DROWSY DRIVER DETECTION SYSTEM

REPORT FOR MINI PROJECT BTECH 6Th SEMESTER

Submitted By

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IEC2018022 **IEC2018024** **IEC2018028**

UNDER THE GUIDANCE

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ABSTRACT

There is no denying the fact that the number of road accidents are increasing by leaps and bounds. Many studies prove that the “Driver’s negligence “serve as the major factor in the catastrophic accidents taking place. We are trying to use science and technology to alert the drivers when they feel exhaustive and thus, trying to curb the road accidents.

Our project strives to capture the live situation of the motorist using PI camera. The video streaming will be constantly monitored using raspberry pi.

To come to any conclusion, we’ll use facial landmark detection technique to extract the exact state of eyes or lips. After studying, we have come up with certain threshold values to differentiate if the driver is blinking his eyes or feeling snoozy, if he needs some fresh air or not amidst his journey. We’ll measure Eye Aspect Ratio (EAR) and distance between the lips to know the state of the driver and hence give conclusion

We have tested this project on various persons considering the symmetry of faces, if he wears spectacle or not and come up with high accuracy of 93.33%. Our project works on real time data and its low latency and its impromptu responses make it an asset.

INTRODUCTION

Road accidents have been a burning issue across the globe. As per the stats by NCRB, total 4,37,396 road accidents were recorded across India in 2019 out of which 1,54,732 led to fatality.

Studies done in Central Road Research Institute (CRRI) observed the accidents data on 300 km Lucknow- Agra Expressway and came to the conclusion that: “40% of highway accidents occur due to drivers dozing off.”

The above figures undoubtedly depict the ignorant behavior of the India drivers towards taking adequate amount rest and results in endangering their lives.

As per the suggestions of road safety experts, a driver should not spend more than 8 hours at the wheel to ensure his complete vigilance on the road.

At this point, it’s really important for the motorists to know the importance of frequent breaks and optimum amount of sleep.

MOTIVATION

Driving is an essential component of day-to-day life; it consists of several important aspect but the most important aspect is the safety of driver.

Due to the advancement of technology safety of driver is given utmost importance but still the number of accidents is increasing at an alarming rate.

Most of the accidents causes severe injuries and, in some cases, may cause death of an individual.

As observed the main reasons for these road accidents are negligence and fatigue of the driver.

Negligence of driver can’t be curbed but the fatigue of the driver can be detected. Many researches suggest that drowsiness detection can be done in several ways.

Drowsiness can be detected in many ways like using brain waves, heart rate, eye blinking pattern, head movement, yawning etc.

OBJECTIVE

- To alert the driver in case of drowsiness to avoid any catastrophic event from happening.
- To reduce road accidents increasing at an alarming rate.
- To ensure the safety of passengers as well as driver

LITERATURE REVIEW

S. No.	Publisher Name & Year	Paper Title	Objective	Work
1	Springer-Verlag 2003	Experimental evaluation of eye blink parameters as drowsiness measure	Study about eye blinking pattern to detect drowsiness	Very important outcomes /histograms to know about eye blink pattern
2	Conference paper, Sixth International Symposium on human factors in Driving Assessment, Training and Vehicle design, June 27-30, 2011	PERCLOS: An alertness measure of the past	Study about "PERCLOS"	Helped in deploying the detection system and coding in Arduino
3	International journal of engineering and computer science-2018	Arduino based real time driver drowsiness detection and mobile alert system using Bluetooth	Gain knowledge about hardware architecture and equipment to be deployed	Usage of Arduino, eye sensors and various other sensors and various other sensors and various other sensors for future works
4	Second IEEE International conference on engineering and technology-2016	Head movement – based driver drowsiness detection: A review of State-of-Arts Techniques	Head movement-based driver drowsiness detection: A review of State-Of-Arts techniques	We came across various threshold values of Head movements

METHODOLOGY

We are detecting the drowsiness status of the individual based of the the physical features of the face i.e., using eyes and mouth. With these two physical features we can conclude that if the driver is drowsy or not.

