# DRIVER DROWSINESS DETECTION SYSTEM

**Mr. S. Kranthi Reddy,** Assistant Professor Dept of Computer Science & Engineering from Vignan Institute of Technology and Science, Telangana, India,
mail: kranthi.sandhi@gmail.com

**Mr. Cheruku Sai Ganesh**, UG Scholar, Dept of Computer Science & Engineering from Vignan Institute of Technology and Science, Telangana, India,
mail: saiganeshcheruku598@gmail.com

**Mr. Rachamalla Prashanth**, UG Scholar, Dept of Computer Science & Engineering from Vignan Institute of Technology and Science, Telangana, India,
mail: rachamalla1999@gmail.com

**Mr. Tati Praneeth Reddy**, UG Scholar, Dept of Computer Science & Engineering from Vignan Institute of Technology and Science, Telangana, India,
mail: praneethreddytati@gmail.com

**Abstract**- In recent years, road accidents have increased significantly. One of the major reasons for the accidents as reported is driver fatigue. Therefore, there is a need for a system to measure the fatigue level of the driver and alert the driver when he/she feels drowsy to avoid accidents. So, in this paper we propose a system which comprises of a camera installed in the car dashboard. It will continuously monitor the blink pattern of driver and detect whether he is feeling drowsy or not. If the system finds the driver is feeling drowsy then an alert will be generated to avoid accident. This project attempts to contribute towards the exercise of analyzing driver behavior-based Eye Aspect Ratio (EAR) in order to reduce preventable road accidents.

Keywords- Blink pattern, Camera, Car dashboard, Driver fatigue, Drowsy, Eye Aspect Ratio (EAR).

## I. INTRODUCTION

Driver fatigue is a significant factor in many vehicle accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries can be attributed to fatigue related crashes. The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. The aim of this project is to develop a prototype drowsiness detection system. The focus will be placed on designing a system that will accurately monitor the open or closed state of the driver’s eyes in real-time By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves a sequence of images of a face, and the observation of eye movements and blink patterns. The analysis of face images is a popular research area with applications such as face recognition, virtual tools, and human identification security systems.

This project is focused on the localization of the eyes, which involves looking at the entire image of the face and determining the position of the eyes by a self- developed image-processing algorithm. Once the position of the eyes is located, the system is designed to determine whether the eyes are opened or closed and detect fatigue.

Researchers have identified various signs or symptom that determine the drowsiness of a person and they are as follows:

- Daydreaming and lack of concentration.
- Yawning after every small period.
- Blinking frequently and partially closed eye.
- Not able to remember the traveled path.
- Slow reactions.
- Drifting or maybe move out from the lane.

The main focus of this project is to reduce accidents that are caused by the drowsiness of the driver. And we intend to do that by placing a camera in the dashboard of the car and record the eyeblinking pattern of the driver if he is blinking faster than usual to detect whether the driver is feeling sleepy or not and alert the driver with an alarm to get some rest to avoid accidents.

## II. LITERATURE SURVEY

**"Predicting driver drowsiness using vehicle measures: Recent insights and future challenges"** is a paper presented by **Charles C.Liu, Simon G.Hosking, Michael G.Lenné**which uses various sensors to detect the vehicle movement to judge the drowsiness of the driver which do have certain drawbacks that can be avoided by using the behavioral characteristics of the driver.

Certain researchers have also tried to test the physiological signal such as electroencephalogram (EEG), electromyogram (EMG), electrooculogram (EOG), electrocardiogram (ECG) is used to detect the fatigue level. Physiological signal-based system is the most promising fatigue detection system but they require sensor attached to the skin which may affect the user by causing skin irritation, revulsion, loathing, repulsion, etc. **"A Hybrid Approach to Detect Driver Drowsiness Utilizing Physiological Signals to Improve System Performance and Wearability"** [3]this one such system proposed that uses the EEG and ECG to check the drowsy level of the driver. Such system is proved to be very accurate but the feasibility of such system in day to day life is questionable. **"One Millisecond Face Alignment with an Ensemble of Regression Trees"** [4]by VahidKazemi and Josephine Sullivan their paper addresses the problem of Face Alignment for a single image. Using the Dlib library of python they were able to detect the face from theframe.

