A PROJECT REPORT ON

Driver Drowsiness Detection System

(DDDS)

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UNDER THE GUIDANCE OF

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SUBMITTED TO

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2023-2024

DEPARTMENT OF INFORMATION TECHNOLOGY

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Certificate

This is to certify that the project entitled, **" Driver Drowsiness Detection System "** , is bonafied work of **Gautam Sanjay Gupta** bearing **Seat.No: _____** submitted in fulfillment of the requirements for the award of degree of **BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai.**

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ABSTRACT

A **Driver Drowsiness Detection System** is designed to monitor a vehicle's driver to detect signs of drowsiness or sleepiness. Here's an abstract outlining its key components and functionality:

The Driver Drowsiness and Sleeping Detection System (DDDS) is an advanced safety technology aimed at reducing the risk of accidents caused by driver fatigue. This system employs a combination of sensors, image processing, and machine learning to continuously monitor the driver's condition during operation. The primary objective is to identify early signs of drowsiness or sleepiness and promptly alert the driver to prevent accidents.

Key Components:

. Camera-Based Monitoring: The system utilizes one or more cameras placed within the vehicle to capture real-time images of the driver's face.

. Alert Mechanisms: When the system detects signs of drowsiness or sleepiness, it activates alert mechanisms. These can include audible alarms, seat vibrations, visual warnings on the dashboard, or even automated slowing down of the vehicle.

Benefits:

- Accident Prevention: The primary benefit is the prevention of accidents caused by drowsy driving, which can be especially dangerous during long trips or night driving.

- Enhanced Safety: By continuously monitoring the driver's condition, the system promotes safer driving practices.

The Driver Drowsiness and Sleeping Detection System is a crucial component of modern vehicle safety systems, helping to mitigate the risks associated with driver fatigue and drowsiness, thereby saving lives and reducing accidents on the road.

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to all those who have been instrumental in the realization of the **Driver Drowsiness & Sleeping Detection System project**. This venture would not have been possible without the unwavering support, guidance, and contributions from various sources

We would like to express our deep gratitude to our honourable Principal **Dr. Pushpinder G. Bhatia** for giving us an opportunity to study and pursue a career in Information Technology.

I would like to express my appreciation to our head of department and my project Guide **Ms. Harpreet Kaur** for her valuable andconstructive suggestion during planning of this project work. A special thanks to all our professors of Information Technology For their valuable advice atevery stage of work. Also, we are Extending our thanks to lab assistants and admin for theirseemingly Small but valuable help for timely Internet Access and lab Access.Our goal is to contribute to safer roads and reduce accidents caused by driver drowsiness.

This project represents the collaborative effort and dedication of many, and we are profoundly thankful for the contributions and support provided by each individual and organization mentioned above.

Declaration

I am **Gautam Gupta**, hereby declare that the work presented in the project titled **"Driver Drowsiness & Sleeping Detection System"** is entirely my own original work, except where explicitly stated otherwise. This project was undertaken in fulfillment of the requirements for **GURU NANAK COLLEGE.**

The project done in partial fulfillment of the requirement for the award of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be subunitted final semester project as a part of our curriculum.

Name and Signature of the student

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CHAPTER 1 :- INTRODUCTION

1.1 BACKGROUND

A Driver Drowsiness and Sleeping Detection System is a technology designed to help keep drivers alert and safe while they are operating a vehicle. It works by monitoring the driver's behavior and alerting them if it detects signs of drowsiness or sleepiness.

Here's how it works:

Cameras or sensors inside the vehicle track the driver's facial expressions, eye movements, and head position.

The system analyzes these data to identify signs of drowsiness, such as frequent blinking, nodding off, or closing one's eyes for extended periods.

If the system detects these signs, it can sound an alarm, vibrate the steering wheel, or display a warning message on the dashboard to alert the driver.

Some advanced systems may also take actions like slowing down the vehicle, pulling over to the side of the road, or notifying authorities in extreme cases.

The system analyzes these signals in real-time and triggers alerts, such as sound alarms or seat vibrations, to alert the driver when signs of drowsiness are detected, potentially saving lives on the road.

The goal of this system is to prevent accidents caused by tired or drowsy drivers by providing timely warnings or assistance to keep them awake and attentive on the road. It's a valuable safety feature in modern vehicles.

The background of Driver Drowsiness and Sleeping Detection Systems is all about using technology to prevent tired drivers from causing accidents.

It started with researchers studying how being sleepy affects driving. They realized that sleepy drivers make mistakes and cause crashes.

The development of Driver Drowsiness Detection Systems aims to improve road safety by alerting drivers when they are at risk of falling asleep at the wheel, thereby reducing the occurrence of accidents and saving lives. These systems use cameras and sensors to see if the driver looks tired, like if they're blinking a lot.

1.2 OBJECTIVE

The objective of a Driver Drowsiness Detection System is to keep drivers safe by alerting them when they are getting too sleepy while driving, helping prevent accidents caused by drowsy driving. The goal of a Driver Drowsiness Detection System is to keep drivers safe by when they're getting too tired while driving. It works by using special sensors to notice signs of drowsiness, like blinking or nodding off, and then alerts the driver to take a break or rest. The objective is to prevent accidents caused by sleepy driving, making the roads safer for everyone.

These systems aim to achieve the main goal of a Driver Drowsiness and Sleeping Detection System is to keep people safe while driving by preventing accidents caused by tired or drowsy drivers.

Watch the driver to see if they're getting too sleepy.

Alert the driver if it thinks they're falling asleep.

Stop accidents by making the driver more awake and aware.

1. Early Detection of Drowsiness:

The system aims to detect signs of drowsiness in drivers as early as possible to prevent potential accidents before they occur.

This involves monitoring various indicators such as eyelid movement, facial expressions, head movements, and steering behavior to identify patterns associated with drowsiness.

2. Accurate Detection:

This requires the development of robust algorithms that can reliably distinguish between genuine drowsiness indicators and other factors that may mimic drowsy behavior.

3.Real-time Monitoring:

The system operates in real-time, continuously monitoring the driver's behavior and physiological signals to detect changes indicative of drowsiness.

It provides timely alerts to the driver when signs of drowsiness are detected, allowing for immediate intervention to prevent potential accidents.

In summary, the objective of these systems is to use technology to prevent accidents caused by tired drivers and make roads safer for everyone.

1.3 Purpose, Scope, And Applicability

1.3.1 PURPOSE

The purpose of a Driver Drowsiness and Sleeping Detection System is to make sure drivers stay awake and alert while driving so that they don't have accidents because they're too tired. It's like a safety helper in the car that watches over the driver and wakes them up if they start getting too sleepy, keeping everyone safe on the road.

The purpose of a Driver Drowsiness and Sleeping Detection System is to prevent accidents by ensuring that drivers stay awake and alert while driving. This system uses technology to monitor the driver and provide warnings or assistance if signs of drowsiness or sleepiness are detected. Its main goal is to enhance road safety and reduce the risk of accidents caused by tired drivers.

●Alerting them when they're getting too sleepy while driving.

●Helping prevent accidents caused by drowsy driving.

●Overall, it's about enhancing road safety and saving lives.

1.3.2 SCOPE

The scope of a Driver Drowsiness and Sleeping Detection System involves its application in vehicles to ensure driver safety by detecting and addressing drowsiness-related risks.