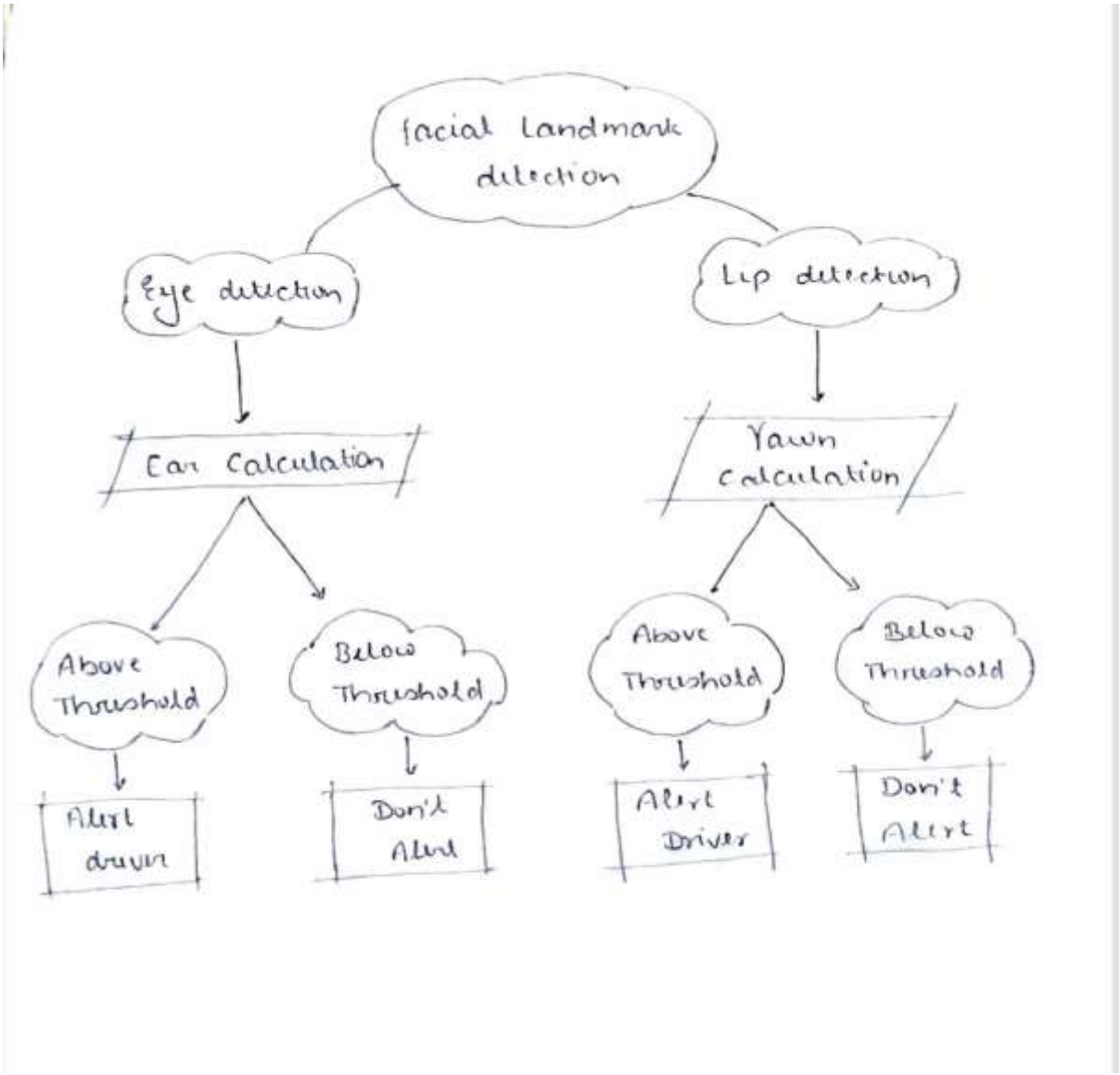

Fig 1 – Proposed Approach

FACIAL LANDMARK DETECTION

This is the initial step of the proposed methodology, using facial landmarks detection algorithm using dib we can extract the various features of the human face like-

- Eyes
- Eyebrows
- Nose
- Mouth
- Jawline

There are total of 68 coordinates to differentiate various facial features.

