iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** V **Month of publication:** May 2021

DOI: https://doi.org/10.22214/ijraset.2021.34668

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

Driver's Drowsiness Detection System

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Abstract: ***With an average number of 1.4 Billion vehicles hitting the road worldwide, the saturation rate has been increased by around 18 percent per year globally. With this number of vehicles, a normal man commuted for at least 15 to 20km per day worldwide. Also, due to the increased use of roadways in Business like Logistics transport, the commute distance may increase to thousands of KMs per day increasing the traffic level on highways worldwide. With all these aspects in mind, there is a huge chance that Drivers in the city/country must drove over time and over distance. Resulting in spreads of Drowsiness among the drivers. To overcome this situation and to avoid any Human casualty in the future, I am trying to set up a small mechanism to alert the driver and their respected loved ones whenever any driver goes drowsy while driving.***
Driver Drowsiness system (D3S) is a mechanism that reads the facial expression of an individual sitting in the driver's seat and detects whether a driver is sleeping or about to sleep. On the determination of his/her expression, the system generates a loud alarm which makes the driver awake and avoids any mishaps on road.
Keywords: Face Detection, Eye Detection, Blink Detection, Yawn Detection, Flask.

I. INTRODUCTION

Nowadays, Transport systems are an essential part of human activities. In this fast-moving world, a normal man commutes for at least 15 to 20km per day and if the person is living in Metros-like cities, consider the commute for a minimum of 40 to 50km per day. Due to such high demand for commuters, an increase in Cab/bus drivers is an expected need. To fulfill the demand, most of the time it happens that Drivers in the city/country must drove over time and distance. Resulting in a spread of Drowsiness among the drivers. According to Economic Times, five lakh accidents take place in the country every year and around 1.5 lakh people are killed, and between 2.5-3 lakh people are injured. The GDP loss to the country is two percent. Besides, 62 percent of those killed in road accidents are in the 18-35 age group. Also, according to the studies by Financial Express, around 40% of Total accident cases in India had happened just because of Driver's drowsiness while driving on road. The increasing number of accidents due to a driver's vigilance level diminishing has become a grave problem for us. Exhausted drivers lead to take the lives of themselves as well as the co-passenger along with the victim of an accident in many cases.

So, in this context, it is important to use new technology to monitor and alert drivers for the entire journey of driving.

In this paper, a module for D3System is presented which can help to reduce the number of accidents caused by driver's drowsiness and will improve road safety as well as makes driver's and traveler's life easy by integrating a live detection and alerting system in running vehicle on road. Driver Drowsiness Detection System (D3S).

II. LITERATURE SURVEY

Many efforts have been reported in the literature of development on the drowsiness, alert devices, and eye motion detection system is comprehensive and varied.This section discusses a few research articles which mainly focus on drowsiness alert devices and related eye detection systems which have helped in the initial process of prototype designing.

Vitabile et al. [4] implement a system to detect symptoms of driver drowsiness based on an infrared camera. By exploiting the phenomenon of bright pupils, an algorithm for detecting and tracking the driver's eyes has been developed. When drowsiness is detected, the system warns the driver with an alarm message.

Hong et al. [5] define a system for detecting the eye states in real-time to identify the driver drowsiness state. The face region is detected based on the optimized Jones and Viola method [3]. The eye area is obtained by a horizontal projection. Finally, a new complexity functions with a dynamic threshold to identify the eye state.

Alshaqaqi et al. [6] propose an algorithm to locate, track and analyze both the driver's face and eyes to measure PERCLOS, a scientifically supported measure of drowsiness associated with slow eye closure.

Tereza Soukupova´ and Jan C˘ ech et al. [7] proposed A real-time algorithm to detect eye blinks in a video sequence from a standard camera using EAR and SVM.

Tianchi Liu et al. [8] defined a system called, Driver Distraction Detection Using Semi-Supervised Machine Learning.

