JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Deep Learning Based Driver Yawning Detection

Neha Patil[1],Namrata Patole[2],Chetan Thorat[3], Abhishek Phapale[4]

Electronics and Telecommunication Department, SPPU, Pune

[1]neharpatil2002@gmail.com, [2]namrata.nikam_skncoe@sinhgad.edu, [3]chetanthorat1802@gmail.com

[4]abhiphapale74@gmail.com

***ABSTRACT*—Drunk drivers are frequently to blame for accidents. We are seeking to solve this issue in our project by creating a system that will alert the driver if he or she is drowsy or weary. The facial region is first found and tracked in the recorded video stream using computer vision methods. The eye and mouth were removed, and they were examined for symptoms of driving fatigue. It is done by calculating the Mouth Aspect Ratio (MAR) and the Eye Aspect Ratio (EAR). Both EAR and MAR have threshold values; when the mouth is opened to yawn, the MAR value increases and the EAR value decreases. When these figures exceed their cutoff, the buzzer starts to alert the driver.**

***Keywords*— Shape-predictor-68, Open-CV, D-lib, EAR, MAR, Face landmarks.**

I. INTRODUCTION

Driving when fatigued is a serious issue in today's society. Driving when fatigued was a factor in about 12% of serious car accidents. This problem is addressed in this research by designing a system that would warn the driver if it detected sleepiness. To identify sleepiness, our method examines both the mouth and the eyes. As there will be no traffic, the drivers thought that midnight was a fantastic time to drive. As a result of the toll, it takes on their sleep cycles, they are more likely to fall asleep behind the wheel.So if they nodded off while driving, this technology will let them know. Our system can be used in commercial systems because it is not subject-dependent. By examining the eye aspect ratio and the mouth aspect ratio, it is possible to identify the eye closure and yawn (MAR). If there is a shift in these levels, we can identify the first indications of exhaustion. The driver is closing his eyes if the value of EAR keeps dropping, while the driver is yawning if the value of MAR rises. In this project, we use this logic to determine the driver's level of weariness.

II. LITERATURE SURVEY

Pooja D.C.1, Sara Aziz2, Shakuntala Koujalagi3, Shilpa B. H.4, Mr. Vasanth Kumar ,"Diver Drowsiness Detection Using Open CV and Raspberry Pi",N.T.5, ISSN: 2321-9653; Volume 10 Issue VII July 2022.
In this paper, the countless number of people drive on the highway day and night. People traveling long-distance suffer from lack of sleep. Due to which it becomes very dangerous to drive when feeling sleepy. Further rmore, driver fatigue is a factorinal most 60 percent of these accidents. In this paper, we provide a real-time monitoring system that makes use eye identification and image processing algorithm. Driver drowsiness detection is a vehicle safety technology which prevents accidents when the driver is getting drowsy.

Fouzia, Roopalakshmi R, Jayantkumar A Rathod, Ashwitha S Shetty, Supriya k, "Driver Drowsiness"Detection System Based on Visual Features" ,IEEE Catalog Number: CFP18BAC-POD,ISBN: 978-1-5386-1975-9 published April 2018.
In this paper, Driver drowsiness is one of the major cause for most of the accident since the world. Detecting the driver eye tiredness is the easiest way for measuring the drowsiness of driver. The existing systems in the literature, are providing slightly less accurate results due to low clarity in images and videos, which may result due to variations in the camera positions. When the eyes are detected closed for too longtime, a vibrator signal is generated to warn the driver. The experimental results of the proposed system, which is implemented on Open CV and Raspberry Pi environment with a single camera view, illustrate the good performance of the system in terms of accurate drowsiness detection results and thereby reduces the road accidents.

Mahek Jain, Bhavya Bhagerathi, Sowmyarani C N, "Real-Time Driver Drowsiness Detection using Computer Vision", ISSN: 2249- 8958 (Online), Volume-11 Issue-1, October 20212021.
In this paper, the driver drowsiness detection is to detect the drowsiness in low light condition. The proposed system is a method to detect driver's eye closure and yawning for drowsiness analysis by infrared camera. The advantage of this method is that it can detect eye closure and yawning in low light condition.This method consists of our steps, namely, Face detection, Eye detection,

Mouth detection, Eye closure and yawning detection.The main concept is detecting the driver's face and set it to region of Interest (ROI).