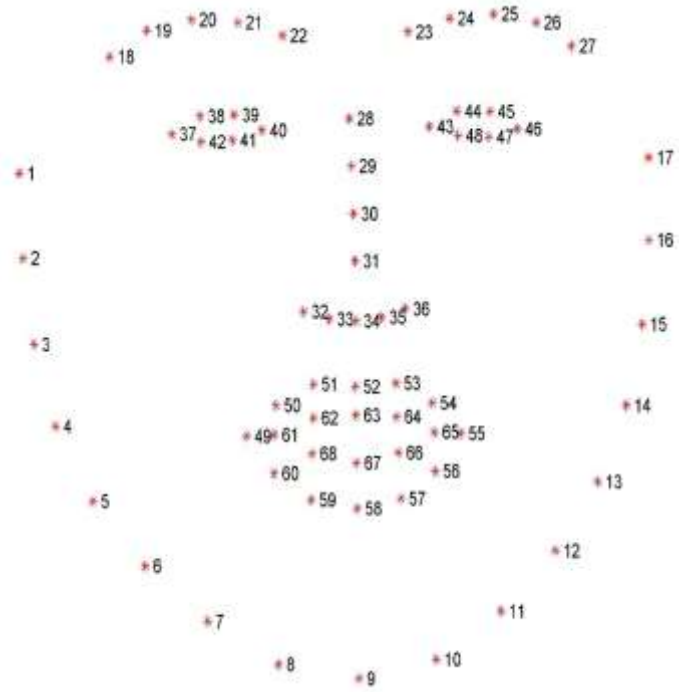

Fig 2- 68 landmark Coordinates

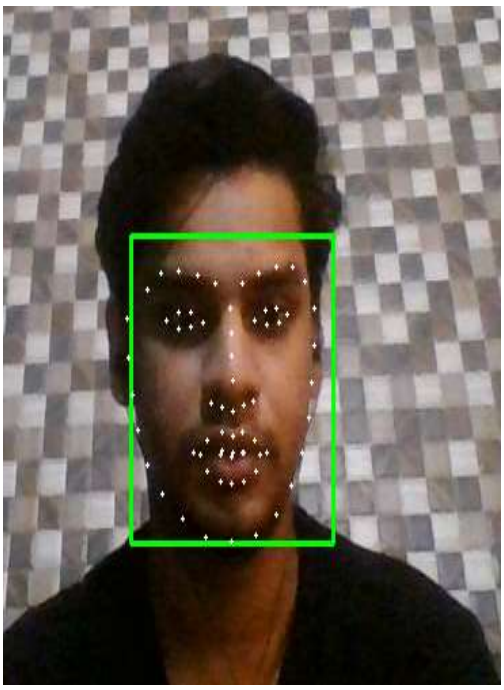

Fig 3 – Landmarks Detection

EYE AND MOUTH DETECTION

From the landmarks obtained in the previous step we extracted selected coordinates to detect eyes and mouth of an individual.

For left eye we used the coordinates [37-42] we selected and for right eyes coordinates [43-48] were selected.

Similarly for the mouth detection the coordinates of upper lip upper edge [50-53], upper lip lower edge [61-64] and lower lip upper edge [65-68] and lower lip lower edge [56-59] were extracted.