A. As Gone Through The Above Research Come To Know Below Strategies For The Identification Of Driver's Drowsy State

1) Face Detection
2) Eye-Region Extraction
3) Mouth-Region Extraction
4) Blink Detection
5) SVM
6) PRECLOS

B. Also, There Are Various Strategies To Detect Drowsiness Are Available As Mentioned Below

1) Steering pattern monitoring
2) Vehicle position in lane monitoring
3) Physiological measurement
4) Driver eye/face monitoring

By throwing light on what has been mentioned above there are some pros and cons of the first four systems available but in all four I went for the fourth system as it is less expensive, hard to manipulate its data.

III.PROPOSED SYSTEM

The speedy detection and process of information is that the main aim of my system. In this section, will introduce my system that detects the drowsiness of the driver.

Following are the successive stages of a project:

1) Face Detection
2) Eye & Lips region extraction
3) Eye-Blink and Yawn Detection
4) Alarm Generation
5) Embedding code to a flask

A. Face Detection

Have used an approach namely the Viola-Jones algorithm for object detection that minimizes computation time whereas achieving high detection accuracy. The approach was used to construct a face detection system that is approximately fifteen times quicker than any previous approach.

Face detection mainly follows below stages:

1) *Haar Features:* Viola-Jones algorithmic rule uses a 24x24 window as the base window size to start evaluating these features in any given image. If we consider all features into mind then there will be 160,000+ features in this window.
2) *Integral Image:* In integral image ,Rectangle features are computed very rapidly using an intermediate representation.
3) *Ada Boost:* As stated previously there can be approximately 160,000+ feature values within a detector at 24x24 base resolution which needs to be calculated. But it is to be understood that only a few sets of features will be useful among all these features to identify a face. Ada-boost is a machine learning algorithm that helps in finding only the best features among all these 160,00+ features. After finding features, a weighted combination of all these features is used in evaluating and deciding that any given window has a face or not.
4) *Cascade:* The basic principle of the Viola-Jones face detection algorithm is to scan the detector many times through the same image –each time with a new size. Even if an image should contain one or more faces, it is obvious that an excessively large amount of the evaluated sub-windows would still be negatives (non-faces). So, the algorithm should concentrate on discarding non-faces quickly and spend more time on probable face regions. Hence a single strong classifier formed out of the linear combination of all best features is not good to evaluate on each window because of computation cost.Therefore, a cascade classifier is used which is composed of stages.Where the job of each stage is used to determine whether a given sub-window is not a face or maybe a face. A given sub-window is immediately discarded as not a face if it fails in any of the stages.

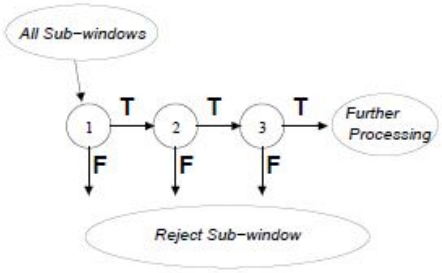


Fig 1.0: Cascade classifier.

B. Eye & Lips Region Extraction

Once the face is detected, now comes the task to detect the facial landmarks in the face using the dlib's landmark predictor. The landmark predictor returns 68 (x, y) coordinates representing different regions of the face, namely - mouth, left eyebrow, right eyebrow, right eye, left eye, nose, and jaw. For sure, I do not need all the landmarks, here I need to extract only the eye and the mouth region landmarks.

