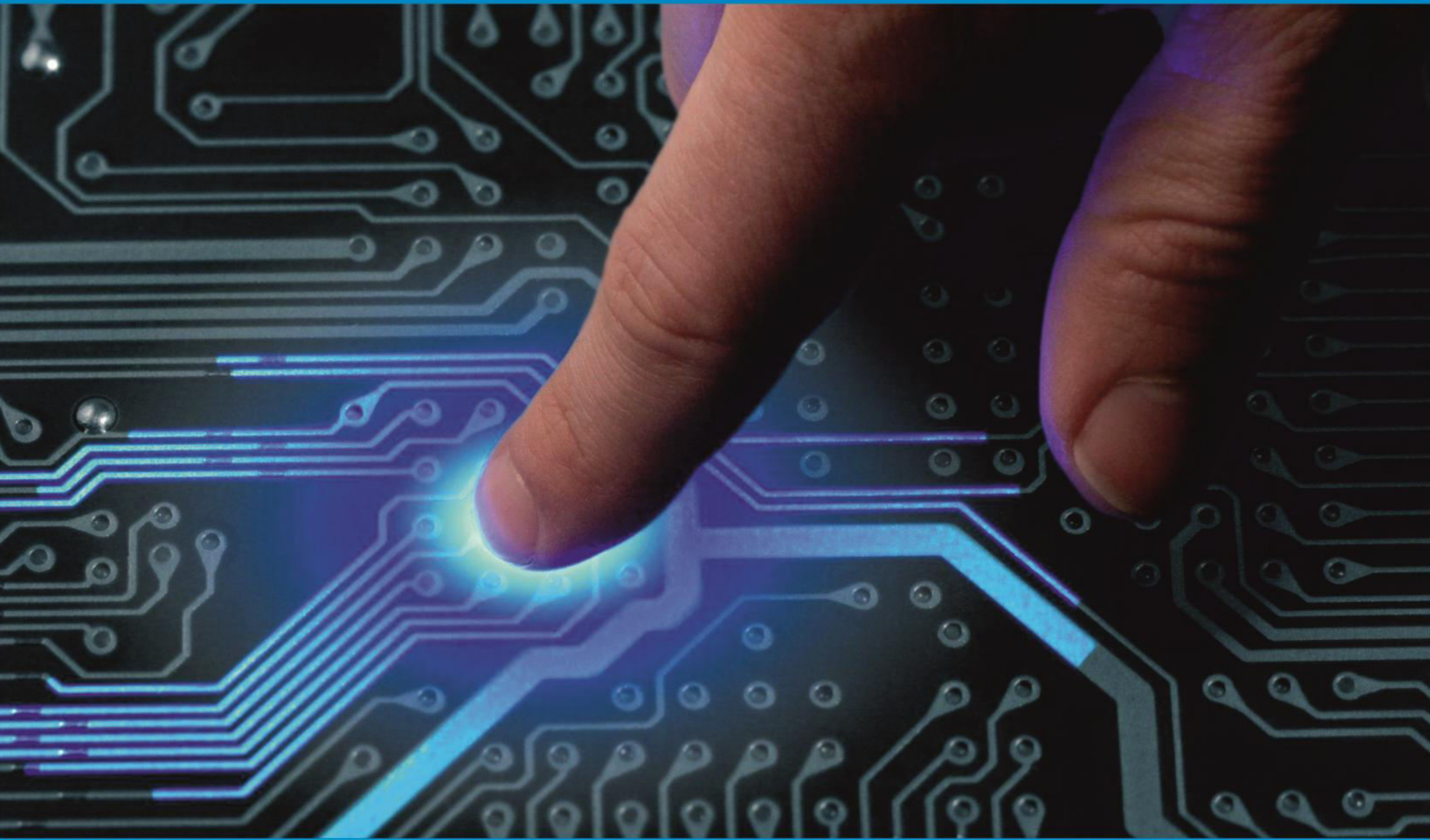
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 5, May 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.488

9940 572 462 | 6381 907 438 | ijircce@gmail.com | www.ijircce.com

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 5, May 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0905108

Drowsiness Detection using Real-Time Video Processing

Vaishnavi Kadam, Soham Raorane, Prerna Khivasara, Swarang Haldankar, Smita Bansod

B.E Student, Dept. of I.T., Shah & Anchor Kutchhi Engineering College, Mumbai, India

B.E Student, Dept. of I.T., Shah & Anchor Kutchhi Engineering College, Mumbai, India

B.E Student, Dept. of I.T., Shah & Anchor Kutchhi Engineering College, Mumbai, India

Assistant Professor, Dept. of I.T., Shah & Anchor Kutchhi Engineering College, Mumbai, India

ABSTRACT: Drowsiness has been perpetrated to be one of the most common causes of road accidents. According to enforcement officers patrolling the highways and major roads in India, sleep-deprived drivers remain responsible for about 40% of road accidents.