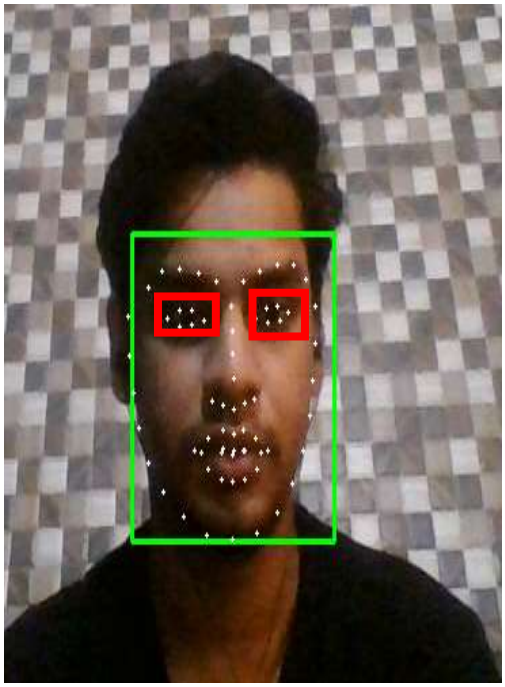

Fig 4- Eye Detection

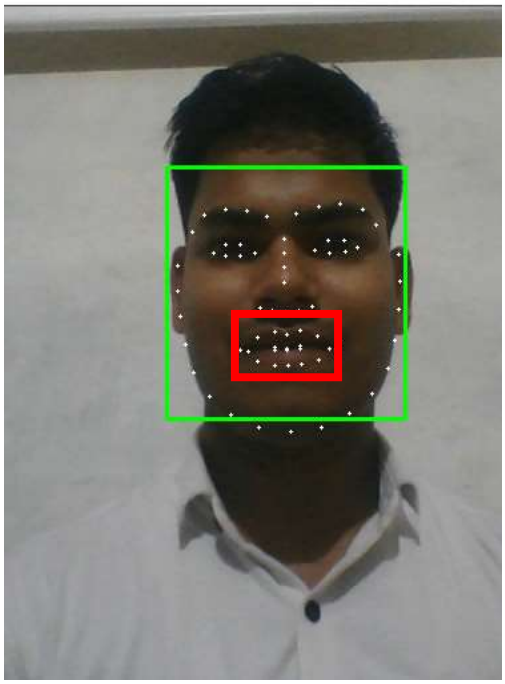

Fig 5 – Mouth Detection

CALCULATION

- **EAR (Eye Aspect Ratio) –** Eye aspect ratio is a parameter which help us to determine the state of the eye whether it is open or closed. This parameter helps in detection of drowsiness of the driver.

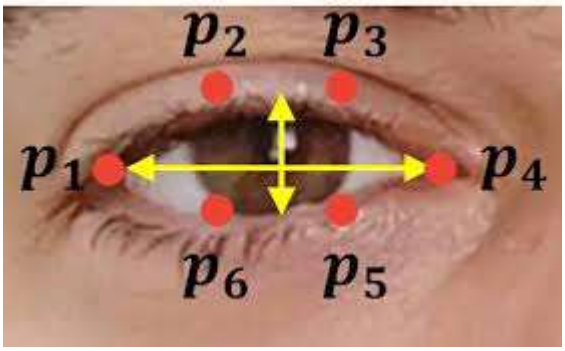

Fig 6 – EAR Calculation

$$EAR = \{|p2-p6| + |p3-p5|\} / \{2\ |p1-p4|\}$$

- **MAR (Mouth Aspect Ratio) –** We have to calculate the mean of both the edges of the upper lip and lower lip determining the difference between these two values will help us to determine whether the person is yawning or not which is also a parameter which helps in detection whether driver is feeling drowsy.

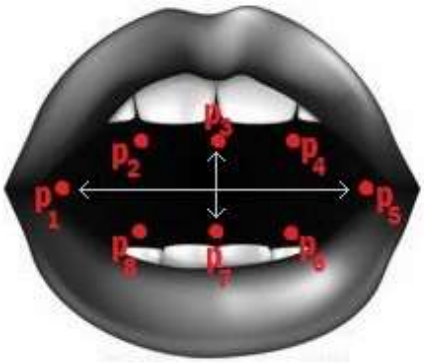

Fig 7 – MAR Calculation

$$MAR = \{|p2-p8| + |p3-p7| + |p4 -p6|\} / \{2|p1-p5|\}$$

DECISION MAKING

- **EYE CLOSED –** Based of several researches and testing conducted from our end we determined the threshold value of the EAR to determine the drowsy status of the individual. The threshold determined by us was 0.27, if the EAR is below this threshold value the driver will be alerted.