So, there is a need of such a system that can monitor the driver's real time behavior to judge the drowsy level of it and eye blink are best way of detecting the drowsiness of driver.

## III. PROPOSED SYSTEM

- To develop a system that detects driver drowsiness level and warns him or her of his or her state.
- The project focuses on these objectives, which are:
- To suggest ways to detect fatigue and drowsiness while driving.
- To study on eyes and mouth from the video images of participants in the experiment of driving simulation conducted by MIROS that can be used as an indicator of fatigue and drowsiness.
- To investigate the physical changes of fatigue and drowsiness.
- To develop a system that use eyes closure and yawning as a way to detect fatigue and drowsiness.

## IV. METHODOLOGY

The process of losing alertness at the wheel due to fatigue can be characterized by a gradual progression of facial features: Changes relating to the direction of the gaze of the driver, Changes in the position of the eyelids or the size of the eyes, Rapid changes in rate of blinking and orientation and position of the head.

The new system is drowsiness detection system for automobile. Driver drowsiness will be determined from several symptoms that manifest in drowsy driver's face. Through analysis of the eye states, the system will be able to tell a drowsy driver from a normal driver. A video stream will be continuously obtained from the driver's faces and feed into a microcontroller for processing. Classifiers will then be used to classify the state of the driver's eye. If a drowsy driver is detected an alarm will be raised, until the system notices the driver is alert.

Development of the system was through agile methodology where the scrum and the extreme programming method were combined. The system was broken into small modules, these modules were developed independently and tested integration was done. During unit, testing refactoring was adopted in order to optimize the units for their intended purpose.

After starting the video stream, we have to eliminate the lightning effects using the histogram equalization and Gamma Correction.

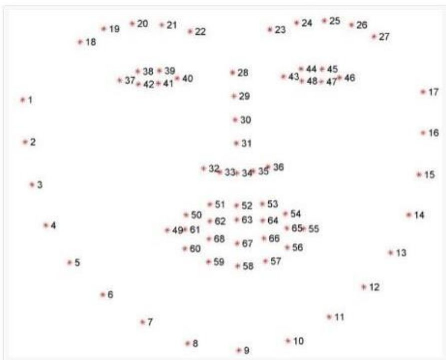

**Figure-1:**. 68 Facial Landmark Model

## PERCENTAGE EYE CLOSURE COMPUTATION

In order to determine the drowsiness level in the driver a percentage of the number of the frames with drowsy eyes is obtain against the total number of detected frames; the percentage is obtained in loops of 200 frames, which represent blocks of 20 sec. A *total_ frame* counter is used to calculate the total number of frames received; another counter *drowsy* counter establishes the total number of drowsy frames that have been detected and then a counter *normal* record the number of frames with eye that are alert.

To establish the percentage of the time the eyes remain closed, the drowsy counter is divided by the total and the outcome multiplied with 100.

***Percentage of time eyes remain closed= (drowsy/total_frame) x 100.***

The computations are made in blocks of 200 frames, this represents every 20 second because the system is set to operate at a frame rate of 10frames per second. These values how In order to compute the time taken by consecutive drowsy frame, the system uses processor clock time to compute the time difference when the first drowsy frame in the block was detected and when the last was detected.

**cpu_time_taken = ((double)(stop - start))/CLOCKS_PER_SEC**

From the obtained CPU time the difference between two subsequent ***cpu_time_taken*** is obtained to give us the total time taken by a micro sleep that the driver experiences.

## DROWSINESS ALERT MODULE

Once the driver drowsiness levels have been established, the system continually monitor the levels and in the event they hit a certain level currently set at 50% the system will trigger a warning on the display. If the driver notices and takes corrective action, the percentage drops and the warning disappears. If the driver continues to be drowsy and the percentage continues to rise for a period above 30 seconds the system treats this as a micro-sleep and an audio alert is generated by the system to warn the driver he is asleep.