In this paper, a system for Drowsiness Detection is presented to possibly reduce the number of accidents and increase transportation safety. The face is an important part of the body that bequeaths a lot of information. When a driver is in a state of fatigue or asleep, the frequency of time his eyes are closed is comparatively more than that of the normal state. This system consists of a robust algorithm that analyzes the eye to eyelid ratio of the driver to generate equations based on the threshold value to detect whether the driver is drowsy or not. If the algorithm finds the driver's eyes closed for an extended amount of time, the system alerts the driver by ringing a loud alarm.

KEYWORDS: Drowsiness, real-time video processing, facial landmarks, Python, alert.

I. INTRODUCTION

Car accidents are the major cause of death in which approximately 1.35 million people die each year. The majority of these accidents are caused because of drowsiness or due to distraction of the driver. Countless people drive for long distances every day and night on the highway. Lack of sleep or distractions like attending phone calls, talking with the passenger, etc. may lead to an accident [1]. We proposed a system that alerts the driver if the driver gets distracted or feels drowsy to prevent such accidents.

Intelligent vehicle systems are being built due to the advancement in computing technology. Drivers must always be cautious and alert while driving on the road so that they can react to sudden events immediately. Driver fatigues often become a direct cause of many traffic accidents. Therefore, there is a need to develop systems that will detect and notify the driver when he/she is feeling fatigued, which could significantly reduce the number of fatigue-related car accidents. One of the possible uses of intelligent vehicle systems is Drowsiness Detection. This system,

1. Uses facial landmarks detection and image processing for detection of drowsiness.
2. Alerts the driver by ringing the alarm if drowsiness is detected.

This system consists of portable hardware which can be easily installed in the car for use.

II. LITERATURE SURVEY

In a comparison with previous research, we discovered that face detection using facial landmarks is the most powerful approach since it can detect the face and distinguish its components to produce process outputs. As a result, this method was chosen for data analysis. As a result, this method was chosen for data analysis.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 5, May 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0905108

Drowsy Driving: Asleep at the Wheel Drowsy Driving [2] is a risky blend of driving and sleepiness or exhaustion. This generally occurs when a driver has not slept enough, but it may also happen as a result of chronic sleep disorders, medications, substance abuse, or heavy workloads.

As this article suggests, the symptoms of drowsiness are as follows:

1. It impairs your ability to pay attention to the lane.
2. Slows response speed when braking or steering unexpectedly.
3. It affects your ability to make sound choices.

B. Real-time Facial Landmark Detection

This article [3] illustrates how to use Python, OpenCV, and dlib to incorporate real-time facial landmark detection that can be used in video streams. In this case, the process is centered around detecting facial landmarks in a sequence of frames. It uses the module imutils which consists of basic image processing functions such as skeletonization, displaying Matplotlib images, sorting contours and detecting edges.

dlib is a landmark's facial landmark detector consisting of pre-trained models. It estimates the location of 68 (x, y)-coordinates that is responsible for mapping the facial structures on the face.

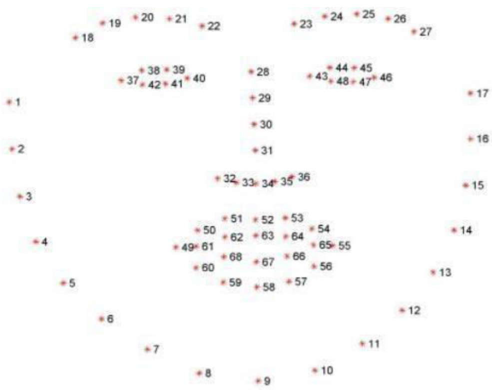


Fig. 1. Visualization of Indexes of 68 Facial Landmarks

C. Survey of Existing Systems

Petchara Inthanon and Surasak Mungsing [4] researched “Detection of Drowsiness from Facial Images in Real-Time Video Media using Nvidia Jetson Nano”, which uses the tool Nvidia Jetson Nano with an IoT equipment to detect facial landmarks from the video media that help to generate equations to analyze the symptoms of drowsiness. This system uses an infrared camera which is difficult to find and hence without this camera, it becomes difficult to detect a face accurately in low light.