Steps

1) Load shape predictor

2) Map facial landmarks

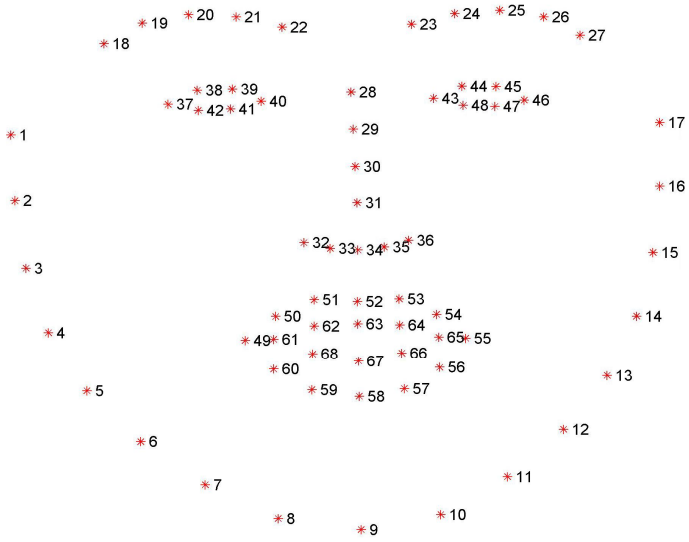


Fig 2.0: 68Facial landmarks.

C. Eye-Blink & Yawn Detection

After extracting mouth and eye coordinates from facial landmark the next task is to detect blink and yawn and this is done with the help of EAR(Eye Aspect Ratio) and MAR(Mouth Aspect Ratio).The eye region is marked by 6 coordinates. These coordinates can be used to find whether the eye is open or closed if the value of EAR is checked with a certain threshold value.

E.g.

EAR = (A + B) / (2.0 * C)

EAR < = 0.2 ,Blink is detected

In the same way, MAR is calculated to detect if a person is yawning. Although, there is no specific metric for calculating this, so have taken for points, 2 each from the upper and lower lip and calculated the mean distance between them as:

MAR = (A + B + C) / 3.0

MAR>14,Yawn is detected.

D. Alarm Generation

Once the EAR and MAR ratios detected above and below their threshold ,the alarms are blown.

E. Embedding Code To Flask

Here, I have used Flask to render the python code into the website.Flask is a micro web framework written in Python. It is classified as a microframework because it does not require tools or libraries. It has no database abstraction layer, form validation, or any other components where preexisting third-party libraries provide common functions.

1) Type of Devices Needed

After knowing all things, here comes main part ,i.e., type of devices identified for capturing images.

2) Face is Detected using 3 Options of Cameras

a) Web Camera.

b) External IR Camera.

c) Mobile Phone Camera.

Web Camera of laptop and External IR Camera can be accessed easily by using OpenCV library.

For using Mobile phone camera, you have to download 'IP Webcam' application which is easily available on play store and it is used for connecting project system with android mobile phones using IP address of mobile phone. Only the thing is , we must put that unique IP in code to make it work.

IV. RESULT

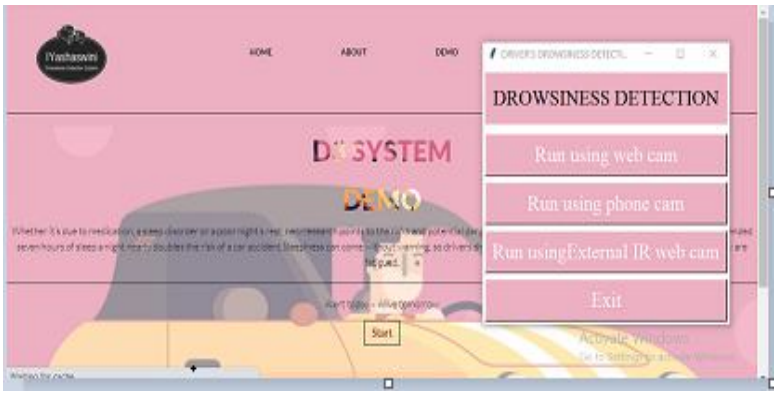


Fig 4.0: Drivers Drowsiness Detection System Web page.

