

## DETECTION OF DROWSY DRIVER AND ALERT SYSTEM USING OPTICAL DETECTION TECHNIQUE

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### ABSTRACT

Detection of Drowsy Driver using Optical Detection Technique's main motive is to demonstrate the implementation of recognizing a driver's behavior using 'Optical detection' through image processing. Somnolence recognition System is designed by implementing the vision - based concepts. The purpose of such a system is to detection the driver's fatigue. By placing the camera front of driver inside the car, we can monitor the face of the driver and look for the eye-movements which indicate that the driver is no longer in condition to driving. In such a case, an alarm should be issued. We also have a method that can determine if the eyes are open or closed. The main goal of this system is that it must be highly non-intrusive and it should start when the ignition is turned on without having at the driver initiate the system.

**Keywords:** Optical Detection, Diver Fatigue, Drowsy State, Face Detection, Eye Detection, Blink Pattern, Optical System.

### I. INTRODUCTION

This paper aims to develop a prototype of a drowsy driver warning system. Driver's Drowsiness detection may be a car safety technology that forestalls accidents when the driving force is getting drowsy. Various studies have suggested that around 22% of road accidents are fatigue-related, up to 50% on certain roads. Driver fatigue may be a significant think about an outsized number of auto accidents. Recent statistics estimate that annually 2100 deaths and 76,000 injuries are often attributed to fatigue-related crashes. the event of technologies for detecting or preventing drowsiness at the wheel may be a major challenge within the field of auto safety systems. With this Python project, we'll be making a drowsiness detection system. there's a countless number of individuals who drive on the highway who drive daily day and night. Taxi drivers, bus drivers, truck drivers, and other people who are traveling long-distance suffer from a scarcity of sleep. thanks to this, it becomes very risky to drive when feeling sleepy. the bulk of accidents happen thanks to the drowsiness of the driving force. So, to stop these accidents we'll build a system using Python, OpenCV, which can alert the driving force when he feels sleepy. the target of this intermediate Python project is to create a drowsiness detection system which will detect that a person's eyes are open or closed for a couple of seconds. this technique will alert the driving force when drowsiness is detected.



**Figure 1:** Illustration of Drowsiness Detection

**II. LITERATURE SURVEY**

**System Review:** This survey is done to cover the need and indispensable for the general population, and to do as such, we went through different sites and applications and looked for the rudimentary data. Based on these data, we made an examine that helped us get new thoughts and make different arrangements for our aim. We conclude that there is a need of such application and felt that there is a decent scope in this field too.

**Table 1.** Literature Survey

Sr No.	Paper Name	Authors	Reference Points
1.	Driver drowsiness detection system with OpenCV and keras	R. Vishnu et al 2021 J. Phys	<ul style="list-style-type: none"> <li>This paper allowed us to understand and the use of the coding software with various photo outcomes.</li> </ul>
2.	Design and Implementation of a Driver Drowsiness Detection System: A Practical Approach	Aleksandar Ćolić, Oge Marques and Borko Furht	<ul style="list-style-type: none"> <li>This paper describes the steps involved in designing and implementing a driver drowsiness detection system based on visual input (driver's face and head).</li> <li>It combines off-the-shelf software components for face detection, human skin color detection, and eye state (open vs. closed) classification in a novel way.</li> <li>Preliminary results show that the system is reliable and tolerant to many real-world constraints.</li> </ul>
3.	Implementation of Detection System for Drowsy Driving Prevention Using Image Recognition and IoT	Seok-Woo Jang and Byeongtae Ahn	<ul style="list-style-type: none"> <li>In recent many accident and serious injuries has increase due to drowsiness.</li> <li>In particular heavy cargo trucks and high-speed bus accident that occur during driving in middle of night has emerged serious problem.</li> <li>So, machine learning was applied to predict drowsiness and improve drowsiness prediction using facial recognition.</li> </ul>
4.	A Low-Cost Prototype for Driver Fatigue Detection	Tiago Meireles and Fábio Dantas	<ul style="list-style-type: none"> <li>This helps us to find several methods for detecting and to build a low-cost prototype for driver fatigue detection by using most inexpensive components for project.</li> </ul>
5.	DRIVER FATIGUE AND ROAD SAFETY - IMPLICATION IN AN INDIAN CONTEXT	Rahul Dagli	<ul style="list-style-type: none"> <li>This research paper helps us understand the causes of driver fatigue and its effect.</li> <li>Also, it highlights the different measures taken in European Nations to avoid accidents due to driver fatigue.</li> <li>It mentions a few suggestions for implementation of few measures which can be implemented at Indian</li> </ul>

