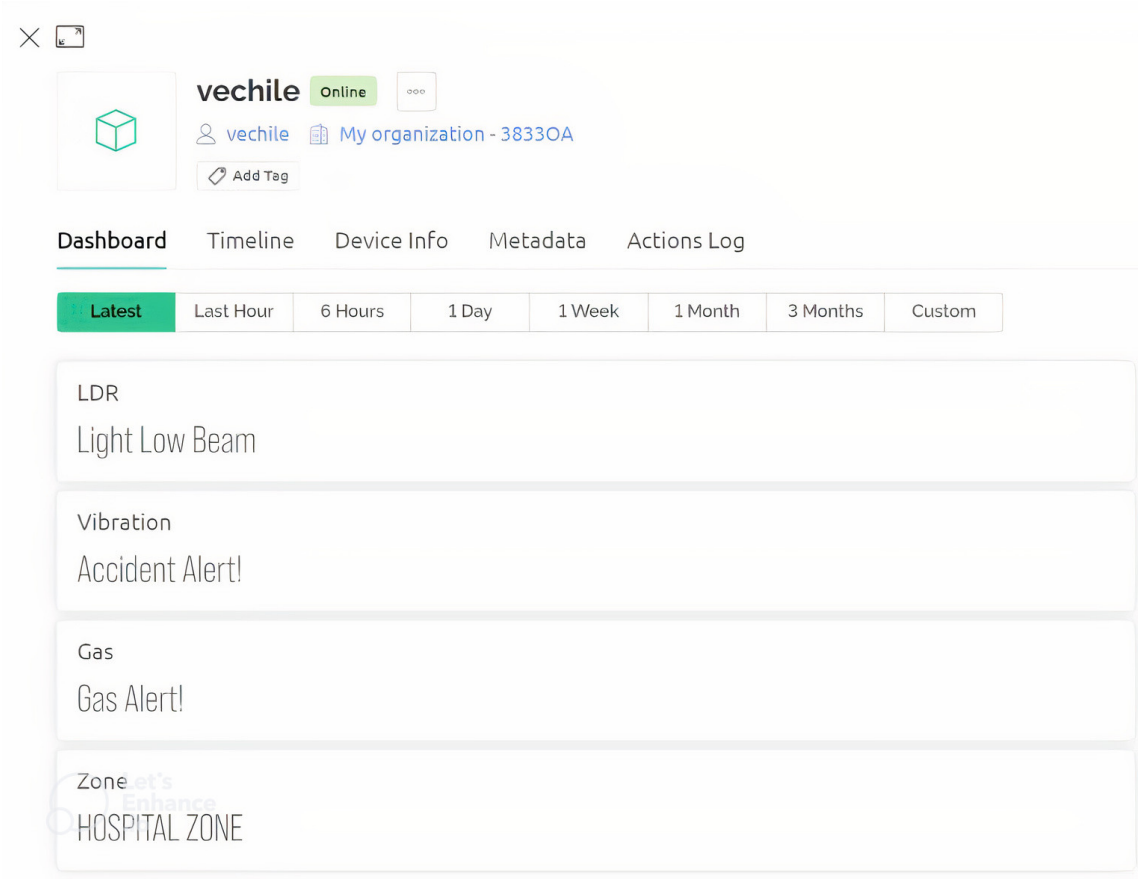

FIGURE 5.6: **OUTPUT - HOSPITAL ZONE IS DETECTED**

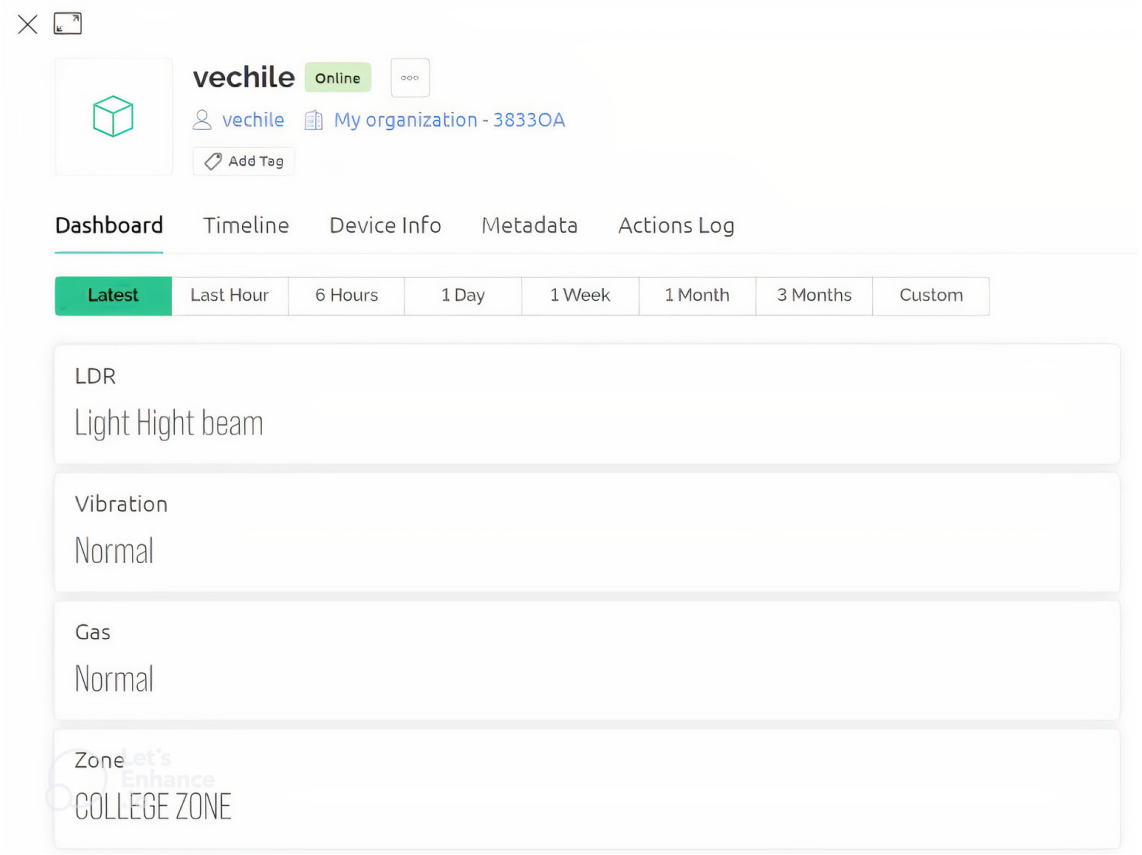

FIGURE 5.7: **OUTPUT - COLLEGE ZONE IS DETECTED**

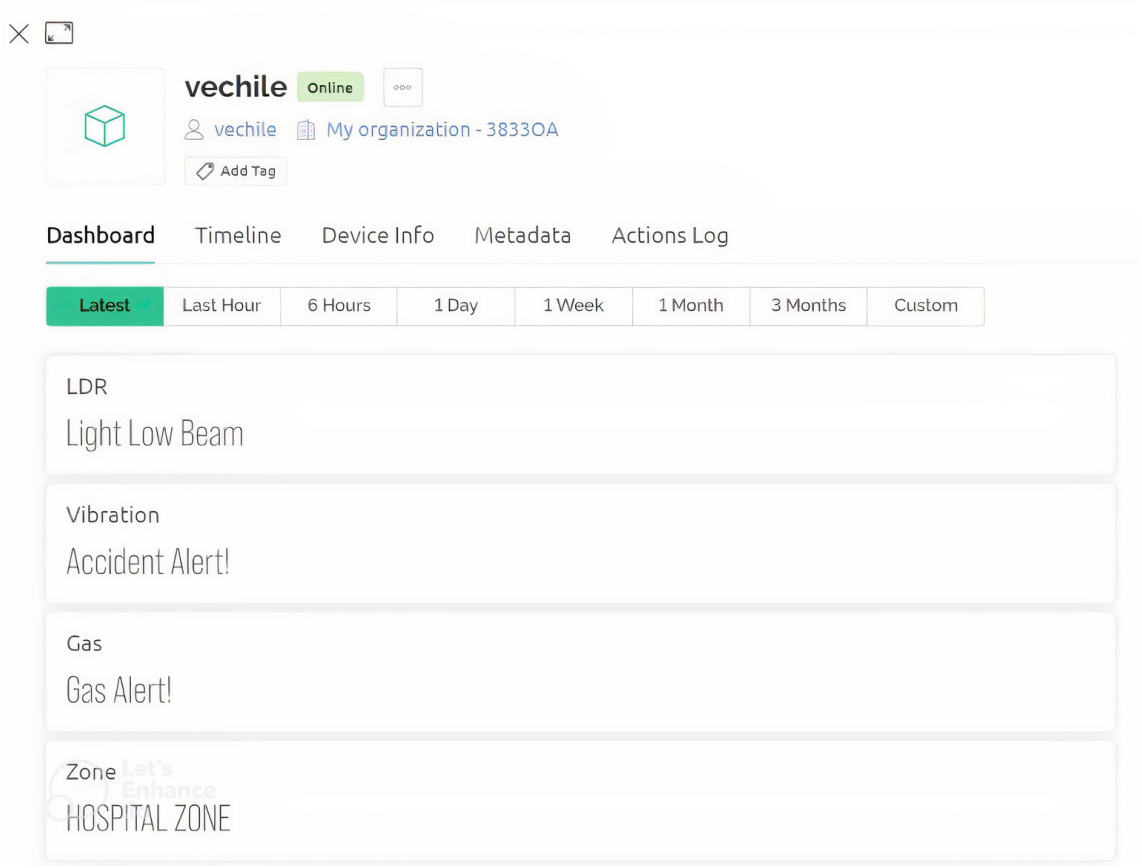

FIGURE 5.8: **OUTPUT - ACCIDENT IS DETECTED**

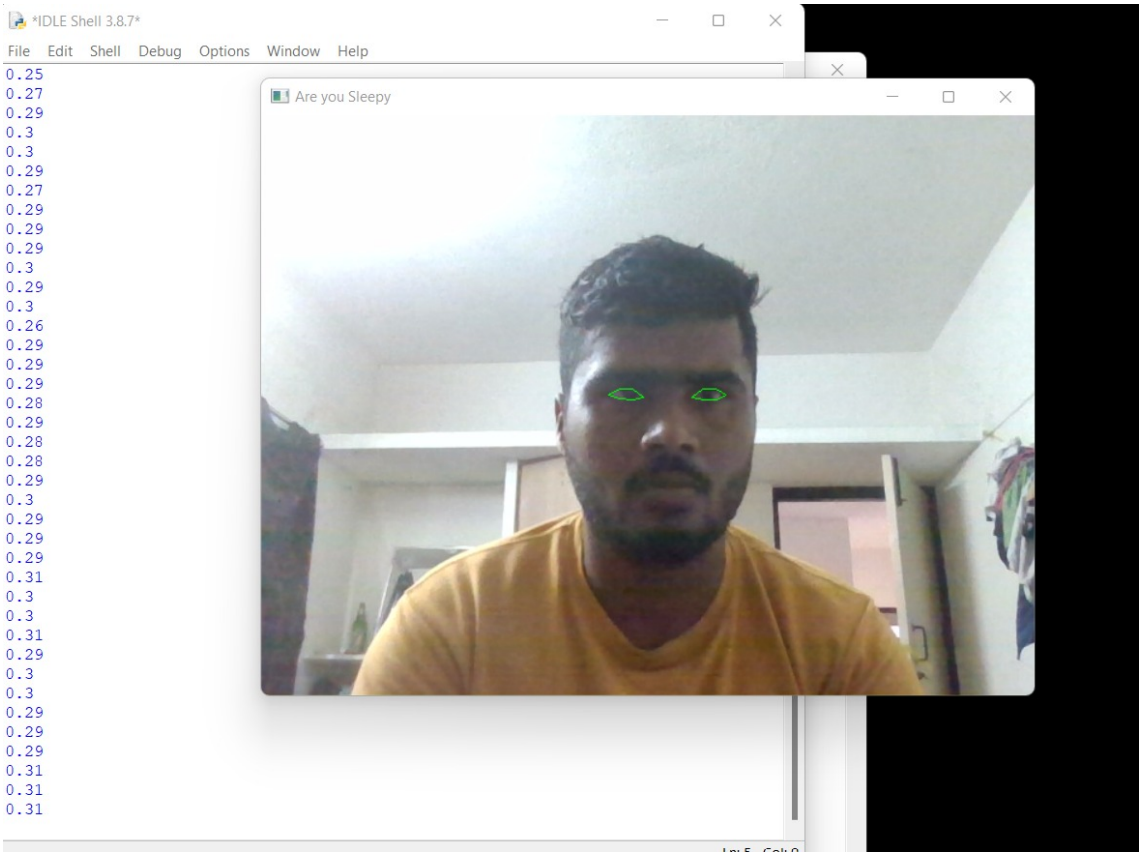

FIGURE 5.9: **OUTPUT - DROWSINESS DETECTION**

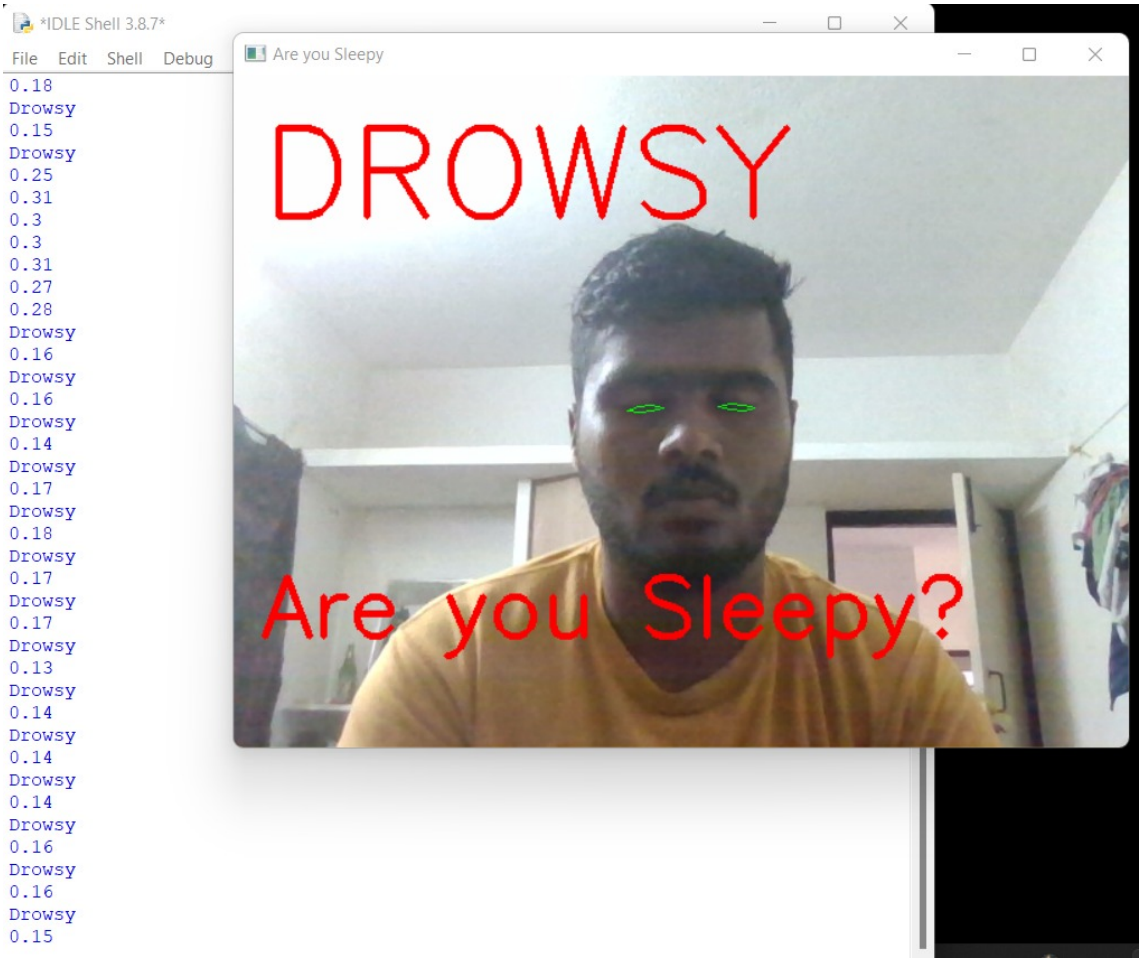

FIGURE 5.10: **OUTPUT - DRIVER DROWSINESS IS DETECTED**

CHAPTER 6

CONCLUSIONS AND FUTURE WORK

6.1 CONCLUSION

This study employs a well-thought-out strategy for identifying drunk driving. It is possible to accomplish safe automotive driving as well as a reduction in the frequency of accidents caused by alcohol by employing this design. This technique can be utilised to minimise intoxicated drivers