The scope of a Driver Drowsiness and Sleeping Detection System is all about where and how it can be used to keep drivers safe. It's typically used in cars, trucks, and other vehicles to watch over the driver and prevent accidents caused by sleepiness. Its "scope" means it's meant for use on the road to make sure drivers stay awake and alert while driving.

●Monitoring drivers for signs of drowsiness.

●Alerting drivers when they're getting too sleepy.

●Helping prevent accidents caused by drowsy driving.

●Overall, it's about keeping drivers safe on the road.

1.3.3 APPLICABILITY

The applicability of a Driver Drowsiness and Sleeping Detection System is about where it can be used and how it helps. It's like figuring out where your safety alarm clock can be used. These systems help prevent accidents and delays by alerting drivers when they show signs of drowsiness, allowing for timely intervention and mitigation of risks.

In simple terms, it's used in vehicles like cars, trucks, and buses to make sure the driver doesn't fall asleep while driving. It's like a guardian angel for drivers on the road, helping them stay awake and avoid accidents caused by sleepiness.

The applicability of a Driver Drowsiness and Sleeping Detection System refers to where and how it can be used effectively.

●**Passenger Vehicles:** They are commonly used in cars and other personal vehicles to enhance the safety of individual drivers these systems provide an additional layer of protection for drivers and passengers.

Private car owners can install Driver Drowsiness Detection Systems to enhance their safety during long drives or late-night journeys.

●**Commercial Vehicles:** These systems find application in trucks, buses, and other commercial vehicles, especially important for professional drivers covering long distances.

●**Public Transportation:** Some versions can be employed in public transportation, such as buses and trains, to ensure the safety of passengers.

These systems help ensure that public transportation drivers remain alert and attentive throughout their shifts, minimizing the risk of accidents due to driver.

●**Emergency Response Vehicles:** Emergency response organizations, such as police, fire, and medical services, can deploy Driver Drowsiness Detection Systems in their vehicles to ensure the safety of first responders.

These systems help maintain the vigilance and responsiveness of emergency personnel during critical operations, reducing the likelihood of accidents en route to incidents.

The applicability of these systems is widespread, with the primary aim of reducing accidents caused by drowsy or fatigued drivers in various vehicle types and settings.

CHAPTER 2: - SYSTEM AND ANALYSIS

2.1 Problem Definition:

The problem definition of a "Driver Drowsiness and Sleep Detection System" is to create a technology that can recognize when a person operating a vehicle is becoming drowsy or falling asleep while driving. This system aims to identify signs and also We want to create a system that can tell when a driver is getting too drowsy to drive safely, and then alert them to stay awake and focused on the road. This helps keep everyone and issue alerts to the driver to prevent accidents and ensure road safety.

Driver Drowsiness Detection System involves understanding the specific challenges and objectives associated with addressing drowsy driving to guide the development of an effective solution **:**

●**Identifying the Problem:** Sometimes drivers get really tired while driving, which can lead to accidents because they can't stay focused. The problem we want to solve is drivers getting too tired while driving, which can lead to accidents.

●**Our Goal:** Our goal is to develop a system that can accurately detect signs of driver drowsiness and provide timely alerts to prevent accidents. We aim to create a system that can detect when a driver is getting too sleepy and give them a warning to stay alert or take a break.

●**Understanding Why It's a Problem:** When drivers get too tired, they can't focus well on the road, and they might even fall asleep while driving. This can cause accidents and put lives at risk.

●**Deciding How to Solve It:** We need a system that can detect when a driver is getting too tired and alert them so they can take a break or stop driving.

●**Why It's Important to Solve:** It's important to solve this problem because it can save lives and prevent accidents on the road. By alerting tired drivers, we can help them stay safe and avoid crashes.

●**User Experience and Acceptance:** Designing user-friendly interfaces and alerting mechanisms that effectively capture the driver's attention without causing distraction or annoyance.

Conducting user studies and feedback sessions to understand drivers' preferences, concerns, and acceptance of the drowsiness detection system.

2.2 Requirements Analysis :

A comprehensive requirements specification for a Driver Drowsiness and Sleep Detection System typically includes:

1. **What the System Should Do:**

Keep an eye on the driver while they're driving.

Recognize if the driver is getting too sleepy.

Sound an alarm to wake up the driver if they start to doze off.

2. **How the System Should Work:**

It should work in real-time, meaning it keeps watching the driver all the time.

When it sees signs of sleepiness, like closing eyes or nodding off, it should quickly beep or alert the driver.

3. **What Features It Should Have:**

Ability to customize alerts, like loud sounds or vibrations.

It should adapt to different driving conditions and times of the day.

It should record data about when it gives alerts and how the driver reacts..

4. **How Well It Should Work:**

It should be really good at spotting when the driver is getting sleepy, without making mistakes.

It should react fast when it sees signs of sleepiness, without any delays.

5. **How Easy It Should Be to Use:**

It should be easy for anyone to understand and use, without needing a manual.

It should fit well with the car's controls and not be distracting for the driver.

By keeping these things in mind, we can create a Driver Drowsiness Detection System that keeps drivers safe on the road.

2.3 Planning And Scheduling

Planning and scheduling for a Driver Drowsiness Detection System means figuring out when and how to build it, and when to use it.

Here's what it involves in easy words:

●**Deciding What to Do:** First, we need to plan what features the system will have, like what sensors to use and how to alert the driver.

●**Making a Timeline:** We set up a schedule to decide when each part of the system will be built and tested. This helps us stay on track and finish the project on time.

●**Testing and Improving:** After building the system, we test it to make sure it works correctly. If we find any problems, we go back and fix them.

●**Deciding When to Use It:** Once the system is ready, we plan when and how it will be used, like in cars or trucks, and how often it will be updated or maintained.

●**Resource Allocation:** Allocate resources, including personnel, equipment, and budget, to each task based on their requirements and priorities. Ensure that resources are distributed effectively to meet project objectives within the specified timeline and budget.

●**Timeline Development:** Develop a detailed project timeline or schedule that outlines the start and end dates for each task we divide the work among team members, so everyone knows what they need to do and when it needs to be done.

●**Risk Management:** Identify potential risks and uncertainties that may impact project success, such as technical challenges, resource constraints, or changes in requirements. Develop risk mitigation strategies to address and mitigate these risks proactively throughout the project lifecycle.

●**Monitoring and Control:** Implement mechanisms for monitoring and controlling project progress against the planned schedule. Track key performance indicators (KPIs) and milestones to identify and take corrective actions as needed to ensure project success.

●**Documentation and Reporting:** Maintain comprehensive documentation of project plans, schedules, progress, and outcomes. Generate regular reports to stakeholders to provide updates on project status, risks, issues, and achievements.

By planning and scheduling the Driver Drowsiness and Sleep Detection System effectively, you can improve safety, reduce the risk of accidents, and optimize your logistics operations while prioritizing driver well-being.

2.4 SOFTWARE REQUIREMENT

❖ Arduino IDE :-

➢ **Arduino IDE :-** The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment

Figure 2.4.1 : Arduino IDE.