Manu B.N [5] researched “Facial Features Monitoring for Real Time Drowsiness Detection”, which uses Viola Jones to detect facial features, which once detected are then converted into illumination invariant. It also performs eye tracking as well as yawning detection using correlation coefficient template matching. If any of the former phases are detected, then an alarm will ring. For classification, a binary classifier SVM is used with a linear kernel. Matlab 13 is used for acquiring video frames from a camera that captures 15fps 40 M pixels. This system fails to predict drowsiness if the head is tilted or lowered.

Wisaroot Tipprasert, Theekapun Charoenpong, Chama- porn Chianrabutra and Chamaiporn Sukjamsri [6] researched “A Method of Driver’s Eyes Closure and Yawning Detection for Drowsiness Analysis by Infrared Camera”, which uses an infrared camera for detecting driver’s eyes closure and yawning for drowsiness analysis. The advantage of the system is that it performs effectively in low light conditions as well. While experimenting, the camera was setup in such a way that it wasn’t directly facing the driver due to which the camera was to detect the full face of the driver, which created further errors. Here, the occurrence of errors was also caused due when the face was obstructed by a hand.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 5, May 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0905108

Belal Alshaqaqi, Abdullah Salem Baquhaizel, Mo- hamed El Amine Ouis, Meriem Boumehed, Abdelaziz Ouamri and Mokhtar Keche [7] researched "DRIVER DROWSINESS DETECTION SYSTEM", which uses Advanced Driver Assistance System (ADAS) for possibly reducing the number of road accidents caused by drowsy drivers. This system uses Artificial Intelligence to detect drowsiness based on visual information. It uses the PERCLOS which is a scientifically supported measure of drowsiness associated with slow eye closure. In the future, this system is going to implement its algorithm on a Digital Signal Processor (DSP) to create a real-time autonomous system.

W. Deng and R. Wu [8] researched "Real-Time Driver- Drowsiness Detection System Using Facial Features", which proposes a system called DriCare uses MC-KCF algorithm to monitor the driver's face and identify facial key regions to track a driver's tired status and achieve the system's real-time accuracy. It is made up of a commercial camera vehicle unit, a cloud server that processes video data, and a smartphone that stores the outcome.

III. PROPOSED SYSTEM

The system design consists of a webcam that acts as an input, various Python libraries for processing the data, and Anaconda terminal to display the output.

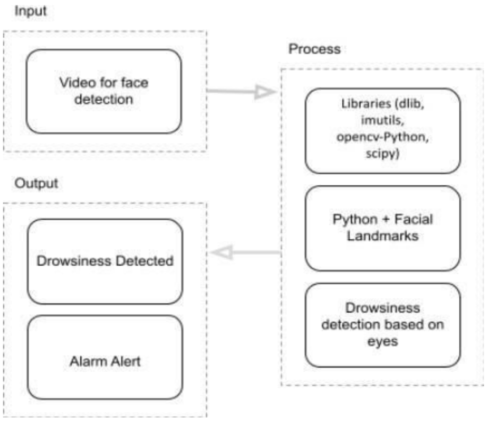


Fig. 2. System Workflow

The webcam is used to continuously track the movement of the eyes of the driver. The camera is used at a fixed frame rate of 20fps, for capturing the images. The image processing module processes these images to performs face landmark detection to detect drowsiness of the driver.

EAR (Eye Aspect Ratio) can detect drowsy people's unusually long-closed eyes. Eye detection in the x-axis parallel to the earth and y-axis parallel to the earth at 90 degrees has 12 points in total as shown in Figure 2. Points 0, 1, and 5 are left eye points. And points 2, 3, and 4 are right eye points.

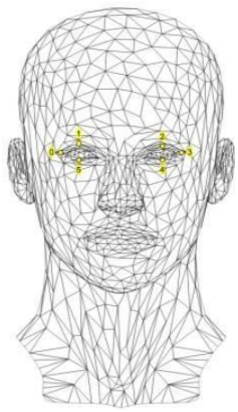


Fig. 3. Facial Landmarks

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 5, May 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0905108

To detect the drowsiness, we derived an equation. To calculate this equation, we need the horizontal points of the right and left eyes i.e., 0 and 3 respectively. And we also need the vertical points of the right eye i.e., 1 and 5, and the vertical points of the left eye i.e., 2 and 4.