Tejashwini N, Chinna T, Deepthi R S, Swathi S, Vijayashree, "Drowsy Driving Detection System IOT Perspective" , pices, vol. 4, no. 8, pp. 203-209, Dec. 2020.

This paper proposes a true time Drowsy Driving Detection System for the prevention of road accidents using IOT. One among the main issues for the traffic collision is Sluggishness Driving. An out sized number of road accidents occur due to this which ends up in severe injuries and deaths. The measurements are highly influenced by structure of road, sort of vehicle and driving skills. These are the vehicle based(traditional approaches) measures who designs the system.

Wisaroot Tipprasert, Theekapun Charoenpong, Chamaporn Chianrabutra, Chamaiporn Sukjamsri,"A Method of Driver's Eyes Closure and Yawning Detection for Drowsiness Analysis by Infrared Camera" ISSN: 2277-3878 (Online), Volume-8 Issue-4, November 2019 .

In this paper, the proposed system aims to reduce the number of accidents that occur due to driver drowsiness and fatigue, which in turn will increase road safety. This has recently become a common reason for accidents. Various faces and body gestures are consider indicate drowsiness and fatigue in drivers, including tiredness in the eyes and yawning. These characteristics are an indication that the driver's condition is not okay[5]. EAR (Eye Aspect Ratio) calculates the ratio of distances between the horizontal and vertical eye markings required to detect drowsiness. For the purpose of detecting yawning a, YAWN value is calculated based on the distance between the lower lip and the upper lip, and the distance is compared to a threshold.

Adnan Shaikh, Rizwan Memon, Asif Lohar, Shiburaj Pappu "Driver Drowsiness Detection System Using Haar Cascade Algorithm",Volume 9 Issue 4 2022.

This paper presents the different aspects of the project related to the development of a system to detect driver drowsiness. This report analyses the different techniques and procedures used in the development of a drowsy driving detection system.The goal of this project is to provide real-world insight into how the system works and what changes can be made to improve its usefulness. Through the study, we were able to identify areas of improvement that can make the system even more efficient.

Sangivalasa, Bheemunipatnam Mandal, Visakhapatnam (A.P) –531162 2019-2020 ,"Automated Driver Driver Drowsiness Detection For Non 2 Wheelers" (A.P) –531162 2019-2022.

Many of the accidents occurs due to drowsiness of drivers. It is one of the critical causes of road ways accidents now a days. Latest statistics says that many of the accidents were caused because of drowsiness of drivers. Vehicle accidents because of drowsiness in drivers causing death to thousands of lives. Morethan30% accidents occur due to drowsiness. For the prevention of this a system is required which detects the drowsiness and alerts the driver which saves the life. In this paper we present a scheme for driver drowsiness detection. In this driver is continuously monitored through web cam.

Muhamad Razman, Hikmat Ullahkhan , Shahid Mahmood Awan , Amina Ismail , Mahwish Ilyas, And Ahasan Mahmood , "A Survey on State-of-the-Art Drowsiness Detection Techniques", IEEE Access Volume 7 DOI: 10.1109/ACCESS.2019.29143732019.

This paper presents a comprehensive analysis of the existing methods of driver drowsiness detection and presents a detailed analysis of widely used classification techniques. Drowsiness or fatigue is a major cause of road accidents and has significant implications for road safety.

R. Grace, V. E. Byrne, D. M. Bierman, J.-M. Legrand, D. Gricourt, B. Davis, et al., "A drowsy driver detection system for heavy vehicles," in Digital Avionics Systems Conference, 1998. Proceedings.17th DASC. The AIAA/IEEE/SAE, 1998, pp.I36/1 -I36/8 vol. 2.

In addition, the research frameworks are elaborated in diagrams for better understanding. In the end, over all research findings based on the extensive survey are concluded which will help young researchers for finding potential future work in the relevant field Contents.