			Level.
6.	Advantages and disadvantages of different methods to evaluate sleepiness warning systems	Anna Anund och Katja Kircher	<ul style="list-style-type: none"> <li>Through this paper we learned the different reactions of drowsy drivers to the warning signs of the DDS.</li> <li>Four kinds of test: Simulation, Test track, On Road Experience and Field of Operation Test were carried out to understand these reactions as mentioned in the paper.</li> </ul>

### III. METHODOLOGY

**Working:** In our program, we used the following libraries mentioned below: SciPy, NumPy, Imutils, Dlib, Pygame, Math, OpenCV, Tkinter

- After passing our video feed to the Dlib frame by frame, we can detect the left eye and right eye features of the face.
- Now, we draw contours around it using OpenCV.
- Using SciPy's Euclidean function, we calculate the sum of both eyes' aspect ratio which is the sum of 2 distinct vertical distances between the eyelids divided by their horizontal distance.
- Now we check if the aspect ratio value is less than 0.25 which was calculated after several tests. If it is less an alarm is sounded and the user is warned.

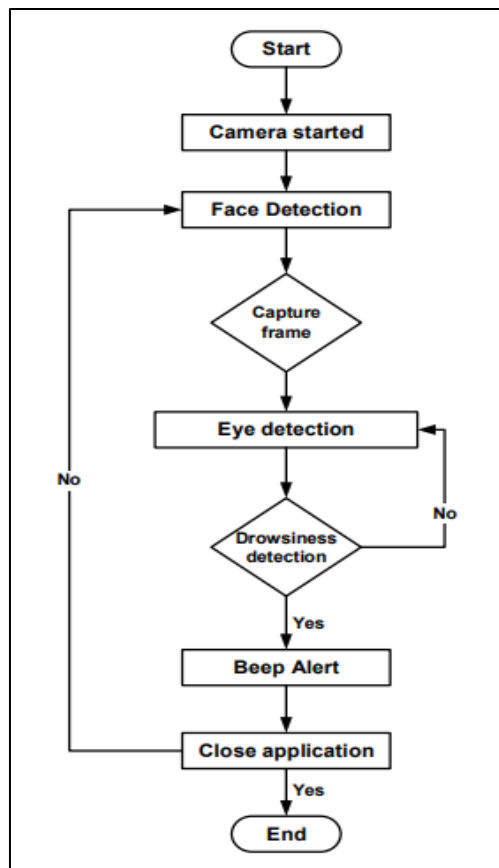


Figure 2: System Working Flowchart

**Terminology:**

Drowsiness: Drowsiness refers to feeling abnormally sleepy during the day. people that are drowsy may nod off in inappropriate situations or at inappropriate times. It refers to feeling sleepy or tired, or being unable to stay your eyes open.

Driver face monitoring system: Driver face monitoring system detects driver fatigue and drowsiness on the basis of face and facial components. Here, the system first detects face then extracts symptoms from them then supported those symptoms it decides whether the driving force is drowsy or not.