Using variables X and Y, we calculate the Euclidean distances between the two sets of vertical eye landmarks (x, y)-coordinates.

To calculate the Euclidean distance between the horizontal eye landmark (x, y)-coordinates, we use the variable Z.

Eyes motion behavior calculation indicates that normal value is displayed when eyes open. When the EAR value is lower than a specific point (0.25), it detects that the eyes are closed. If the eyes are closed for an extended amount of time, it considers it as a symptom of drowsiness and rings an alarm to alert the driver.

IV. EXPERIMENT RESULTS

The table below shows the results obtained from the system:

Eye State	**EAR**	**Alert**
Open	$x > 0.35$	-
Half Closed	$0.25 < x < 0.35$	-
Closed	$x < 0.25$	Drowsiness Alert!

As the system consists of a module that detects the eyes, to test the system performance, we conducted the following experiments:

1. Eye detection without any obstruct: The system performed accurately.

2. Eye detection with an obstruct:
   The system performed accurately when the other components of the face were covered. The system even worked when a few strands of hair were covering the eyes.
3. Eye detection while yawning:
   Even though the system doesn't have any module for mouth detection, it worked as while yawning the driver's eyes are usually almost closed.

4. Eye detection while wearing spectacles:
   The system performed accurately with an exception of when the light was reflected on the spectacles making it difficult for the system to detect the eyes.

5. Eye detection while one eye was closed:
   The accuracy of the results here was 50%, as the system fluctuated between giving an alert and not.

6. Eye detection while the head is tilted:

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 5, May 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0905108

The system performance was average with an exception of when the head was turned to either side or lowered.

V. CONCLUSION AND FUTURE SCOPE

In this paper, we presented a system that performs real- time video processing to detect the drowsiness of a driver and if so, alerting the driver by ringing an alarm.

The accuracy of the detection is not affected even when the face is covered in some parts except for the eyes. It even works efficiently when the driver is wearing spectacles with the limitation of when light is directly reflected onto spectacles making it difficult for the system to detect the eyes. With poor lighting conditions even though the face is easily detected, sometimes the system is unable to detect the eyes. The results are sufficient, but there is room for progress in face recognition using other methods including symmetry estimation.

A possible future scope would consist of infrared cameras that can be used to detect faces in poor lighting conditions. Other hospitality functionalities can be added to the system. For example, in case of an accident, an emergency service alert with a location tracker that sends the location of the accident to the emergency services and few selected contacts can be added to the proposed system. It would also be more efficient to integrate this system as an inbuilt system in the vehicles rather than it being individually implemented.

REFERENCES

1. Social Determinants of Health, "Global status report on road safety 2018", World Health Organization.
2. "Drowsy Driving: Asleep at the Wheel", Centers for Disease Control and Prevention.
3. "Real-time facial landmark detection with OpenCV, Python, and dlib", pyimagesearch, https://www.pyimagesearch.com/2017/04/17/real-time- facial-landmark-detection-opencv-python-dlib/.
4. Petchara Inthanon and Surasak Mungsing, "Detection of Drowsiness from Facial Images in Real-Time Video Media using Nvidia Jetson Nano", 2020 17th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON).
5. Manu B.N, "Facial Features Monitoring for Real Time Drowsiness Detection", 2016 12th International Conference on Innovations in Information Technology (IIT).
6. Wisaroot Tipprasert, Theekapun Charoenpong, Chama- porn Chianrabutra and Chamaiporn Sukjamsri, "A Method of Driver's Eyes Closure and Yawning Detection for Drowsiness Analysis by Infrared Camera", 2019 First International Sym- posium on Instrumentation, Control, Artificial Intelligence, and Robotics (ICA-SYMP).
7. Belal Alshaqaqi, Abdullah Salem Baquhaizel, Mo- hamed El Amine Ouis, Meriem Boumehed, Abdelaziz Ouamri and Mokhtar Keche, "DRIVER DROWSINESS DETECTION SYSTEM", 2013 8th International Workshop on Systems, Signal Processing and their Applications (WoSSPA).
8. W. Deng and R. Wu, "Real-Time Driver-Drowsiness Detection System Using Facial Features", in IEEE Access, vol. 7, pp. 118727-118738, 2019, doi: 10.1109/ACCESS.2019.2936663.