III. BACKGROUND

Nighttime driving can be dangerous. The majority of long-distance travellers like nighttime driving.The lack of traffic is the obvious cause of this. Traffic can indeed be a good excuse, but only in particular cases.It's probable that there won't be much traffic if you drive on the weekends, even at night.Driving at night has a lot of other issues besides traffic. Consider the weather: you never know what it will be like as you travel across the state. Additionally, inclement weather like rain or snow can cause issues. Who knows how effective the headlights on your car are, either. You should have them examined! The most important element that impacts night-time driving is poor visibility. It's critical to understand that not all roads have adequate lighting at night. There can be places when you can only rely on the headlights of your car to keep your eyes on the road. Having said that, it's not unusual to drive in low-light conditions while using your high beams. While there is nothing wrong with that, the glare can reduce your visibility.

IV. METHODOLOGY

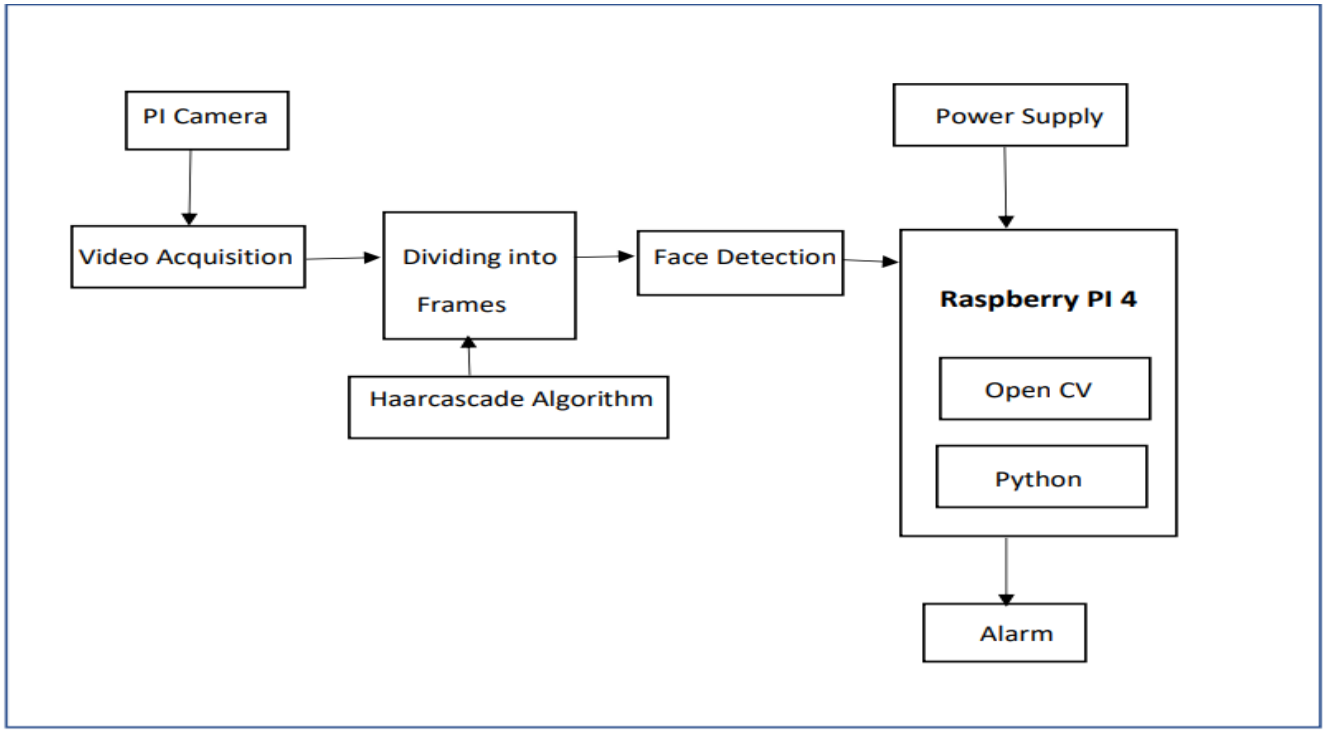

Fig.1: Architecture Diagram for Drowsiness and Yawning Detection System

❖ BLOCK DIAGRAM DESCRIPTION :-

1. Video Acquisition

The system is made to enhance the video quality of thermal imaging camera systems and give the cameras the ability to record, broadcast, and analyse footage. Getting the driver's live video feed is the major goal of video acquisition. The acquisition of video is accomplished by using a PI camera.