Face Detection: There are two methods for detection of face and that they are Feature based method and learning based method. just in case of feature-based methods, face is often detected from a picture on the idea of straightforward features, face rotation etc. one among the favored algorithms for facial detection is “haar-cascade”. it's computationally less costly, a quick algorithm, and provides high accuracy. A Haar-like feature consists of dark regions and lightweight regions. It produces one value by taking the difference of the sum of the intensities of the dark regions and therefore the sum of the intensities of sunshine regions. this is often done using the `cv2.CascadeClassifier::detectMultiScale` method, which returns boundary rectangles for the detected faces (i.e., x, y, w, h). It takes two parameters namely, multiplier and min neighbors. Scale Factor determines the factor of increase in window size which initially starts at size “minsize”, and after testing all windows of that size, the window is scaled up by the “scale factor”, and therefore the window size goes up to “maxsize”. If the “scale factor” is large, there'll be fewer steps, so detection are going to be faster, but we may miss objects whose size is between two tested scales. Another approach is on the idea of complexion where complexion is decided using probability distribution in color space.

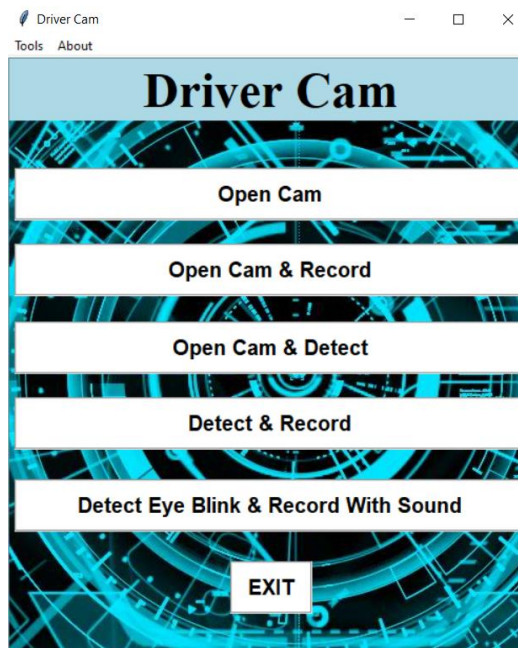
Eye Detection: The eye-detection algorithms specialize in the detection of the frontal human eye. The Python OpenCV library functions are mainly aimed toward real-time computer vision. it's mainly wont to do all the operation for image processing also as detecting objects. OpenCV already contains many pre-trained classifiers for face, eyes, smile etc. The `cv2.CascadeClassifier()` method is employed to load the required XML classifier for detecting objects. In haar classifier complexity is certainly increasing, less robustness to different lighting conditions. And speed and detection accuracy are high.

Eye Blink: The eye-blink duration is that the most reliable parameter for the detection of the drowsiness level. With the precise eye region, we will detect the blinks with the assistance of two lines. One drawn horizontally and other drew vertically splitting the eyes. Temporary closure of eyes alongside the movement of eyelids is understood as blink. it's a rapid natural action. we've to seek out what happens when eye is blinked. we will conclude that the attention is closed/blinked when Eyeball isn't visible, Eye lid is closed, Upper and lower eyelids are connected together. A blink is meant to last 200-300 milliseconds. A drowsy blink would last for 800-900 ms..

#### Technologies Used:

1. PYTHON: Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level inbuilt data structures, combined with dynamic typing and dynamic binding, make it very attractive for web development. Python's has large standard library, commonly cited together of its greatest strengths, we've use one among the library which is Tkinter. Tkinter is that the standard GUI library for Python. Python when combined with Tkinter provides a quick and straightforward thanks to create GUI applications. Tkinter provides a strong object-oriented interface to the Tk GUI toolkit. we've also use libraries like NumPy, SciPy, playsound etc.
2. IMAGE PROCESSING: In computing, digital image processing is that the use of computer algorithms to perform image processing on digital image. Image processing allows us to rework and manipulate thousands of images at a time and extract useful insights from them.
3. OPENCV: OpenCV-Python may be a library of Python bindings designed to unravel computer vision problems. OpenCV-Python makes use of NumPy as all the OpenCV array structures are converted to and from NumPy arrays.