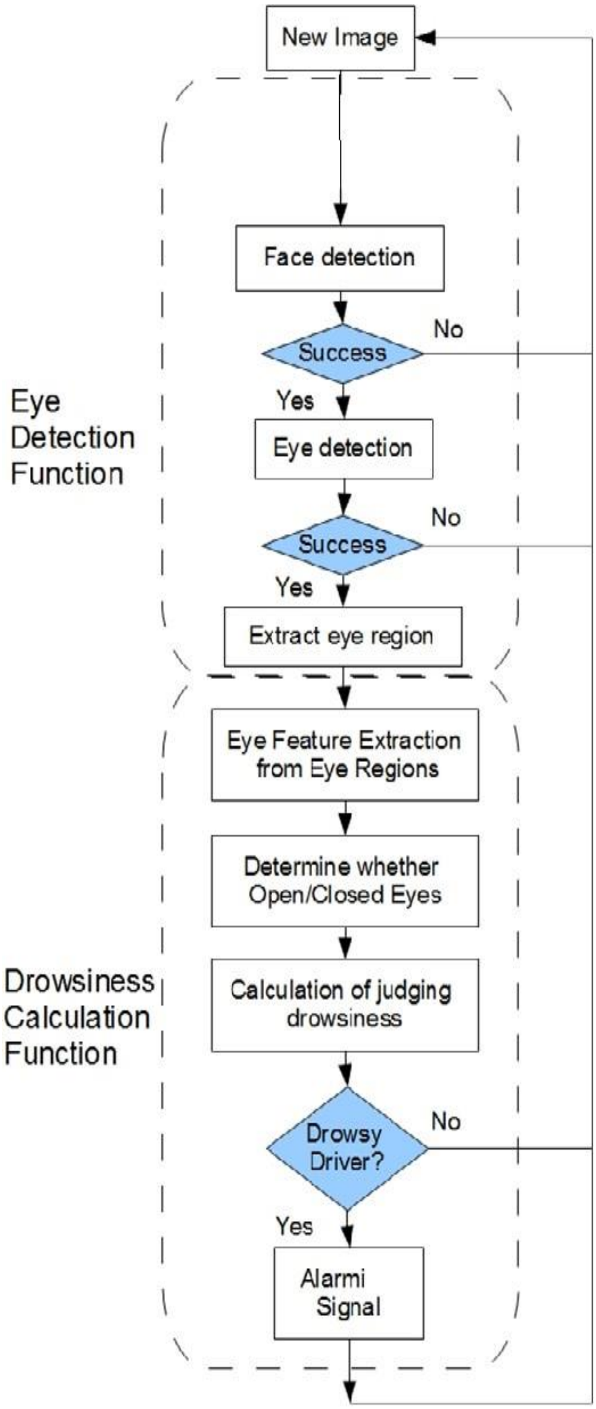


**Figure-2:**Architecture

## V. RESULTS AND DISCUSSION

The system performances when evaluations are done under different condition interesting findings were arrived at with different factor identified to be impacting on the performance of the system.

Lighting is a parameter that highly impacts on the performance of the system, when the system is tested on different lighting conditions the results continuously vary depending on the level of external illumination. Under normal lighting condition the performance is high as indicated by the result, under this condition when lighting is controlled the system recorded up to 91% of drowsiness detection however the average drowsiness detection goes down to 65.1% percent. These percentages however vary depending with the prevailing lighting condition.

When illumination increases the performance continuously decreases to a level where there are no detections made. External Illumination affects the brightness of the eye, which in turn leads to changes in the pixel intensity measured. Light from the camera is interfered with by the reflections from the external sources making detection of the target object difficult. This however can be addressed by increasing the light that faces the driver's faces. This helps to fade out the reflections from the other surroundings and to brighten the driver face in order to make it visible from the background through increasing the amount of light the face reflects. However, this approach should be carefully considered so as not to interfere with the drivers eyes, the amount of light emitted in the visible spectrum should be low enough that the driver does not notice or get destructed and ensure that the safety of the eyes is observed.