Face and eye recognition in the context of image processing is a crucial and difficult issue. Additionally, it is a critical phase in facial recognition. The Haar Cascade Classifier is implemented using Open-Source Computer Vision Library Open CV. In this project, a video sensor is needed to identify drivers' faces in order to recognize driver drowsiness. The rate at which the eyes blink can then be used to gauge how sleepy a motorist is. The techniques for implementing face and eye detection, including eye blinks, using the Haar Cascade Classifier and Eye Aspect Ratio, respt.The four major steps in the Haar Cascade Classifier must be completed. Haar Feature, Integral Image, AdaBoost, and Cascade Classifier are the stages. Regarding Eye Aspect Ratio, it uses a formula based on the width and height of the eye to identify eye blinks (eyes open and close).

2.Dividing into Frames:
This module is used to handle live video by taking it as an input and turning it into a collection of frames or images.Aframeset is a group of frames in the browser window. Similar to how tables are structured into rows and columns, frames are divided into frames. After identifying the driver's face, the rate at which the eyes blink is used to determine the driver's degree of drowsiness. The eye blink can be recognized using the scalar value by the Eye Aspect Ratio (EAR) formula, which was introduced in.
For instance, if a driver's eyes are blinking more frequently, it indicates that they are drowsy. In order to determine the frequency of eye blinking, it is therefore essential to accurately detect the shape of the eyes. The EAR is used as an estimation of the eye openness condition from the landmarks found in the image with the face. The eye landmarks are identified for each video frame between the computed height and breadth of the eye.

3. Face detection:- Nowadays, facial recognition systems are very common since they can be far more secure than fingerprints and typed passwords. Your smartphone's face unlock feature, which makes everything incredibly simple, may be something you're familiar with. In various locations, including airports, train stations, and streets, face recognition is also utilised for surveillance. Due of the portability and surveillance capabilities of the Raspberry Pi, we will construct a facial recognition system utilising the OpenCV library. I have tested this system, and it will undoubtedly function properly. The frame grabber provides the frames for the face detection function, which takes one frame at a time and attempts to identify the face of the car in each frame.