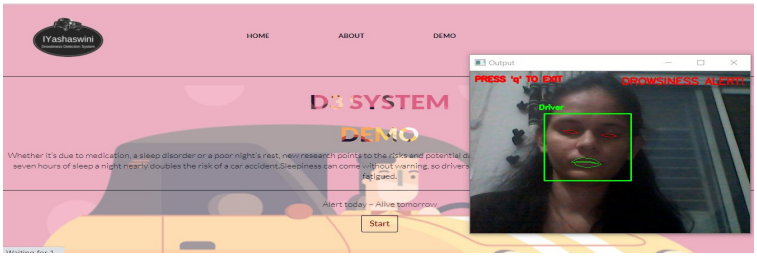


Fig 4.1: Drowsiness Detection using Webcam.

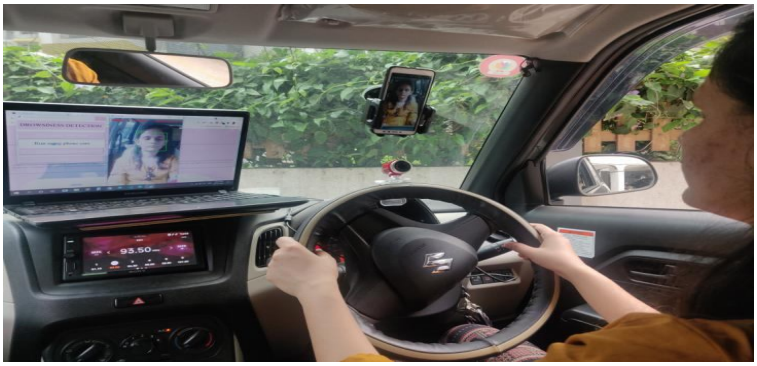


Fig 4.2: Drowsiness Detection using Mobile Phone.

Fig 4.3: Drowsiness Detection using External Webcam.