and accidents caused by drunken driving. The government must enact laws requiring such circuits to be installed in every car, as well as regulations requiring that such devices be pre-installed when the vehicle is manufactured.

Because the LDR sensor's working model is so small, it may be connected to or fitted to current automobiles. Because the model is so basic, it may be readily fixed or changed in cars. The sensors are readily available for easy replacement and come at a modest cost.

Driver Assistance Systems and other modern technologies rely on the notion of detection and identification of road signs and written text instructions from road signboards to guarantee a safe ride. Various environmental factors such as weather, changing lighting conditions, and partially visible signboards make determining the meaning and purpose of road signs challenging.

We've also created a sleepy driver warning system that may be used in a variety of ways. Using a haar cascade classifier, we utilized OpenCV to recognize faces

and eyes. This system will be further developed and enhanced to incorporate other safety features, such as limiting the number of persons who may access or drive the vehicle.

In this project, we developed and implemented an Intelligence System to prevent accidents. To keep the vehicle in question safe from collisions with other cars. The deployment of a vehicle tracking system enhances fleet management, resulting in higher profits. In both personal and business scenarios, vehicle tracking improves security and safety, communication channels, performance monitoring, and productivity. As a reason, it will become increasingly important in our daily life in the next years.

6.2 FUTURE SCOPE

The accident alert and detection initiative's main purpose is to limit the number of individuals who die in accidents that cannot be avoided. Paramedics are summoned to the scene of an accident to enhance the chances of survival. This auto tracking and accident alert function may play a greater role in daily life in the future. Future possibilities for this sort of device might include securely landing an automobile aside without disturbing other vehicles.

We want to create an implementation of the key causes of accidents as part of our future work and to prevent them to the greatest extent possible using the approach we suggested.

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