V. FLOWCHART

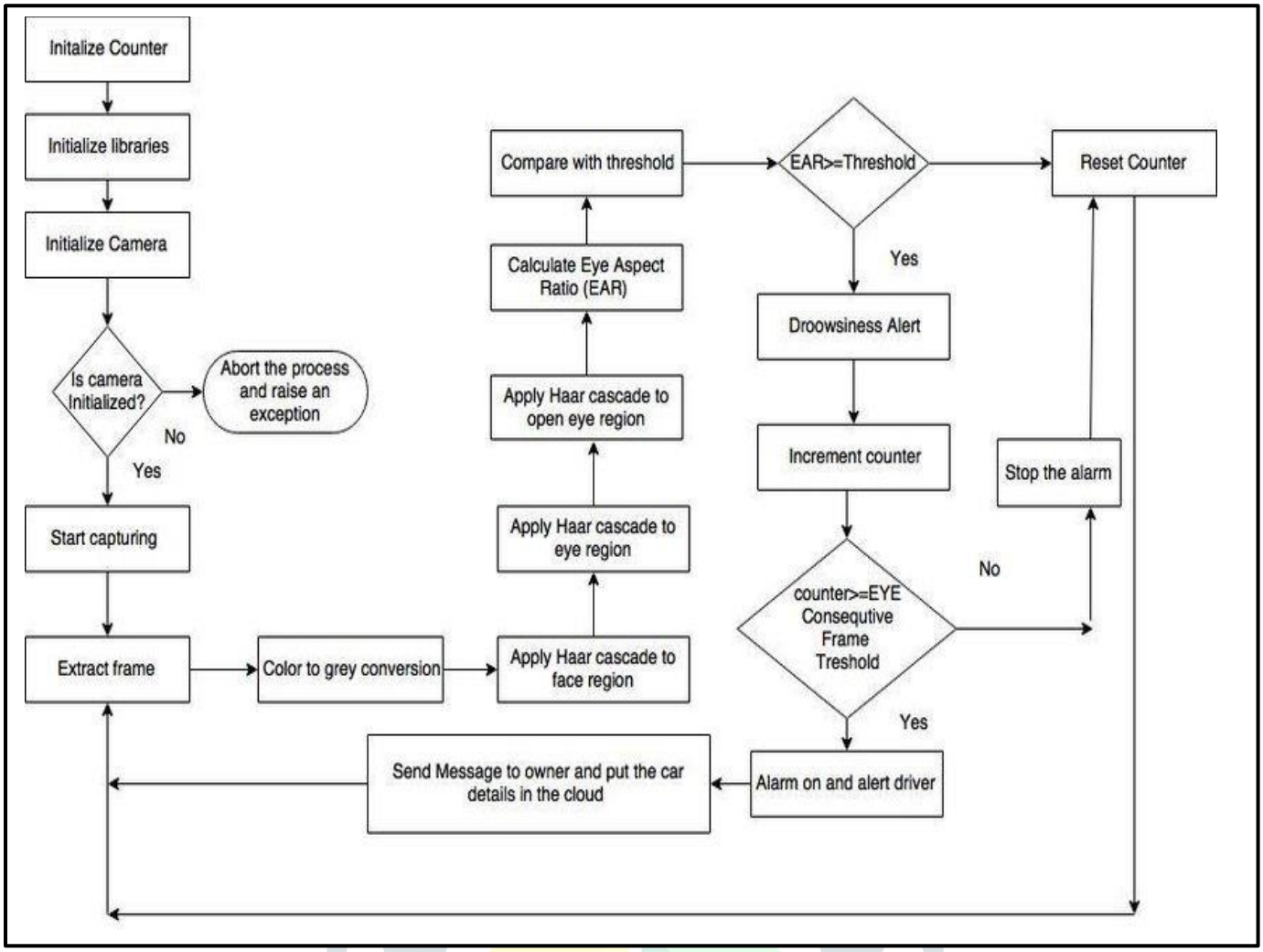

Fig.1: Flowchart ForProposed Methodology

Driver fatigue is yawning and eye blinking. To address this issue, we developed anexperiment that utilizes a Pi camera, buzzer, LCD, and Raspberry Pi to detect and alert the driver whenthey are yawning or blinking excessively. The purpose of this experiment is to create a system that canaccurately detect signs of driver fatigue and provide timely alerts to prevent accidents. By utilizing the Picamera, the system can capture real-time images of the driver's face and analyze them using imageprocessing techniques to detect yawning and eye blinking. The buzzer and LCD are used to provide audioand visual alerts to the driver when signs of fatigue are detected. The system has the potential to improvedriver safety by detecting fatigue and alerting the driver to take a break or rest, ultimately reducing the riskof accidents caused by driver fatigue. The experiment is an innovative approach to addressing a criticalissue in transportation safety and can serve as a foundation for further research and development in thefield.

❖ Steps To Setting The Raspberry Pi :

1. MountthePi cameraonthedashboardofthevehiclefacingtowards thedriver'sface.
2. ConnectthePicameratotheRaspberryPiusingaribboncable.
3. Connectabuzzertothe RaspberryPithroughaGPIOpin.
4. ConnectanLCD screento theRaspberryPi usingthe HDMIport.
5. Install the necessary software on the RaspberryPi, such as Python and OpenCV, to process thevideofeedfrom thePi camera.