Arduino Ide Software connected with python code by using Port-(COMn)

To connect Arduino IDE with Python code, you can use the pyserial library in Python to communicate with the Arduino via serial communication. Here's a basic example:

1. First, make sure you have pyserial installed. You can install it via pip if you haven't already:

pip install pyserial

2.Write your Arduino code in the Arduino IDE and Python code, you can use pyserial to communicate with the Arduino using :

Port-(COM3)

3.Upload your Arduino code to your board and Run your Python code. It will communicate with the Arduino via serial port (COM3)

Remember to replace serial_port with the correct port for your Arduino, which can be found in the Arduino IDE under Tools > Port. Also, adjust the baud rate to match the one set in your Arduino code.

● **Python (3.9 version) :**

Python is a computer programming language that's easy to read and write or readability, and versatility have made it one of the most popular programming languages in the world.. Python is an Interpreted, High-level, Dynamic Typing, Cross-Platform and General-purpose Programming Language.

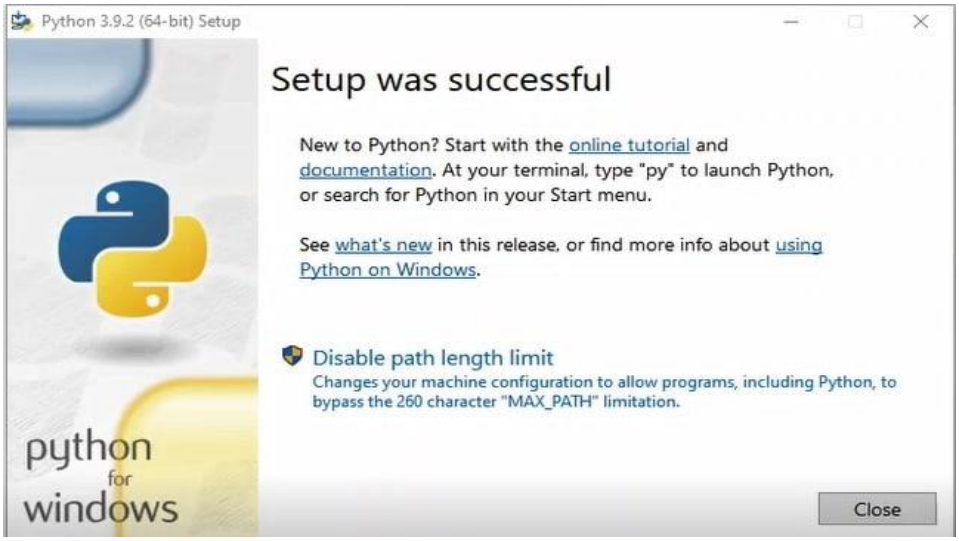

Figure 2.4.2 : Python (3.9 version).

● **Python (3.9 version recommended) installed on your system, then using pip, you can install the necessary packages**

➢ **OpenCV** - **pip install cv2** (face and eye detection) for import cv2

➢ **Landmark** - **pip install dlib** (Face Landmark Detection) for import dlib

➢ **Software connected with python** - **pip install pyserial** (Arduino Ide Software connected with python code) for import serial

2.5 HARDWARE REQUIREMENT

●**Hardware components**

➢Arduino UNO.

➢Buzzer.

➢DC Motor.

➢Laptop Camera

➢Connecting Wires.

➢LED Red Light.

❖Arduino UNO :

The Arduino UNO is a microcontroller board that works by processing and controlling digital and analog inputs and outputs. Here's a simplified overview of how it works:

●**Microcontroller:** The heart of the Arduino UNO is the ATmega328P microcontroller. It's like the brain of the board, responsible for executing the program (or sketch) you upload to it.

●**Programming:** You write a program (sketch) on your computer using the Arduino IDE (Integrated Development Environment). This program defines what the Arduino will do.

●**Upload:** You connect the Arduino UNO to your computer via USB and upload the program to it. The microcontroller stores this program in its memory.

●**Input and Output:** The Arduino UNO has various input and output pins. It can read digital or analog signals from sensors or devices (inputs) and send digital or analog signals to control other devices (outputs).

●**Processing:** The microcontroller constantly runs the program you uploaded. It reads inputs, processes them according to your instructions in the program, and controls outputs accordingly.

●**Communication:** Arduino UNO can communicate with other devices or computers through serial communication, allowing it to exchange data or receive commands.

●**LED Indicator:** The onboard LED on the Arduino UNO often serves as a simple output for testing and debugging.

●**Power Supply:** It can be powered via USB, an external power supply, or a battery, depending on your project's requirements.

Figure 2.5.1 : Arduino Uno.

●**Cameras**: Special cameras keep an eye on the driver's face to check if they look tired or sleeping detect uses a camera in your car to watch your face and Checks Your Eyes the system looks at your eyes how it move and if your eye is close then the system give you alarm warning and stop the car engine

Figure 2.5.2 : Camera.

●**Alarms and Warnings:** If the system thinks the driver is too tired, it can make an alarm or alert to wake them up and Alert System detects drowsiness, it can trigger an alert. This alert can be in the form of an alarm, flashing lights, or other warning signals to wake up the driver. Detects Drowsiness:When the system detects that the driver is showing signs of drowsiness, it can issue These alerts may it gives you a warning, like a buzzer or LED Red lightlight ON.

Figure 2.5.3 : Buzzer And LED.

●**General Motor:** General Motors' system in cars can detect if a driver is feeling very tired or sleepy. this system directly turn off the car's engine if the driver is sleepy. Instead, it alerts the driver through warnings like vibrating the seat or issuing alarms, to wake the driver up and prevent accidents caused by drowsiness. This is because shutting down the engine directly while the car is moving could be very dangerous. The main aim of the system is to keep the driver safe and prevent accidents by warning them if the driver feeling to sleep then the system activate to stop the engine.

Figure 2.5.5 : DC Motor.

CHAPTER 3 :- SYSTEM DESIGN

3.1 BLOCK DIAGRAM :

A block diagram is a schematic of a system's components and their interactions. In the case of a sleep detection system using Arduino, an engine, LED, buzzer, and PC/camera, it might be represented as follows:

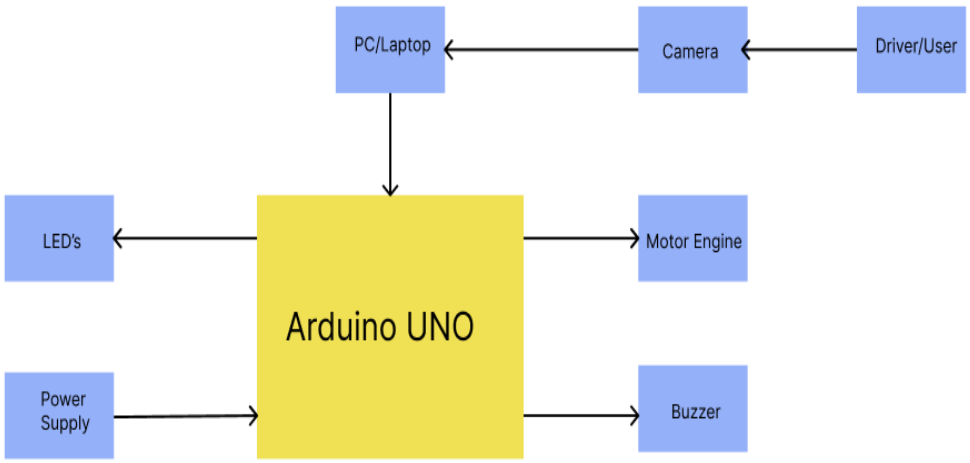

Figure 3.1 : Block Diagram.