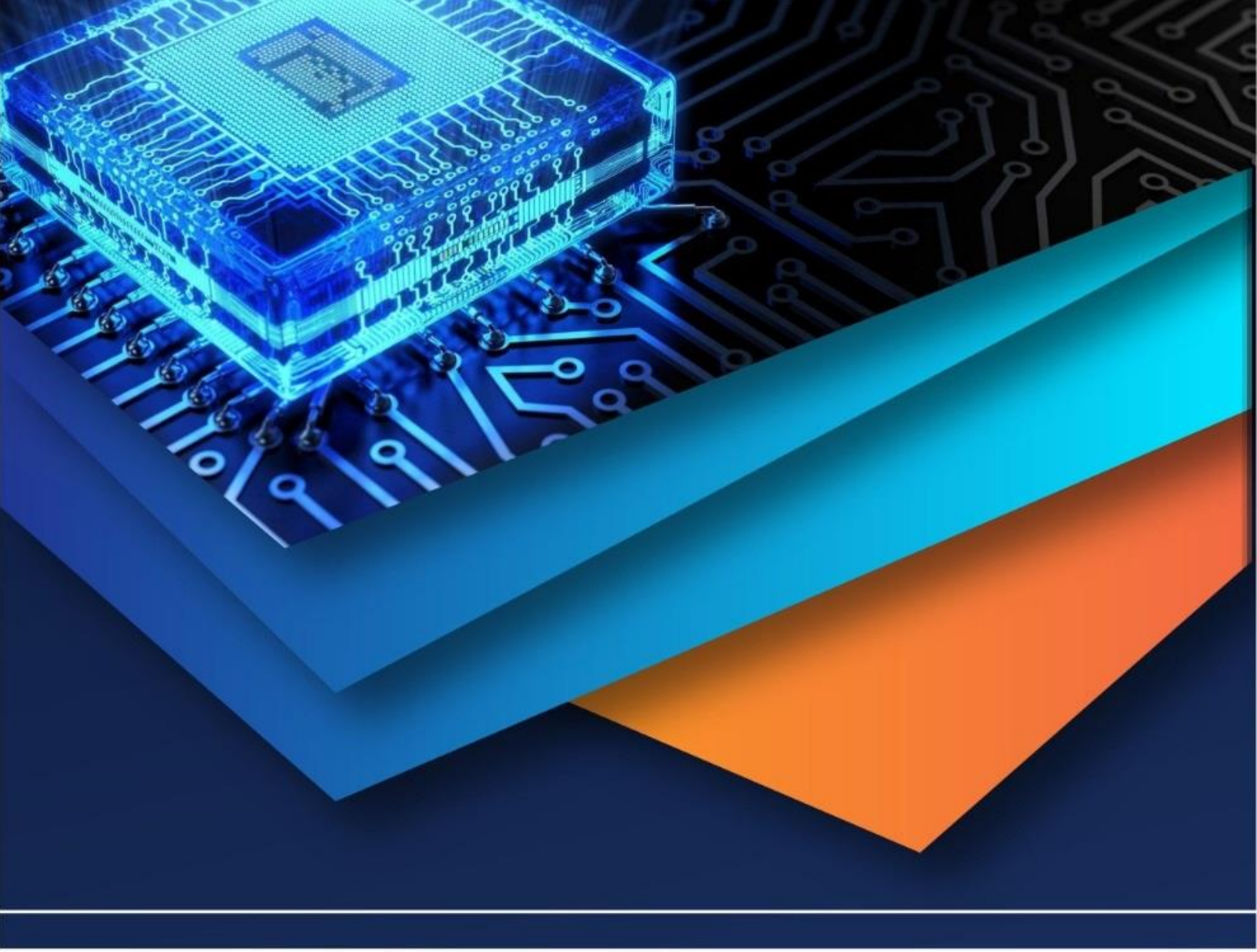
V. CONCLUSION

This paper presents the Concept and Implementation of a Drowsiness Detection System to alert the driver about his/her drowsy state and saves him/her from meeting with any harm.This system determines the state of the driver in Day as well as Night conditions at runtime using an IR camera with an experimental result of 84% accuracy. Face and Eyes detection are implemented based on facial landmark and dlib.

Implementing the system in the real-time example will surely reduce the number of Accidents worldwide.

REFERENCES

[1] https://auto.economictimes.indiatimes.com/news/industry/1-5l-people-die-in-5l-accidents-every-year-in-india-gadkari/73205631
[2] https://www.sciencedirect.com/science/article/pii/S1877050915026666
[3] P.viola and M. Jones ,"Rapid Object Detection using Boosted Cascade of Simple Features" ,in proceeding of IEEE Computer Society Conference on Computer Vision and Pattern Recognition, 2001.
[4] S.Vitabile,A.Paola and F. Sorbello ,"Bright Pupil Detection in Embedded ,Real-time Drowsiness Monitoring System", in 24th IEEE International Conference on Advanced Information Networking and Applications, 2010.
[5] T .Hong ,H.Qin and Q. Sun ,"An Improved Real Time Eye State Identification System in Driver Drowsiness Detection", in proceeding of the IEEE International Conference on Control and Automation, Guangzhou, CHINA, 2007.
[6] https://ieeexplore.ieee.org/document/6602353,published in 2013 8th International Workshop on Systems, Signal Processing and their Applications (WoSSPA)
[7] Real-Time Eye Blink Detection using Facial Landmarks,published by Tereza Soukupova´ and Jan C˘ech at Center for Machine Perception, Department of Cybernetics in 21st Computer Vision Winter Workshop
[8] Driver Distraction Detection Using Semi-Supervised Machine Learning ,published by Tianchi Liu, Yan Yang, Guang-Bin Huang, Yong Kiang Yeo, and Zhiping Lin at IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS.
[9] Zhao Y, Kong X, Taubman D. Image and Graphics. 9th International Conference on Image and Graphics (ICIG) Springer 2017.



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