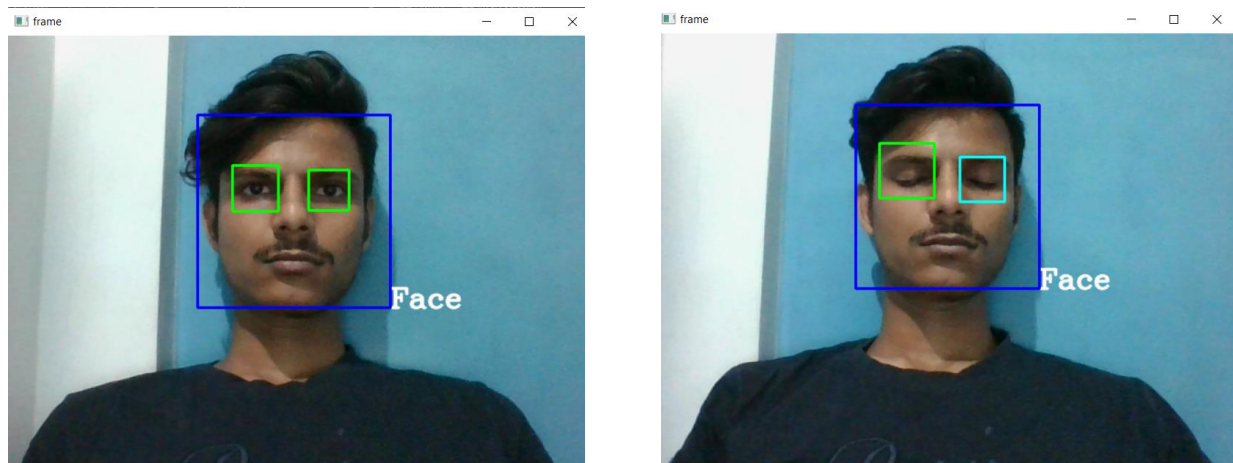
#### IV. RESULT AND DISCUSSION



**Figure 3:** Software Interface

Figure 3 (SW interface) shows the developed application using the technologies mentioned. The interface of five buttons signifies the five stages of the complete process of drowsiness detection. They are elaborated below:

1. Open Cam: Opens the camera of the device.
2. Open Cam & Record: Opens the camera and records the video captured by the camera.
3. Open Cam & Detect: Opens the camera. It also detects the face and the eyes of the person.
4. Detect & Record: Records the video captured with face and eyes detection.
5. Detect Eye Blink & Record with sound: Face and eyes detection is done. If the person is found drowsy, then the sound alert is triggered. Herein the recording is also done with the sound.
6. Exit: Closes the application.



**Figure 4:** Face and Eyes Detection

Figure 4(Face and Eyes Detection) shows the face detection of the application. The application is capable of recording and storing the last two videos captured. It can be increased as per required by making the changes in the program. Similarly, the interface can also be made more aesthetic by making changes in the program. Following are a few highlighting features of the application.

- Simple in design and user-friendly.

- Flexibility.
- Quick detection and alarm response.

## V. CONCLUSION

This project tracks the vehicle driver's eyes, face movements developed to detect drowsiness. Shape prediction methods are used to detect important features on the face to locate the pupils, the program uses various templates -based on the matching and feature-based matching Template. During monitoring, this method decides whether the eyes are open or closed and whether the vehicle's driver looks ahead. An alert signal is going to be generated within the sort of an alarm when the device captures the movement of eyes closed for a minimum of four frames. The factors that contribute to the present serious safety issue are twenty-four-hour services, unpredictable conditions of the environment, high annual mileage, and a rise in work schedules that are demanding. The entire project is meant to decrease the speed of accidents and to contribute to the technology to stop fatalities caused thanks to road accidents.

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