- **Camera/PC:** Monitors the driver's facial features or eye movements to detect signs of drowsiness.

- **Arduino:** Receives input from the camera or PC and processes the data to analyze if the driver is drowsy.

- **Sleep Detection:** The Arduino uses algorithms to determine if the driver is showing signs of drowsiness.

- **Engine Control:** If the driver is detected as drowsy, in this theoretical setup, it could potentially send a signal to stop the engine. However, it's important to note that directly stopping the engine while the vehicle is in motion could be unsafe and is not a standard feature in most vehicles.

- **LED & Buzzer:** These components serve as warning systems to alert the driver of detected drowsiness, providing visual and auditory warnings.

This is a simplified representation and in a real system, various sensors, processing algorithms, and safety protocols would be involved. The system is designed to detect drowsiness and alert the driver using LED lights, sound signals (buzzer), and potentially alter the engine or vehicle settings to ensure driver safety.

3.2 CIRCUIT DIAGRAM :

The circuit diagram for Driver Drowsiness and Sleep Detection System contains a components : Arduino Uno, Camera, Buzzer, LED and Gen- Motor.

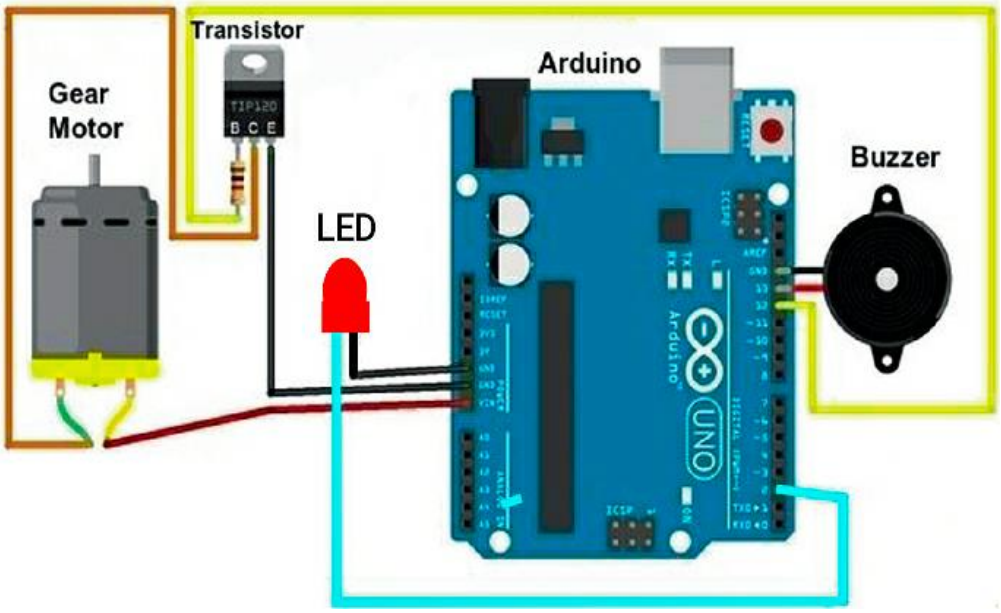

Figure 3.2 : Circuit Diagram.

1. Arduino Uno Connections:

Connect the Arduino Uno to a power supply with +5V and GND pins.

2. PC Camera Connection:

Connect the PC camera to the Arduino Uno via USB for capturing images.

3. LED Connection:

Connect the LED's positive leg (anode) to a digital output pin number - 9 on the Arduino Uno.

Connect the LED's negative leg (cathode) to a current-limiting resistor (220-330 ohms).

Connect the other end of the resistor to the GND pin on the Arduino Uno.

4. Buzzer Connection:

Connect the buzzer's positive terminal to another digital output pin number - 8 on the Arduino Uno.

Connect the buzzer's negative terminal to the GND pin on the Arduino Uno

5. DC Motor Connection:

Connect the DC Motor to digital output pin number - 10 on the Arduino Uno.

Connect the motor driver's VCC and GND pins to the Arduino Uno's +5V and GND pins, respectively.

This configuration allows the Arduino Uno to control the LED, buzzer, and DC motor based on drowsiness detection signals received from the PC camera.

This basic layout explains that the camera or PC feeds data to the Arduino, which processes information to determine if the driver is drowsy. The Arduino can then activate LEDs or a buzzer to alert the driver.The connection to the engine or motor control, while theoretically possible, isn't typically used for safety reasons. Always prioritize safety when modifying or creating automotive systems.

3.3 Flow diagram :-

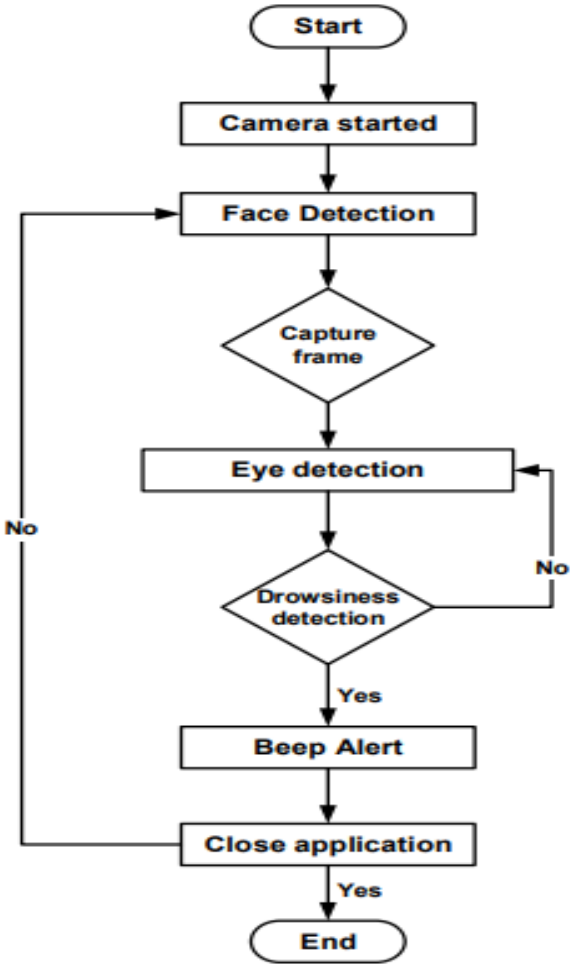

Figure 3.3 : Flow Chart Diagram.

An detecting driver drowsiness is a program that detects and alerts a user who is at a drowsy state. The camera to start capturing real-time video and simple interface. And the camera is used to detect the face of the user with the main features i.e. eye. A certain threshold is established by eye-tracking in order to identify the drowsy eye of a human. The alarm begins when the human is completely awakened when the eye becomes lower than the threshold as defined. Then again, it continues to train the people. Furthermore, the alert sound begins. If yes, activate the alert mechanism or If no, continue monitoring. If drowsiness is detected, the system triggers the alarm to alert the user.

❖ Step for Flowchart Diagram :-

Step 1- Start:

Begin the process.

Step 2- Camera Started:

Activate the camera to start capturing real-time video Frame.

Step 3- Capture Frame:

Continuously capture frames from the camera.

Step 4- Eye Detection:

Analyze each frame to detect the driver's eyes.

