A Mini Project Report on

DRIVER DROWSINESS DETECTION SYSTEM

Submitted

In the partial fulfilment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
COMPUTER SCIENCE AND ENGINEERING
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CERTIFICATE

This is to certify that Mini Project report entitled **"DRIVER DROWSINESS DETECTION SYSTEM"** embodies the original work done by **Md.Ayaz , Md.Sohail, K.Yeshwanth, Karthik Hirulkar & G.Bhavana** bearing Roll Numbers **2103A52024, 2103A52093, 2103A52096, 2103A52119 & 2103A52031** studying **VI** Semester in partial fulfilment of the requirement for the award of degree of the **Bachelor of Technology** in **Computer Science and Artificial Intelligence** And Machine Learning during the academic year 2023-2024.

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ABSTRACT

This project introduces a Driver Drowsiness Detection System that combines Arduino, Python, and OpenCV to tackle the hazard of drowsy driving. It utilizes a camera within the vehicle for real-time monitoring of the driver's facial expressions and eye movements. OpenCV's image processing in Python handles facial detection, landmark recognition, and eye tracking. Arduino interfaces with sensors like eye blink and head tilt sensors, supplementing visual data for drowsiness detection.

Analyzing eye closure, , the system identifies signs of drowsiness. Alerts, controlled by Arduino, such as buzzers or LEDs, warn the driver upon detection. Rigorous testing will assess its accuracy, response time, and reliability under varied driving conditions. This system aims to proactively identify and alert drivers of potential drowsiness, reducing the risk of accidents due to driver fatigue and enhancing road safety.

CONTENTS

1. INTRODUCTION

1.1 Overview:

Driver drowsiness is a pervasive issue on roads worldwide, posing significant risks to both drivers and other road users. It occurs when drivers become fatigued or sleepy while operating vehicles, leading to compromised alertness and impaired driving abilities. To address this critical concern, our mini-project focuses on the development of a Driver Drowsiness Detection System using OpenCV and Arduino. This system aims to actively monitor the driver's facial cues and behaviors in real-time to identify signs of drowsiness and issue timely alerts, thereby mitigating the risk of accidents and promoting road safety.

1.2 Importance:

The importance of detecting and preventing drowsy driving incidents cannot be overstated. Drowsy driving significantly increases the likelihood of accidents, injuries, and fatalities on the road. By detecting early signs of drowsiness and alerting drivers promptly, our Driver Drowsiness Detection System plays a crucial role in preventing accidents and saving lives. Furthermore, addressing drowsy driving contributes to the overall improvement of road safety and helps create a safer driving environment for everyone.

1.3 Tools Used:

The development of the Driver Drowsiness Detection System relies on the utilization of advanced technologies and tools, including:

OpenCV: OpenCV, an open-source computer vision library, provides essential functionalities for facial detection, landmark identification, and feature analysis. Its robust image processing algorithms enable accurate detection and tracking of facial features, making it an ideal tool for implementing drowsiness detection systems.

Arduino: Arduino microcontrollers serve as the central processing unit for the system, facilitating real-time data processing and the execution of the drowsiness detection algorithm. Arduino's versatility and ease of use make it well-suited for interfacing with hardware components and implementing customized alert mechanisms.

By leveraging these tools and technologies, we aim to develop a robust and effective Driver Drowsiness Detection System capable of accurately identifying signs of drowsiness and issuing timely alerts to prevent accidents caused by drowsy driving.

2. LITERATURE REVIEW

2.1 Overview:

A comprehensive review of existing literature provides valuable insights into the development and implementation of driver drowsiness detection systems. These systems aim to address the critical issue of drowsy driving by leveraging advanced technologies, including computer vision and machine learning. By analyzing the objectives, methodologies, and outcomes of previous research studies, we gain a deeper understanding of the challenges and opportunities in this field.

2.2 Objectives of the Project:

The primary objectives of our project include:

Detection Accuracy: To develop a driver [1]drowsiness detection system capable of accurately identifying signs of drowsiness, including eye closure, head nodding, and yawning. High detection accuracy is essential for timely intervention and accident prevention.