VI. RESULT AND OUTPUT

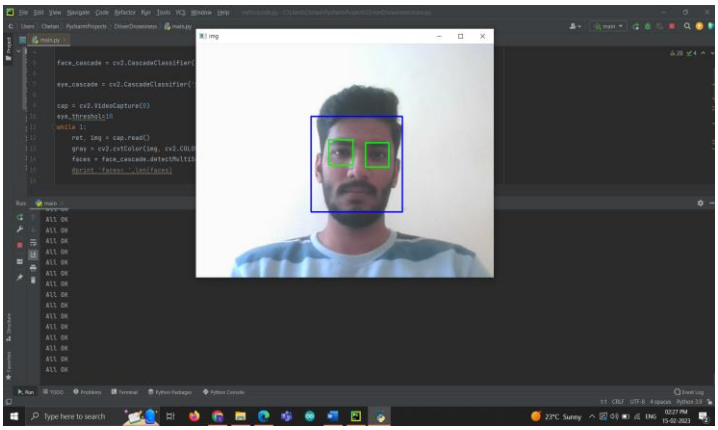

Fig. 2.1 when the subject is awake.

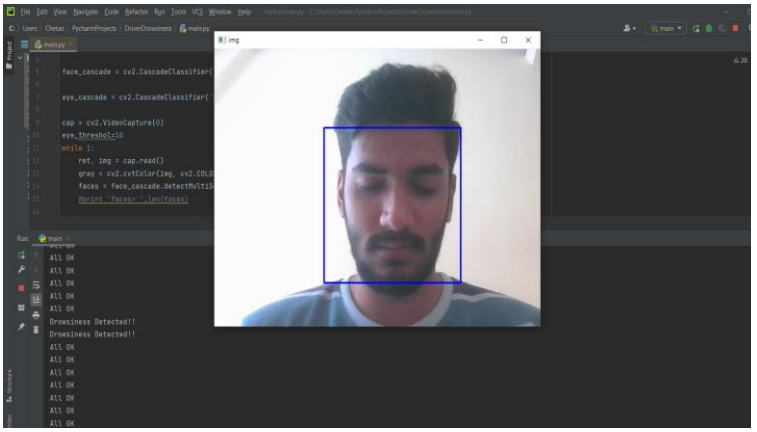

Fig. 2.2 when the subject eyes are closed.

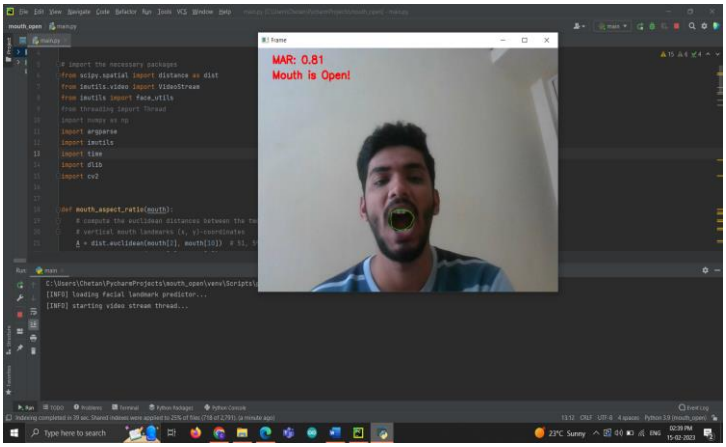

Fig. 2.3 when the subject's mouth is open

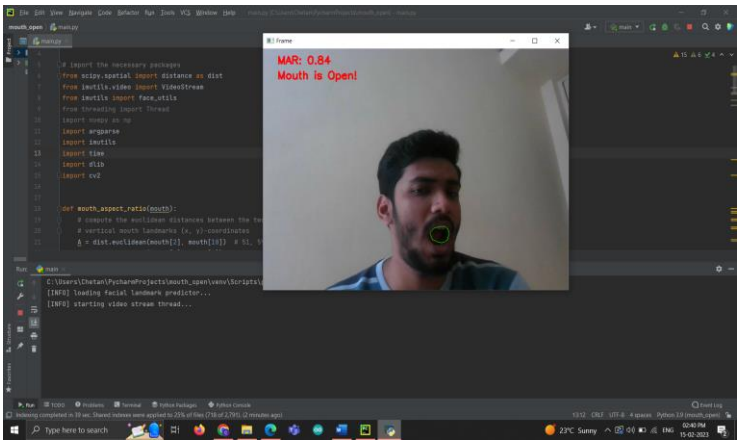

Fig. 2.4 when the subject's mouth is open in different direction.