Step 5- Drowsiness Detection:

Assess the level of drowsiness based on eye movement patterns.

If yes, activate the alert mechanism.

If no, continue monitoring.

Step 6- Beep Alert:

If drowsiness is detected, trigger a beep alert to notify the driver.

Step 7- Close Application:

End the process and close the application.

Step 8- End:

Finish the process.

3.4 Use Case Diagram :-

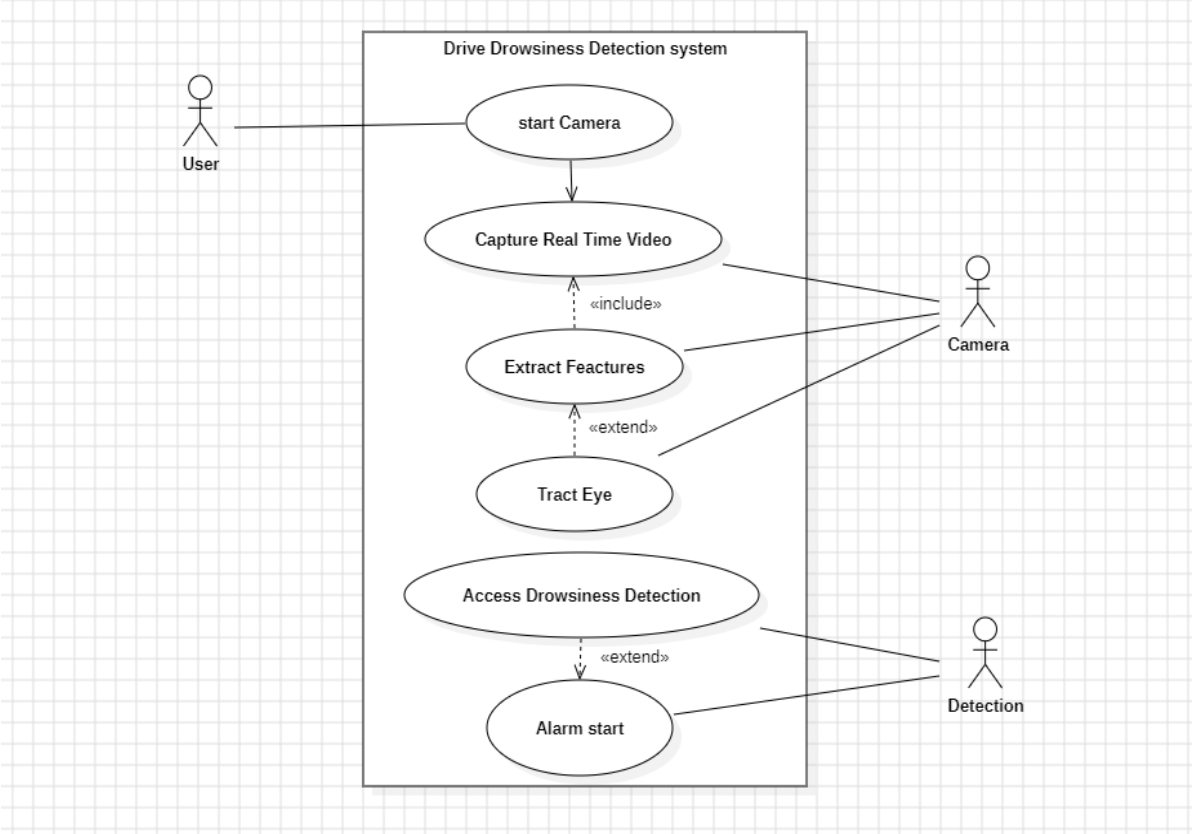

Figure 3.4 : Use Case Diagram.

A use case diagram is a graphical representation of a user's interaction with the system. A use case diagram can show the different types of users of a system and the various ways in which they interact with the system. Use case diagrams are used to gather the requirements of a system including internal and external influences.So when a system is analyzed to gather its functionality use cases are prepared and actors are identified

The system responsible for alerting the driver when signs of drowsiness are detected.Sound Alarm Vibrate Seat Display Warning on Dashboard

These use cases and actors represent the key functionalities and entities involved in a Sleep Detection System for a car. Keep in mind that this is a simplified representation, and the actual diagram might include additional details based on the specific requirements and functionalities of the system.

❖ Step for Use Case Diagram :-

Step1- Start: Begin the process.

Step2- Activate Camera: Turn on the camera to start capturing real-time video.

Step3- Capture Real-Time Video: Continuously record the driver's face using the camera.

Step4- Extract Feature: Analyze the video to extract relevant facial features.

Step5- Track Eye: Focus on tracking the movement of the driver's eyes.

Step6- Access Drowsiness Detection: Use the extracted facial features and eye movements to assess the level of drowsiness.

Step7- Is Drowsiness Detected?: Check if signs of drowsiness are present.

Step8- Alarm Start: If drowsiness is detected, trigger the alarm mechanism to alert the driver.

Step9- End: Finish the process.

Explain:-

- The "User" initiates the process.
- The system starts the camera to capture real-time video.
- It then captures video of the driver's face.
- The system extracts facial features from the captured video.
- Eye tracking is performed to monitor the driver's eye movements.
- The system accesses drowsiness detection algorithms to analyze the extracted features and eye movements.
- If drowsiness is detected, the system triggers the alarm to alert the user.

CHAPTER 4 :- IMPLEMENTATION AND TESTING

❖ Arduino UNO SOURCE CODE :-

```
const int buzzer_Pin = 8;
const int led_Pin = 9;
const int dcmotor_Pin = 10;
char sleep_status = 0;
void setup() {
  Serial.begin(9600);
  pinMode(buzzer_Pin, OUTPUT);
  pinMode(led_Pin, OUTPUT);
  pinMode(dcmotor_Pin, OUTPUT);
  digitalWrite(buzzer_Pin, LOW);
  digitalWrite(led_Pin, LOW);
  digitalWrite(dcmotor_Pin, HIGH);
}
void loop()
{
    while (Serial.available() > 0)
  {
    sleep_status = Serial.read();
    if(sleep_status == 'a')
    {
       digitalWrite(buzzer_Pin, HIGH);
       digitalWrite(led_Pin, HIGH);
```

```
      digitalWrite(dcmotor_Pin, LOW);
      delay(2000);
      digitalWrite(buzzer_Pin, LOW);
      digitalWrite(led_Pin, LOW);
      digitalWrite(dcmotor_Pin, Low);
      delay(100);
    }
    else if(sleep_status == 'b')
    {
       digitalWrite(buzzer_Pin, LOW);
       digitalWrite(led_Pin, LOW);
       digitalWrite(dcmotor_Pin, HIGH);
       delay(2000);
    }
    else
    {
     /* Do Nothing */
    }
  }
}
```