Real-time Processing: To implement real-time data processing capabilities using OpenCV and Arduino, enabling immediate analysis of facial features and prompt generation of alerts when drowsiness is detected. Real-time processing ensures rapid intervention and proactive risk mitigation.

Robustness and Reliability: To design a robust and reliable system capable of operating effectively under diverse environmental conditions and varying driver behaviors. Robustness ensures consistent performance and minimizes false alarms, enhancing the system's practical utility.

Integration of Advanced Technologies: To integrate advanced technologies such as computer vision algorithms and microcontroller-based systems to enhance the capabilities of the driver drowsiness detection system. Leveraging state-of-the-art

tools and methodologies ensures the system's effectiveness and adaptability to evolving needs.

By delineating these objectives, we establish a clear framework [2]for the development and evaluation of the Driver Drowsiness Detection System. These objectives guide the selection of appropriate methodologies, tools, and performance metrics, facilitating the achievement of project goals and objectives.

3. DRIVER DROWSINESS DETECTION SYSTEM

3.1 BLOCK DIAGRAM

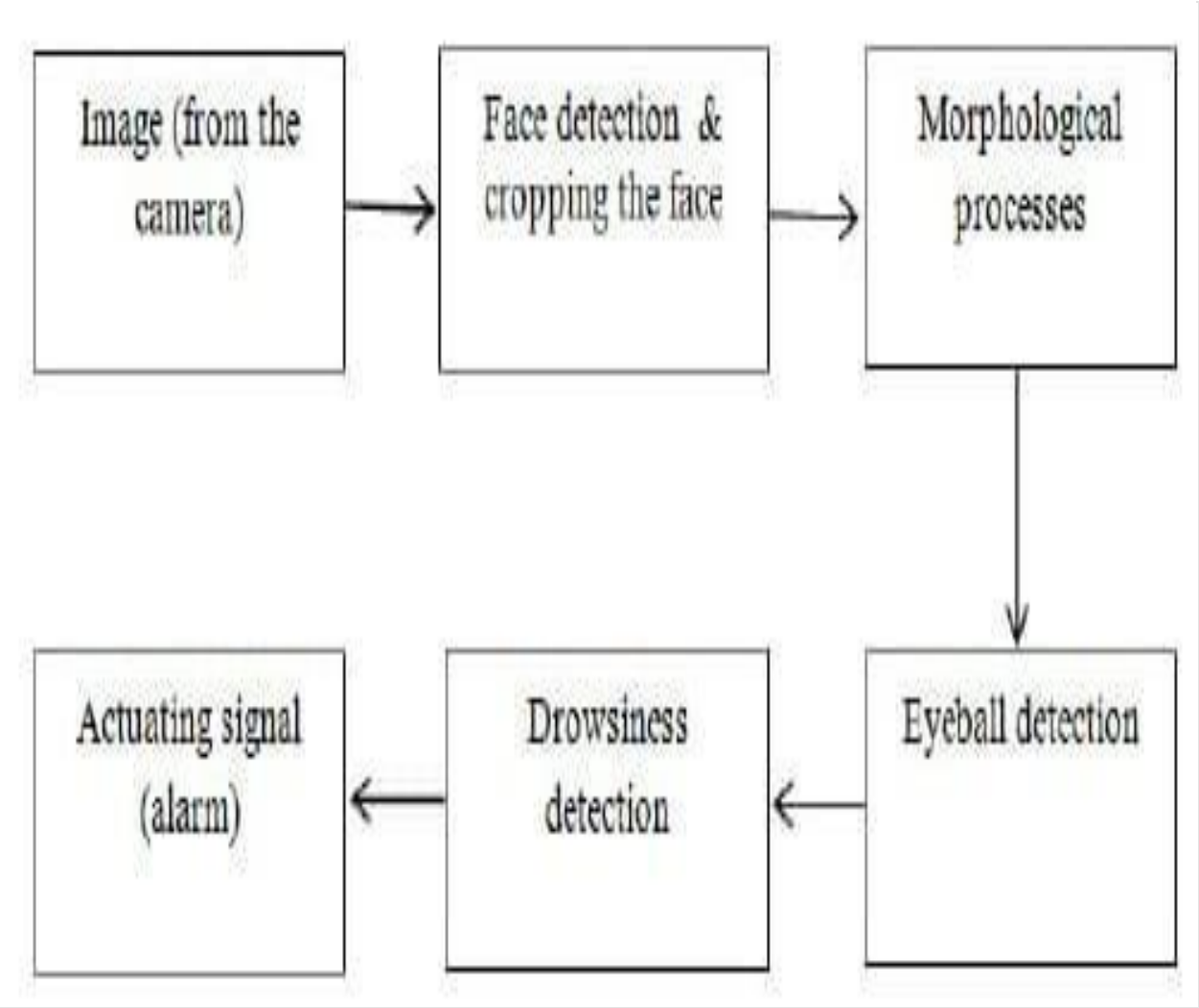

Fig.1:Block diagram

3.2.1 OpenCV: OpenCV facilitates various functionalities critical to the system, including facial detection, landmark identification, and feature analysis. Pre-trained models are utilized for efficient detection and tracking of facial landmarks such eyes, nose, and mouth.

Fig.2:Open cv logo

3.2.2 Arduino Uno: The Arduino Uno microcontroller board acts as the central processing unit, interfacing with hardware components and executing the drowsiness detection algorithm. It receives data from the camera module, performs real-time analysis, and triggers alerts when necessary.

Fig3:Arduino Borad

3.3.3 Alert Mechanism (Buzzer/LED): A buzzer or LED serves as the alert mechanism, providing a visible or audible signal to alert the driver when signs of drowsiness are detected. This immediate feedback prompts the driver to take corrective actions, such as taking a break or pulling over.

Each component is carefully selected and integrated to ensure seamless operation and optimal performance of the Driver Drowsiness Detection System. In the following sections, we delve deeper into the working principles and functionalities of these components, elucidating their roles in the overall system architecture.

Fig4:LCD DISPLAY

Fig 5:BUZZER

4. WORKING

