Driver Drowziness Detection System

CSE541: Computer Vision

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***Abstract*—Driver fatigue is a major cause of vehicle accidents globally, hence, there is a need to detect drowsiness to save lives and property. This project aims to develop a non-intrusive drowsiness detection system that continuously captures images and measures the state of the driver's eyes. The system uses OpenCV libraries, including Haar-cascade to detect the eye. When the closing time of eye exceeds a certain amount, the driver is identified as drowsy, and a warning is issued. This system provides an accurate and non-intrusive method of detecting drowsiness, enhancing road**

Keywords*— Drowsiness, eye movements, non-intrusive, image capture, eye state, OpenCV libraries, Haar-cascade, per closure value

I. Introduction

The issue of drowsy driving is a major concern in today's world. It has been reported that fatigue-related accidents have a significant impact on road safety, causing injuries, deaths, and economic losses. Therefore, there is a growing need for the development of effective measures to detect driver drowsiness and prevent accidents caused by it. In this report, we will explore different methods and techniques available for the detection of drowsy driving, including vehicle-based measures, physiological measures, and behavioral measures. We will examine the advantages and disadvantages of each approach and discuss their practical implementation in real-world scenarios. Finally, we will propose an approach that focuses on the amount of eye closure as the most accurate and non-intrusive indicator of driver drowsiness.

II. Literature Survey

The paper titled "A Comparative Study on Machine Learning Techniques for Intrusion Detection in Wireless Sensor Networks" presents a comparative analysis of different machine learning techniques for intrusion detection in wireless sensor networks. The paper proposes a drowsiness detection system that uses Electroencephalogram (EEG) signals and machine learning algorithms like Discrete Wavelet Transform (DWT), Support Vector Machine (SVM) and K-Nearest Neighbour (KNN).

The paper titled “Driver Drowsiness Detection” presents a comparative study of various techniques for driver drowsiness detection and alert systems. One method uses an arithmetic-based approach to detect fatigue by tracking eye movements through a camera. Another system uses the shape predictor algorithm to identify facial features associated with drowsiness. The systems use computer vision and machine learning algorithms such as Viola Jones, AdaBoost, and CAMSHIFT. The proposed systems are non-intrusive, effective, and can be improved by adding various types of sensors. The output of the system is in the form of an alarm or buzzer that alerts the driver when drowsiness is detected. The paper also groups drowsiness detection techniques into driver-based and vehicle-based and surveys various methods in each category.

III. Implementation

We have till now various modules required for the final model. We have started the camera capturing module which would be needed to detect the number of frames with close eye. We are not still not able to capture frames and process it.

We have implemented the eye detection module. Here, first the face is converted to a gray scale image form a RGB image and then face detection is done using the haarcascade_frontalface_default.xml file. Then, it subsequently identifies the eye within the detected faces using the haarcascade_eye.xml file. We have used the OpenCV library for this purpose.

We have divided the whole data set into two categories namely; close eye and open eye. This was done by the binary indicator given in each image name; 0 indicating close eye and 1 indicating open eye. Later, we further divided the data set into training set, validation set and test set. Here, the training set is 60% of the whole dataset, whereas the validation set is 20% of the training set. While, dividing the data set, we have also made the frame size similar for each image, to make the image processing a lot easier

IV. Results

We first tried eye detection directly without any face detection prior to that. However, it was any giving a higher number of false detections of the background. We needed to reduce this false detection, hence a additional step of face detection added prior to it.

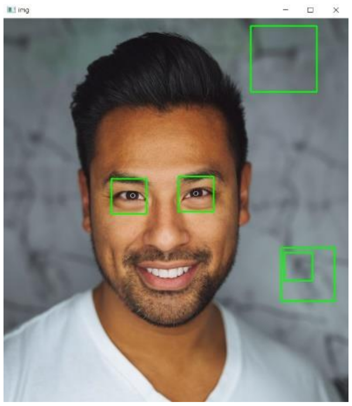

Fig. 1. Eye Detection (Without Prior Face Detection)

As shown in Fig.1, we can see that there is total 3 false detections which does not even any facial structure of the face.

Whereas, when we performed the face detection first and then identified the eye over that face detection frame, the false detection was quite low.

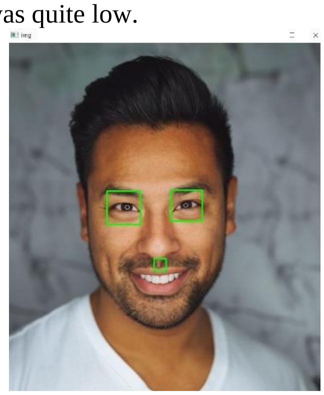

Fig. 2. Eye Detection (With Prior Face Detection)

Here, in Fig.2, we can see that the count of false detection has significantly reduced. There is only one false detection which is also the part of a facial feature and not the background.

We have studied various models and came to the conclusion that the InceptionV3 would be a great choice for our project. We are planning to use the knowledge of this model and train it over our data set.

References

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