❖ Python source code Connected in Arduino UNO (COM3) :

```
#Importing OpenCV Library for basic image processing functions
import cv2

# Numpy for array related functions
import numpy as np

# Dlib for deep learning based Modules and face landmark detection
import dlib

#face_utils for basic operations of conversion
from imutils import face_utils
import serial
import time
s = serial.Serial('COM5',9600)

#Initializing the camera and taking the instance
cap = cv2.VideoCapture(1)

#Initializing the face detector and landmark detector
hog_face_detector = dlib.get_frontal_face_detector()
predictor = dlib.shape_predictor("shape_predictor_68_face_landmarks.dat")
```

```
#status marking for current state
    sleep = 0
    drowsy = 0
    active = 0
    status=""
    color=(0,0,0)

    def compute(ptA,ptB):
        dist = np.linalg.norm(ptA - ptB)
        return dist

    def blinked(a,b,c,d,e,f):
        up = compute(b,d) + compute(c,e)
        down = compute(a,f)
        ratio = up/(2.0*down)

    #Checking if it is blinked
        if(ratio>0.25):
            return 2
        elif(ratio>0.21 and ratio<=0.25):
            return 1
        else:
            return 0
```

```
while True:
    frame = cap.read()
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    faces = hog_face_detector(gray)

    #detected face in faces array
    for face in faces:
        x1 = face.left()
        y1 = face.top()
        x2 = face.right()
        y2 = face.bottom()
        face_frame = frame.copy()
        cv2.rectangle(face_frame, (x1, y1), (x2, y2), (0, 255, 0), 2)
        landmarks = predictor(gray, face)
        landmarks = face_utils.shape_to_np(landmarks)

        #The numbers are actually the landmarks which will show eye
        left_blink = blinked(landmarks[36],landmarks[37],
        landmarks[38], landmarks[41], landmarks[40], landmarks[39])
        right_blink = blinked(landmarks[42],landmarks[43],
        landmarks[44], landmarks[47], landmarks[46], landmarks[45])
```

#Now judge what to do for the eye blinks

```
        if(left_blink==0 or right_blink==0):
            sleep+=1
            drowsy=0
            active=0
            if(sleep>6):
                s.write(b'a')
                time.sleep(2)
                status="SLEEPING !!!"
                color = (0,0,255)

        elif(left_blink==1 or right_blink==1):
            sleep=0
            active=0
            drowsy+=1
            if(drowsy>6):
                s.write(b'a')
                time.sleep(2)
                status="Drowsy !"
                color = (0,0,255)

          else:
              drowsy=0
              sleep=0
              active+=1
```

```
if(active>6):
        s.write(b'b')
        time.sleep(2)
        status="Active :)"
        color = (0,0,255)
         cv2.putText(frame, status, (100,100), cv2.FONT_HERSHEY_SIMPLEX, 1.2, color, 3)


for n in range(0, 68):
      (x,y) = landmarks[n]
       cv2.circle(face_frame, (x, y), 1, (255, 255, 255), -1)
        cv2.imshow("Frame", frame)


   #cv2.imshow("Result of detector", face_frame)
      key = cv2.waitKey(1)
      if key == 27:
           break
```

CHAPTER 5 :- RESULTS AND DISCUSSION

5.1 TEST REPORTS :-

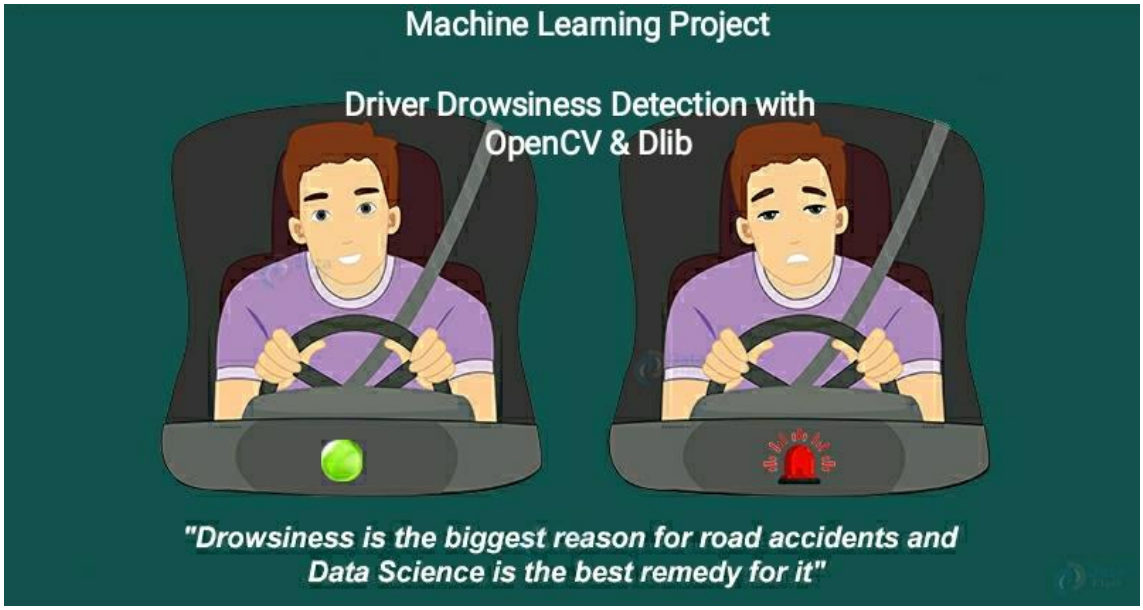

Figure 5.1.1 TEST REPORTS.

With this Project, we will be making a drowsiness detection system. A countless number of people drive on the highway day and night. Taxi drivers, bus drivers, truck drivers and people traveling long-distance suffer from lack of sleep. Due to which it becomes very dangerous to drive when feeling sleepy.

The majority of accidents happen due to the drowsiness of the driver. So, to prevent these accidents we will build a system using Python, OpenCV(import cv2), and Keras which will alert the driver when he feels sleepy.

Drowsiness detection is a safety technology that can prevent accidents that are caused by drivers who fell asleep while driving.

The objective of this intermediate Project is to build a drowsiness detection system that will detect that a person’s eyes are closed for a few seconds. This system will alert the driver when drowsiness is detected.

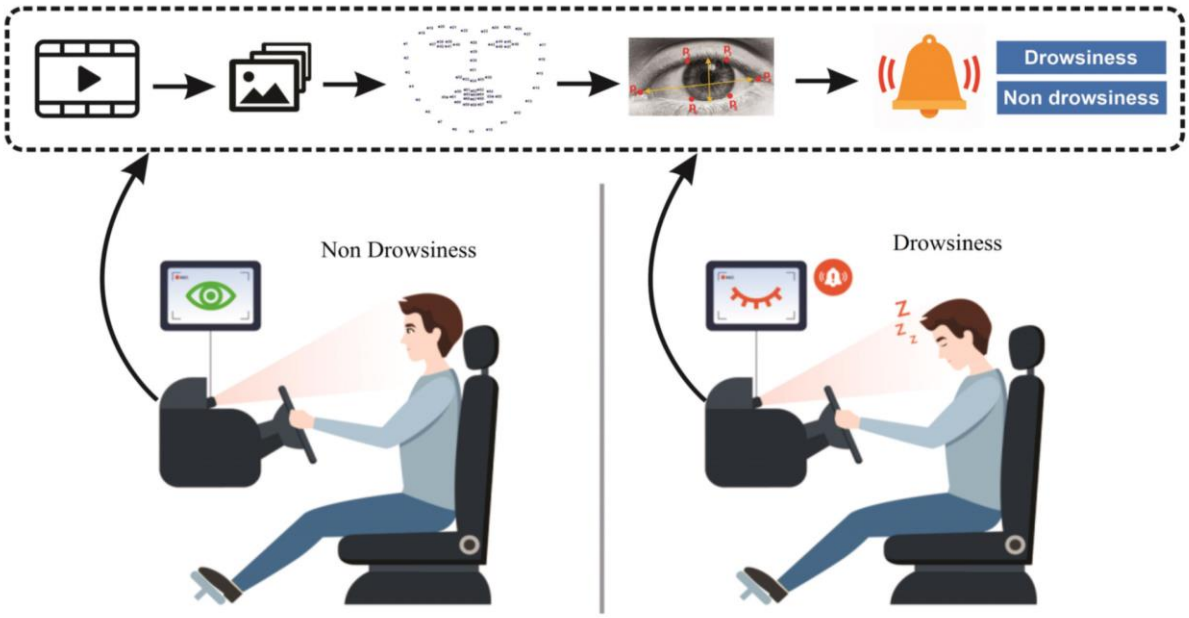

Figure 5.1.2 TEST ANALYZING.