The Fig. 2.1 is shows that in order to identify symptoms of fatigue or yawning, the system employs a webcam to take real-time pictures of the driver's face. These pictures are then processed using computer vision algorithms. The driver's eye and mouth movements are examined by image processing algorithms, which seek for signs of weariness in their patterns.Let's now concentrate on the image of a motorist who is awake. The driver may be seen in this picture with their lips closed and their eyes open. The driver's eyes seem awake and focused, showing that they are paying attention and that they are not showing any indications of exhaustion or sleepiness. In a similar manner, the system would search for modifications in the driver's mouth movement, such as opening or shutting of the mouth or adjustments in the contour of the lips, to identify yawning. The device will sound an alarm to urge the driver to take a break if they repeatedly yawn, which is a sign that they are getting tired.

Certainly! In the Fig.2.2 The driver's eyelids are closed in the second illustration, suggesting that they could be getting sleepy or drowsy. The driver tiredness and yawning detection system is made to watch the driver's eye movements and recognise when their eyes are closed for a considerable amount of time.The system may play a sound or trigger a buzzer to inform the driver if it is set up to employ an audible alert. If the driver has already started to doze off, this signal should be audible enough to wake them. A message such as "Warning: Driver Drowsiness Detected" could also be shown on a monitor inside the car if the system is set up to employ a visual alert. Please pause for a moment. The intention is to warn the motorist that they need to take a pause or rest if they are getting drowsy in either scenario.The driver can then proceed to take the proper action, such as stopping by the side of the road to take a sleep or exchanging driving duties with another passenger. All things considered, the driver sleepiness and yawning detection system is a crucial safety element that can aid in preventing accidents brought on by driver weariness. The device can assist in ensuring that drivers maintain their alertness and attention while operating a vehicle by watching their eye and mouth movements and warning them when they start to drowse or yawn.

Also in above Fig.2.3 and Fig.2.4the driver is yawning, as seen by the gaping lips. The purpose of the driver tiredness and yawning detection system is to track the driver's mouth movements and identify instances when their mouth is open for a protracted length of time.

VII. CONCLUSION

The suggested system operates quickly and analyses the video sequence in real-time. as it won't employ any sophisticatedalgorithms. Low lighting doesn't affect how well it functions. The system is quick, and once it begins taking pictures, it keepsfinding faces and performing detection until it is stopped. This system can be used in commercial systems because it is not subject-dependent. To determine a worker's level of weariness, it can also be utilized in industries. In the future, a system that would slow the car down and park it on the side of the road could be added. A GSM module attached to an accident detection system that would phone a nearby hospital to request an ambulance can be added. Driving while fatigued is dangerous for the driver, other passengers, and cargo.

VIII. FUTURE SCOPE

- Future research might concentrate on how to measure weariness using external aspects like vehicle states, sleeping patterns, weather, mechanical data, etc.

- Drowsiness detection systems may be added to aircraft in the future to inform pilots.

- In the future, it can be used to establish drowsiness detection systems in colleges and schools, alerting personnel to tired students in the classroom.

ACKNOWLEDGMENT

With great pleasure, we deliver the project report for the initial phase, titled "Driver yawning analysis utilising PI Camera and Deep Learning." I'd want to take this opportunity to express my gratitude to Ms. S. M. Ingawale, my internal guide, for providing me with all the support and direction I required. We sincerely appreciate their thoughtful assistance. Their insightful advice was quite beneficial. We also acknowledge the invaluable assistance and advice provided by Dr. S. K. Jagtap, Head of the Electronics and Telecommunication Engineering Department at the Sinhgad Institute of Technology in Pune. The appreciation would be lacking if we did not express our gratitude to our principal, Dr. A.V. Deshpande, who provided us with all the working facilities and the required direction on project.