- **MOUTH OPEN (YAWNING) –** Similar to the eye threshold the mouth open threshold was also determined by several researches and testing conducted from out end. We determined the threshold value of MAR to determine whether the driver is yawning or not which helps in detecting the drowsy status of the driver. If the MAR value is above this threshold value the driver will be alerted. The threshold value used in our project is 20.

PROPOSED SYSTEM

OVERVIEW DESIGN

The overall design of our proposed system is to capture the real time image of the driver using Pi Cam and estimate the drowsiness of the individual. This project is based on python-based image processing done with the help of python inbuilt library dlib and OpenCv and Raspberry Pi.

EYE & MOUTH DETECTION

After capturing the real time image of the driver and processing it to calculate the aspect ratio of eye and mouth which serve as a parameter for drowsiness detection in our project. These aspects ratio are then compared with a threshold value to detect drowsiness.

HARDWARE

For this project Raspberry pi is used which is a series of small single-board computer integrated with Pi Cam to detect real time image of the driver along with a buzzer integrated to alert the driver.

Fig 8(a) - Buzzer

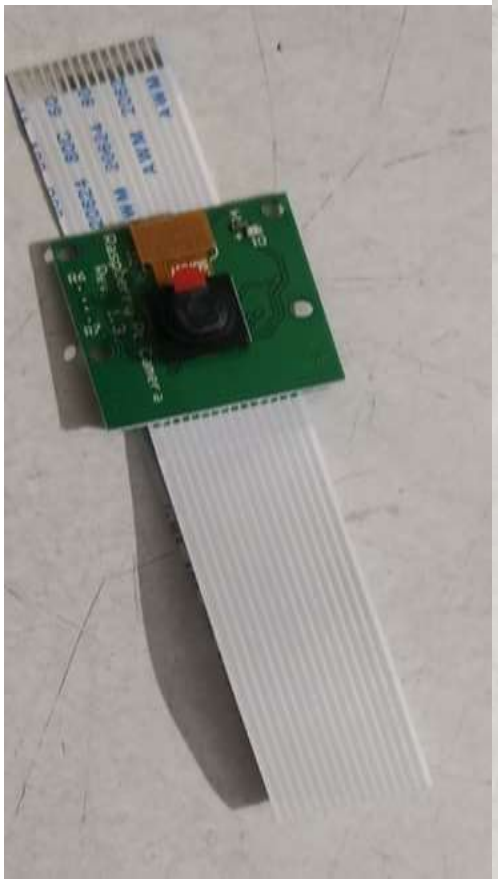

Fig 8(b) – Pi Cam

Fig 8(c) – Raspberry Pi

RESULTS

We have examined our project and here are few results

Normal Eye Close Yawn

Fig 9(a)

Normal Eye Close Yawn

Fig 9(b)

Normal Eye Close Yawn

Fig 9(c)

CONCLUSION

This project was completed as a mini project for 6th semester at Indian Institute of Information Technology, Allahabad's Department of Electronics and Communication Engineering. We successfully implement an effective drowsy driver detection system to prevent road accidents and the results obtained we quite accurate.

ACCURACY

The detection algorithm was by us on several individual under different condition and the result obtained were satisfactory with an accuracy of 93.33%.

LIMITATIONS

- There should be adequate amount of light falling on drivers face so that the camera can easily detect the driver's face and provide accurate results
- The driver should be at a minimal distance for the proper identification of the landmarks.
- The threshold value for EAR is not uniform for all the people round the globe so the threshold value may change from country to country.
- The detection does not work for people that sleep with their eyes open (nocturnal lagophthalmos).

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