The Driver Drowsiness Detection System operates through a series of interconnected processes, encompassing facial detection, feature analysis, drowsiness assessment, and alert generation:

4.1 Facial Detection and Landmark Identification:

Upon system activation, the camera module captures successive frames of the driver's face in real-time. OpenCV algorithms are employed to process these frames, focusing on facial detection and landmark identification.

Fig. 6:Simulation

4.2 Feature Analysis and Drowsiness Assessment:

Facial landmarks, including eye closure, head position, and yawning, are analyzed to assess the driver's level of drowsiness. By comparing these features against predefined thresholds and rules, the system determines whether the driver is exhibiting signs of drowsiness.

4.3 Alert Generation:

If drowsiness is detected beyond a certain threshold the Arduino triggers the alert mechanism, activating the buzzer or flashing the LED to alert the driver. This immediate feedback prompts the driver to take corrective actions, thereby reduci

5.RESULTS

The performance and efficacy of the Driver Drowsiness Detection System were evaluated through comprehensive testing and analysis. Real-world testing scenarios were simulated to assess the system's robustness and reliability across diverse conditions:

5.1 Accuracy:

The system demonstrated robust performance in detecting various stages of drowsiness, including eye closure, yawning, and head nodding, across different drivers and lighting conditions. Facial landmarks were accurately identified and analyzed, enabling precise assessment of drowsiness levels.

5.2 Real time Responsiveness:

The system exhibited rapid response times, triggering alerts promptly upon detecting signs of drowsiness beyond predefined thresholds. The alert mechanism effectively notified the driver, prompting timely corrective actions and reducing the risk of accidents caused by drowsy driving.

5.3Robustness and reliability

Extensive testing validated the system's reliability and effectiveness in alerting drivers promptly, potentially preventing accidents and promoting road safety. The system demonstrated resilience to environmental factors and varying driver behaviors, ensuring consistent performance under real-world conditions. Overall, the results of the testing phase affirm the viability and efficacy of the Driver Drowsiness Detection System in mitigating the risks associated with drowsy driving. The system's accurate detection capabilities, real-time responsiveness, and robust performance underscore its potential as a valuable tool for enhancing road safety and saving lives.