Driver Drowsiness Detection System

In this Python project, we will be using OpenCV (import cv2) for gathering the images and Dlib for deep learning based Modules and face landmark detection (import dlib) which will classify whether the person's eyes are 'Open' or 'Closed'.

The approach we will be using for this Project is as follows :

Step 1 – Take image as input from a camera.

Step 2 – Detect the face in the image and create a Region of Interest (ROI).

Step 3 – Detect the eyes from ROI and feed it to the classifier.

Step 4 – Classifier will categorize whether eyes are open or closed.

Step 5 – Calculate score to check whether the person is drowsy.

❖**Testing :- When Driver is Active LED - off Buzzer - off and DC Motor - on.**

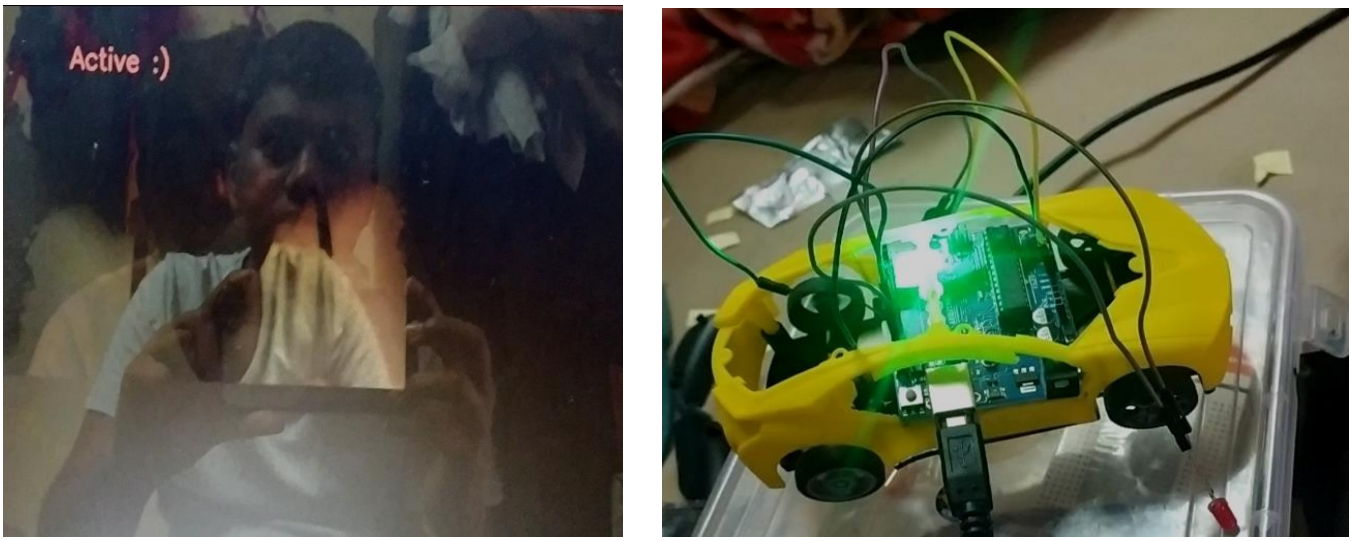

Figure 5.1.1 TEST REPORT WHEN DRIVER IS ACTIVE.

❖ **Testing;- When Driver is Drowsiness DC Motor - off LED - on and Buzzer - on to alert the Driver .**

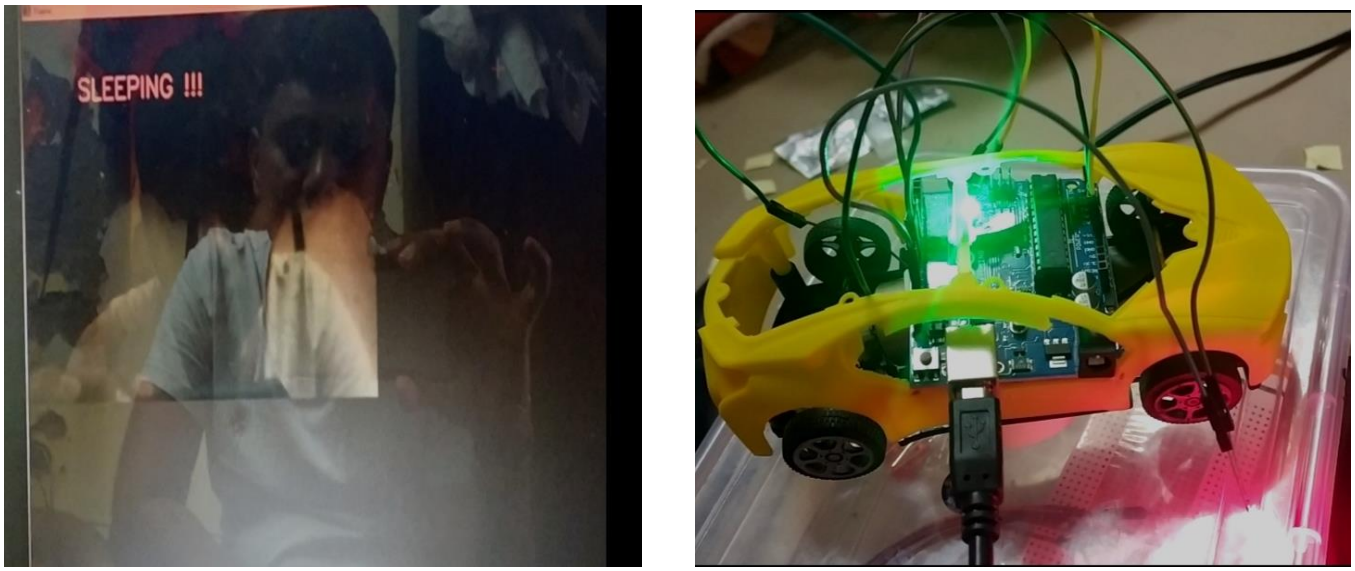

Figure 5.1.1 TEST REPORT WHEN DRIVER IS SLEEP.

5.2 USER DOCUMENTATION :-

This system is designed to enhance road safety by detecting signs of driver drowsiness and alerting the driver to take necessary actions. Please read the following instructions carefully to ensure proper usage of the system.

1. System Overview:

The Driver Drowsiness Detection System utilizes advanced technology to monitor the driver's behavior and facial expressions in real-time.

2. Activation and Setup:

The system starts working as soon as you start your carcar and also ensure that the camera or sensors used by the system are functioning properly.