REFERENCES

[1] Pooja D.C.1, Sara Aziz2, Shakuntala Koujalagi3, Shilpa B. H.4, Mr. Vasanth Kumar ,“Diver Drowsiness Detection Using Open CV and Raspberry Pi”,N.T.5, *ISSN*: 2321-9653; Volume 10 Issue VII July 2022.

[2] Fouzia, Roopalakshmi R, Jayantkumar A Rathod, Ashwitha S Shetty, Supriya k, “Driver Drowsiness”Detection System Based on Visual Features” ,*IEEE Catalog Number: CFP18BAC-POD,ISBN*: 978-1-5386-1975-9 published April 2018.

[3] Mahek Jain, Bhavya Bhagerathi, Sowmyarani C N, “Real-Time Driver Drowsiness Detection using Computer Vision”, *ISSN*: 2249- 8958 (Online), Volume-11 Issue-1, October 20212021.

[4] Tejashwini N, Chinna T, Deepthi R S, Swathi S, Vijayashree, “Drowsy Driving Detection System IOT Perspective” , pices, vol. 4, no. 8, pp. 203-209, Dec. 2020.

[5] Wisaroot Tipprasert, Theekapun Charoenpong, Chamaporn Chianrabutra, Chamaiporn Sukjamsri,”A Method of Driver’s Eyes Closure and Yawning Detection for Drowsiness Analysis by Infrared Camera” *ISSN:* 2277-3878 (Online), Volume-8 Issue-4, November 2019 .

[6] Adnan Shaikh, Rizwan Memon, Asif Lohar, Shiburaj Pappu “Driver Drowsiness Detection System Using Haar Cascade Algorithm”,Volume 9 Issue 4 2022.

[7] Sangivalasa, Bheemunipatnam Mandal, Visakhapatnam (A.P) –531162 2019-2020 ,“Automated Driver Driver Drowsiness Detection For Non 2 Wheelers” (A.P) –531162 2019-2022.

[8] Muhamad Razman, Hikmat Ullahkhan , Shahid Mahmood Awan , Amina Ismail , Mahwish Ilyas, And Ahasan Mahmood , “A Survey on State-of-the-Art Drowsiness Detection Techniques”, *IEEE* Access Volume 7 DOI: 10.1109/ACCESS.2019.29143732019.

[9] R. Grace, V. E. Byrne, D. M. Bierman, J.-M. Legrand, D. Gricourt, B. Davis, et al., "A drowsy driver detection system for heavy vehicles," in *Digital Avionics Systems Conference, 1998. Proceedings.17th DASC. The AIAA/IEEE/*SAE, 1998, pp.I36/1 -I36/8 vol. 2.

[10] Shruti Mohanty, Shruti V Hegde, Supriya Prasad, J. Manikandan ,“Design of Real-Time DrowsinessDetection System using Dlib”, 2019 5th *IEEE International WIE Conference on Electrical and Computer Engineering*, 15-16 Nov 2019, Bangalore, India.

[11] Z. Mardi, S. N. Ashtiani, and M. Mikaili, “EEG-based drowsiness detection for safe driving using chaotic features and statistical tests*,” Journal of Medical Signals and Sensors*, vol. 1, pp. 130–137, 2011.

[12] M. Saradadevi and P. Bajaj, "Driver fatigue detection using mouth and yawning analysis*," International Journal of Computer Science and Network Security(IJCSNS)*, vol. 8, pp. 183-188, 2008.

[13] B. T. Jap, S. Lal, P. Fischer, and E. Bekiaris, "Using EEG spectral components to assess algorithmdetecting fatigue," Expert Systems with Applications, vol. 36, pp. 23522359, 2009.

[14] T. Danisman, I. M. Bilasco, C. Djeraba, and N. Ihaddadene, "Drowsy driver detection system using eye blink patterns," in Machine and Web Intelligence (ICMWI), 2010 International Conference on, 2010, pp.230-233.

S. Podder and S. Roy, *“Driver’s drowsiness detection using eye status to improve the road safety,”* International Journal of Innovation Research in Computer and Communication Engineering, vol. 1, no.7, 2013.