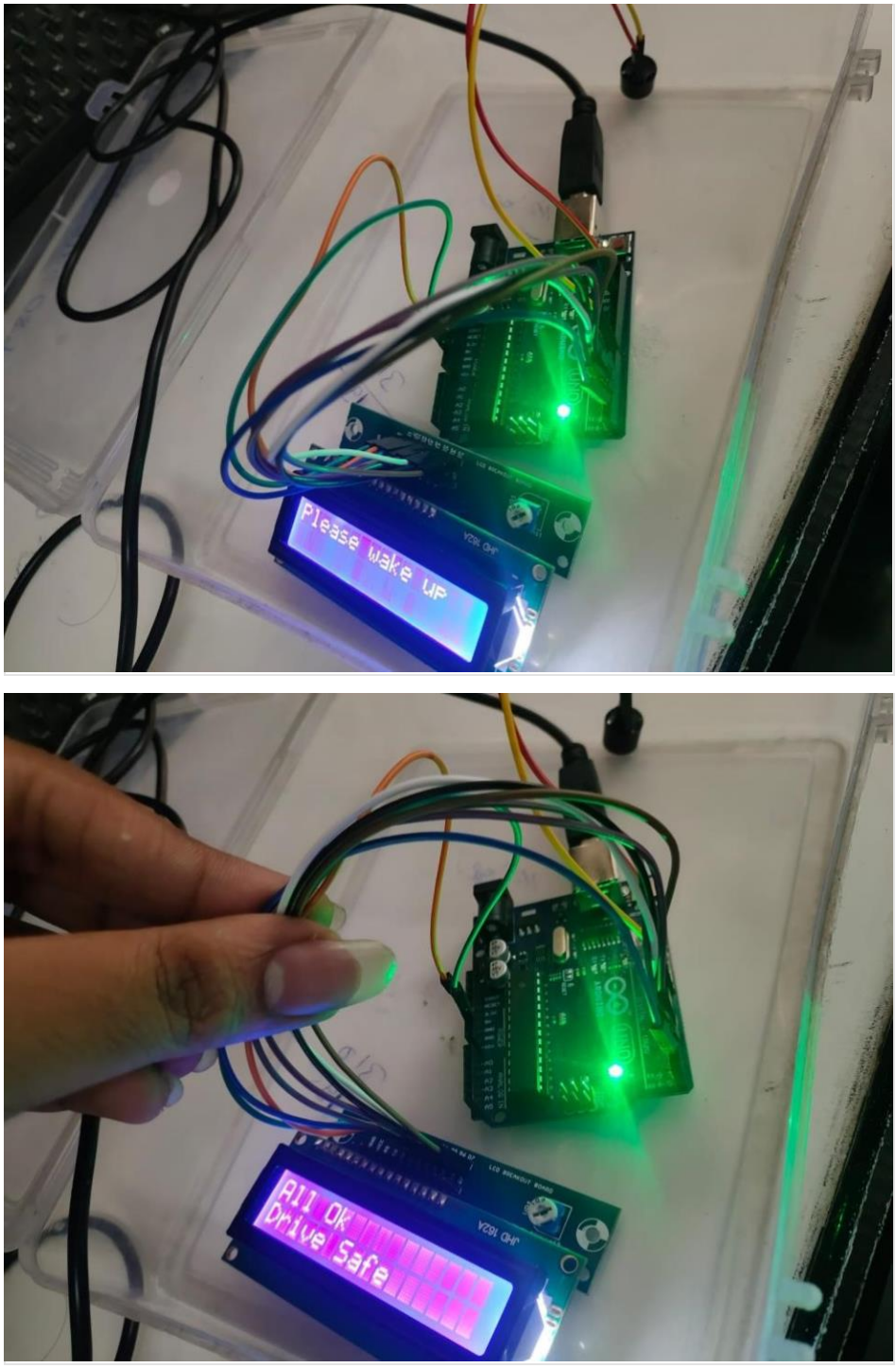

Fig. 7: RESULTS

6.CONCLUSION

In conclusion, the Driver Drowsiness Detection System represents a significant advancement in the field of driver safety technology. By leveraging the capabilities of OpenCV and Arduino, the system provides an effective means of monitoring driver behavior and issuing timely alerts in response to signs of drowsiness. The integration of real-time data processing, facial analysis algorithms, and customizable alert mechanisms ensures rapid intervention and proactive risk mitigation.