3. Monitoring and Alerts:

The system continuously monitors the driver's behavior while driving and if the system notices you're getting sleepy, it will warn you with sounds or lights.

4. Maintenance and Troubleshooting:

Regularly clean the camera or sensors to ensure and update the software regularly to get the best performance

If you experience any issues with the system, refer to the manufacturer's troubleshooting guide

5. Stay focused:

Even though the system is watching out for you, it's still your job to drive safely and pay attention to the road.

6. Give feedback:

If you have any ideas to make the system better or if you run into any problems, let the people who made it know.

CHAPTER 6 :- CONCLUSION AND FUTURE WORK

6.1 Conclusion :-

Driver drowsiness and fatigue are significant causes of road accidents. Every year, they increase the number of deaths and fatalities worldwide. A module for an advanced driver assistance system is presented in this system to reduce the number of accidents caused by driver fatigue and thus increase transportation safety; this system deals with automatic driver drowsiness detection based on visual information and Artificial Intelligence.

The proposed OpenCV algorithms effectively find and help to normalize human faces while causing the majority of accidents related to vehicle crashes. The algorithm begins by detecting heads on colour images using colour and structure deviations in the human face and background.

Driver Drowsiness Detection systems represent a critical advancement in automotive safety technology. By continuously monitoring driver behavior and detecting signs of drowsiness, these systems provide timely alerts to prevent accidents caused by fatigue. With their ability to promote alertness and mitigate the risks associated with tired driving, they play a crucial role in ensuring the safety of drivers, passengers, and other road users. As such, the widespread adoption of Driver Drowsiness Detection systems has the potential to significantly reduce the incidence of fatigue-related accidents and save countless lives on our roads.

Several faces and body gestures, including tiredness in the eyes and yawning, are regarded as signs of drowsiness and fatigue in drivers. These characteristics indicate that the driver's condition is poor.

●**Enhanced Safety:** The system significantly reduces the risk of accidents caused by drowsy driving, thereby enhancing road safety.

●**Real-time Monitoring:** Continuous monitoring ensures timely alerts to drivers, preventing potential accidents before they occur.

6.2 Future work :-

One of the most common causes of accidents is driver drowsiness and fatigue. Each year, the number of people killed in such accidents rises around the world.

This systems could involve integrating advanced AI algorithms with real-time data from various sensors to improve accuracy and responsiveness. Additionally, exploring the use of wearable devices and biometric sensors for continuous monitoring could be beneficial. Moreover, enhancing the system's ability to adapt to individual differences in drowsiness patterns and incorporating features like predictive analytics for preemptive warnings could be areas of focus. Additionally, conducting field tests to gather more diverse data and refining the system based on user feedback would be valuable steps for improvement.

1. Enhanced Feature Detection:

Improve feature detection algorithms to capture a wider range of facial and behavioral cues indicating drowsiness, such as eye closure duration, head position, and yawning frequency.

2.Machine Learning Optimization:

Refine machine learning models using more advanced techniques like deep learning to improve accuracy and reduce false positives/negatives.

3.Data Collection and Driver Behavior Analysis:

Collect and analyze more extensive datasets to improve the system's robustness across different demographics, driving conditions, and environmental factors. Extend the system to analyze driver behaviors beyond drowsiness, such as distraction detection or aggressive driving, to enhance overall safety.

4.Real-time Feedback and Alerts:

Implement real-time feedback mechanisms such as alarms, seat vibrations, or automated phone calls to alert drowsy drivers immediately.

5.Integration with Autonomous Driving Systems:

Explore opportunities to integrate the drowsiness detection system with autonomous driving technologies to enhance overall vehicle safety and driver assistance capabilities. This could involve seamless integration with existing advanced driver assistance systems (ADAS) or autonomous driving platforms.

By focusing on these areas of future work, developers can continuously enhance the performance, reliability, and usability of Driver Drowsiness Detection systems, ultimately contributing to improved road safety and driver well-being.

6.3 ADVANTAGES OF THE SYSTEM

1. **Early Warning System:**

   It provides early warnings to drivers when signs of drowsiness are detected, allowing them to take necessary precautions or breaks to prevent accidents.

2. **Safety Enhancement:**

   By alerting drivers to their drowsy state, the system reduces the likelihood of accidents caused by fatigue, thus enhancing overall road safety.

3. **Reduced Accident Rates:**

   With fewer accidents due to drowsy driving, there is a potential decrease in injury and fatality rates on the roads.

4. **User-Friendly Interface:**

   Many systems are designed to be user-friendly, providing alerts in a non-intrusive manner to avoid

5. **Cost Savings:**

   While the initial investment may be required, the potential cost savings from preventing accidents and reducing insurance premiums can outweigh the expenses in the long run.

6. **Peace of Mind:**

   Both drivers and passengers can have peace of mind knowing that there is an additional layer of safety in place to mitigate the risks associated with drowsy driving.

- Driver Drowsiness Detection Systems help reduce accidents by alerting drivers drowsiness
- It can quickly detect driver drowsiness and easy to use.
- The system can distinguish between normal eye blinks and drowsy eye blinks.
- It can operate in low-light conditions and while the driver is wearing spectacles.
- It helps keep you safe by warning you when you're getting too tired to drive safely.

6.4 LIMITATION OF THE SYSTEM :-

1. Reliance on Visible Cues:

The system heavily depends on visible cues like eye movements and head position, potentially leading to limitations in detecting drowsiness, especially in adverse driving conditions or with individuals wearing sunglasses.

2. Limited Detection Capability:

Some systems may only detect physical signs of drowsiness, such as eye closure or head nodding, while missing other indicators like cognitive decline or microsleeps, potentially allowing drowsiness to go undetected in certain situations.The system's limitations are if a fixed blink duration is assumed, despite the fact that everyone's blink duration varies.

3. False Sense of Security:

Drivers may become overly reliant on the system, assuming that it will always detect their drowsiness and failing to take necessary breaks or rest when needed, leading to a false sense of security and potentially increasing the risk of accidents.These systems may sometimes give false alarms, which can be annoying or distracting for the driver.The system may not be able to detect drowsiness when driver cover our eyes with gogal.

6.5 SUMMARY :-

The Driver Drowsiness Detection System is a technology that warns drivers when they are too tired to drive safely. It's good because it helps prevent accidents, but it's not perfect. Sometimes it gives false alarms or doesn't work well for everyone. It's like having an extra safety feature in the car, but drivers still need to be careful and not rely on it completely.

Technology integrated into vehicles to enhance road safety by detecting signs of driver fatigue and alerting them accordingly. It utilizes various sensors and algorithms to monitor the driver's behavior, such as eye movements, head position, and steering patterns, to assess their level of alertness. When signs of drowsiness are detected, the system triggers alerts, such as visual warnings and audible alarms.

A Driver Drowsiness Detection system is designed to monitor a driver's state to prevent accidents caused by drowsiness or fatigue. It typically uses various sensors to analyze factors like eye movements, steering behavior, and vehicle position. When signs of drowsiness are detected, the system alerts the driver, often through visual or auditory cues, to take a break or rest. These systems aim to enhance road safety by preventing accidents caused by tired drivers.This system is intended to reduce the number of accidents caused by driver drowsiness and it turn increase transportation safety.

CHAPTER 7 :- REFERENCE

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