Here are the screenshots of the project that shows how it works:

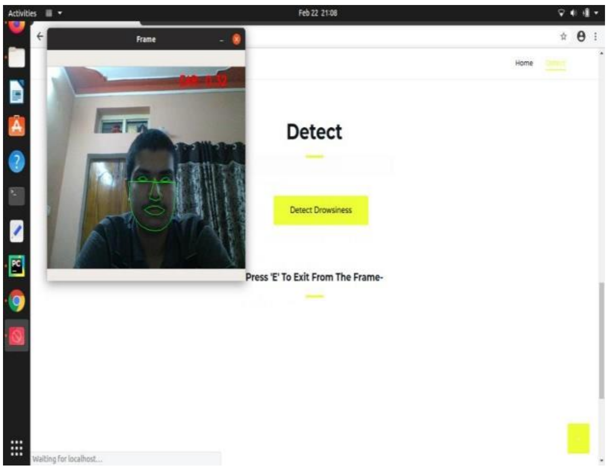


**Figure-3**: Reading the face and detecting eye regions and counting the blinks

In the above figure i.e., Figure 4 system is capturing the live video of the person and checking for blinks if he blinks the EAR value will become less then the thresh value then the blink_count value will be incremented by 1.

**Figure-4:** Sleepy Chart


Lighting is a parameter that highly impacts on the performance of the system, when the system is tested on different lighting conditions the results continuously vary depending on the level of external illumination. Under normal lighting condition the performance is high as indicated by the result, under this condition when lighting is controlled the system recorded up to 91% of drowsiness detection however the average drowsiness detection goes down to 65.1% percent. These percentages however vary depending with the prevailing lighting condition.

## VI. CONCLUSION

This project details the great potential that image processing has. To conquer most of the world problem human perceive the world through vision, in a similar way adequate cheap technology is available for manipulating images to enable machines interact with their environment through vision. Through this, machine will be able to solve many problems.

## FUTURE WORKS

To advance this technology further environmental illumination can be addressed through introduction of a module that can estimate the illumination levels and the threshold value for blink detection adjusted accordingly.

In order to advance the performance of the system and incorporate more drowsiness measure parameter, more powerful embedded devices such as FPGA fitted with microcontroller, and more powerful cameras with higher frame rates can be adopted, however the devices in question will be a little more expensive.

To enhance control and more driver situation monitoring a transmission module can be incorporated to transmit the driver state details in real-time to the relevant authorities.

## VII. REFERENCES

"Predicting driver drowsiness using vehicle measures: Recent insights and future challenges" is a paper presented byCharles C.Liu, Simon G.Hosking, Michael G.Lenné

Awais M, Badruddin N, Drieberg M "A Hybrid Approach to Detect Driver Drowsiness Utilizing Physiological Signals to Improve System Performance and Wearability"

V. Kazemi and J. Sullivan, "One millisecond face alignment with an ensemble of regression trees," *2014 IEEE Conference on Computer Vision and Pattern Recognition*, Columbus, OH, 2014, pp. 1867-1874.

W. Zhihong and X. Xiaohong, "Study on Histogram Equalization," *2011 2nd International Symposium on Intelligence Information Processing and Trusted Computing*, Hubei, 2011, pp. 177-179.

W. Kubinger, M. Vincze and M. Ayromlou, "The role of gamma correction in colour image processing," *9th European Signal Processing Conference (EUSIPCO 1998)*, Rhodes, 1998, pp. 1-4.

Qiong Wang, Jingyu Yang, Mingwu Ren and Yujie Zheng, "Driver Fatigue Detection: A Survey," *2006 6th World Congress on Intelligent Control and Automation*, Dalian, 2006, pp. 8587-8591.

.