Through extensive testing and analysis, the system has demonstrated its reliability, accuracy, and robustness in detecting and responding to drowsy driving incidents. By alerting drivers promptly and prompting timely corrective actions, the system contributes to the prevention of accidents and the promotion of road safety. Looking ahead, further research and development efforts could focus on enhancing the system's capabilities, integrating additional sensors, and exploring advanced machine learning techniques to improve detection accuracy and adaptability. By continuing to innovate and refine driver drowsiness detection technologies, we can further reduce the incidence of accidents and create safer roads for all.

7.FUTURE SCOPE

- **Integration with machine learning models:** Further advancements could involve integrating machine learning algorithms to improve drowsiness detection accuracy and adaptability to individual drivers' behavior patterns.

- **Sensor Fusion:** Incorporating additional sensors such as accelerometers and heart rate monitors could provide complementary data for more comprehensive drowsiness detection and driver monitoring.

- **Wireless Communication:** Implementing a wireless communication module would enable the system to transmit alerts to external devices or centralized monitoring systems, facilitating fleet management and proactive intervention.

- **Field Testing and Deployment:** Future research efforts could focus on deploying the system in commercial vehicles and conducting extensive field testing to evaluate its performance in real-world scenarios and gather user feedback for further refinement.

8.REFERENCES

[1] Real-Time Driver-Drowsiness Detection System Using Facial Features WANGHUA DENG1 AND RUOXUE WU 1,2 1Beijing Engineering Research Center for IoT Software and Systems, Beijing University of Technology, Beijing 100124, China 2School of Software, Yunnan University, Kunming 650000, China 90910.

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DRIVER DROWSINESS DETECTION SYSTEM

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***Abstract*— Fire The face, an important part of the body, conveys a lot of information. When a driver is in a state of fatigue, the facial expressions, e.g., the frequency of blinking and yawning, are different from those in the normal state. In this paper, we propose a system called DriCare, which detects the drivers' fatigue status, such as yawning, blinking, and duration of eye closure, using video images, without equipping their bodies with devices. Owing to the shortcomings of previous algorithms, we introduce a new face-tracking algorithm to improve the tracking accuracy. Further, we designed a new detection method for facial regions based on 68 key points. Then we use these facial regions to evaluate the drivers' state. By combining the features of the eyes and mouth, DriCare can alert the driver using a fatigue warning. The experimental results showed that DriCare achieved around 92% accuracy.**

Keywords—Opencv,Detection,Actuators,Arduinno, Arduino Ide

I. INTRODUCTION

In recent years, an increase in the demand for modern transportation necessitates a faster car-parc growth. At present, the automobile is an essential mode of transportation for people. In 2017, a total of 97 million vehicles were sold globally, which was 0.3% more than that in 2016 [1]. In 2018, the global total estimation of the number of vehicles being used was more than 1 billion [2]. Although the automo- bile has changed people's lifestyle and improved the conve- nience of conducting daily activities, it is also associated with numerous negative effects, such as traffic accidents. A report by the National Highway Traffic Safety Administration [3] showed that a total of 7,277,000 traffic accidents occurred in the United States in 2016, resulting in 37,461 deaths and 3,144,000 injuries. In these accidents, fatigue driving caused approximately 20% ⎯ 30 % traffic accidents. Thus, fatigued driving is a significant and latent danger in traffic accidents. In recent years, the fatigue-driving-detection sys- tem has become a hot research topic. The detection meth- ods are categorized as subjective and objective detection. In the subjective detection method, a drivermust participate in the evaluation, which is associated with thedriver's sub- jective perceptions through steps such as self-questioning.

Visual object tracking is a crucial problem in computer vision. It has a wide range of applications in fields such as human-computer interaction, behavior recognition, robotics, and surveillance. Visual object tracking estimates the target position in each frame of the image sequence, given the initial state of the target in the previous frame. Lucas and Kanade [19] proposed that the tracking of the moving target can be realized using the pixel relationship between adja- cent frames of the video sequence and displacement changes of the pixels. However, this algorithm can only detect the medium-sized target that shifts between two frames. With the isual object tracking is a crucial problem in computer vision. It has a wide range of applications in fields such as human-computer interaction, behavior recognition, robotics, and surveillance. Visual object tracking estimates the target position in each frame of the image sequence, given the initial state of the target in the previous frame. Lucas and Kanade [19] proposed that the tracking of the moving target can be realized using the pixel relationship between adjarecent advances of the correlation filter in computer vision [7], [20]–[22], Bolme [20] proposed the Minimum Output Sum of Squared Error (MOSSE) filter, which can produce stable correlation filters to track the object. Although the MOSSE's computational efficiency is high, its algorithm precision is low, and it can only process the gray information of a single channel.

II . LITERATURE SURVEY

A comprehensive review of existing literature provides valuable insights into the development and implementation of driver drowsiness detection systems. These systems aim to address the critical issue of drowsy driving by leveraging advanced technologies, including computer vision and machine learning. By analyzing the objectives, methodologies, and outcomes of previous research studies, we gain a deeper understanding of the challenges and opportunities in this field.

Integrate advanced technologies such as computer vision algorithms and microcontroller-based systems to enhance the capabilities of the driver drowsiness detection system. Leveraging state-of-the-art tools and methodologies ensures the system's effectiveness and adaptability to evolving needs.

By delineating these objectives, we establish a clear framework [2]for the development and evaluation of the Driver Drowsiness Detection System. These objectives guide the selection of appropriate methodologies, tools. Driver

drowsiness is a pervasive issue on roads worldwide, posing significant risks to both drivers and other road users. It occurs when drivers become fatigued or sleepy while operating vehicles, leading to compromised alertness and impaired driving abilities. To address this critical concern, our mini-project focuses on the development of a Driver Drowsiness Detection System using OpenCV and Arduino. This system aims to actively monitor the driver's facial cues and behaviors in real-time to identify signs of drowsiness and issue timely alerts, thereby mitigating the risk of accidents and promoting road safety. machine learning techniques to improve detection accuracy and adaptability. By continuing to innovate and refine driver drowsiness detection technologies, we can further reduce the incidence of accidents and create safer roads for all.

III. WORKING

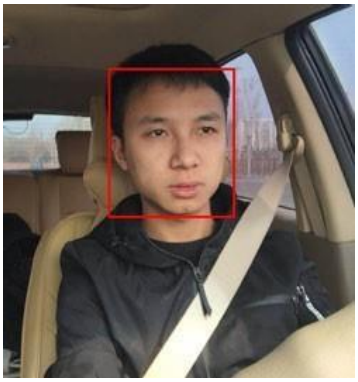
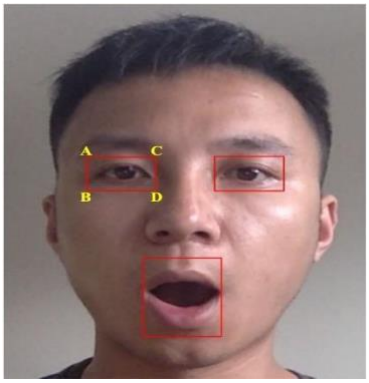


FIGURE1:Facial detection



A buzzer or LED serves as the alert mechanism, providing a visible or audible signal to alert the driver when signs of drowsiness are detected. This immediate feedback prompts the driver to take corrective actions, such as taking a break or pulling over.Each component is carefully selected and integrated to ensure seamless operation and optimal performance of the Driver Drowsiness Detection System. In the following sections, we delve deeper into the working principles and functionalities of these components, elucidating their roles in the overall system architecture.

IV.EXPERIMENTAL RESULTS

The performance and efficacy of the Driver Drowsiness Detection System were evaluated through comprehensive testing and analysis. Real-world testing scenarios were simulated to assess the system's robustness and reliability across diverse conditions:

Accuracy:

The system demonstrated robust performance in detecting various stages of drowsiness, including eye closure, yawning, and head nodding, across different drivers and lighting conditions. Facial landmarks were accurately identified and analyzed, enabling precise assessment of drowsiness levels.

Real time Responsiveness:

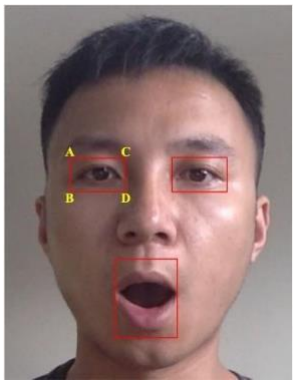
The system exhibited rapid response times, triggering alerts promptly upon detecting signs of drowsiness beyond predefined thresholds. The alert mechanism effectively notified the driver, prompting timely corrective actions and reducing the risk of accidents caused by drowsy driving.

Extensive testing validated the system's reliability and effectiveness in alerting drivers promptly, potentially preventing accidents and promoting road safety.

The system demonstrated resilience to environmental factors and varying driver behaviors, ensuring consistent performance under real-world conditions.

Overall, the results of the testing phase affirm the viability and efficacy of the Driver Drowsiness Detection System in mitigating the risks associated with drowsy driving. The system's accurate detection capabilities, real-time responsiveness, and robust performance underscore its potential as a valuable tool for enhancing road safety and saving lives.

FIGURE2:Eye detection The system demonstrated robust performance in detecting various stages of drowsiness including eye closure, yawning, and head nodding, across different drivers and lighting conditions. Facial landmarks were accurately identified and analyzed, enabling precise assessment of drowsiness levels.



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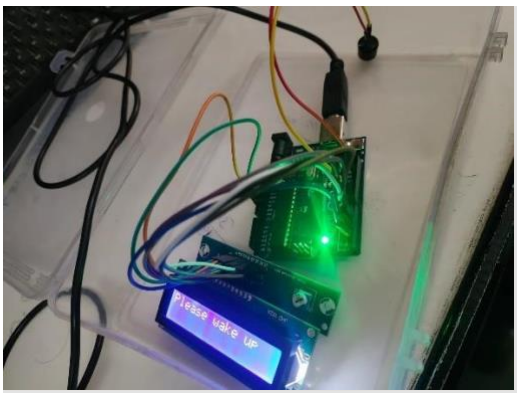

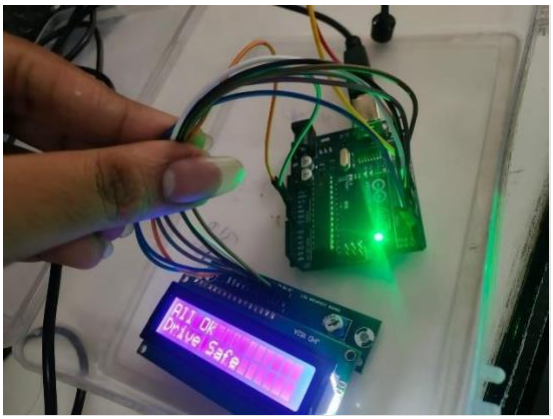

V.CONCLUSIONS The In conclusion, the Driver Drowsiness Detection System

represents a significant advancement in the field of driver safety technology. By leveraging the capabilities of OpenCV and Arduino, the system provides an effective means of monitoring driver behavior and issuing timely alerts in response to signs of drowsiness. The integration of real-time data processing, facial analysis algorithms, and customizable alert mechanisms ensures rapid intervention and proactive risk mitigation.

Through extensive testing and analysis, the system has demonstrated its reliability, accuracy, and robustness in detecting and responding to drowsy driving incidents. By alerting drivers promptly and prompting timely corrective actions, the system contributes to the prevention of accidents and the promotion of road safety.

Looking ahead, further research and development efforts could focus on enhancing the system's capabilities, integrating additional sensors, and exploring advanced machine learning techniques to improve detection accuracy and adaptability. By continuing to innovate and refine driver drowsiness detection technologies, we can further reduce the incidence of accidents and create safer roads for all.

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