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Driver Drowsiness Detection Using HAAR Cascade Algorithm

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ABSTRACT: Drowsiness and distraction are the main cause of the accidents. Majority of the accidents in the worlds are cause due lack of sleep and distractions cause on roads lead to loss of life. Drivers are more likely to be crashed if they are fatigue. Drowsy driving not only puts the driver but also the people around him at risk. According to the statics report nearly statics report nearly 30% to 40% are caused due the drowsiness or distraction of the driver.This projects suggest an idea to detect drowsy and distraction caused by the drivers by using machine learning algorithms. In this project we use HAAR Cascade algorithm, along with the OpenCV library to monitor the real-time video of the driver and to detect the eyes of the driver weather they are distracted or drowsy. If the driver is feeling drowsy or is distracted for few seconds then the alarm will alert him to take a rest.

KEYWORDS: Drowsiness, Distraction, Eye detection, Eye Tracking, Face Detection, Perclos, HAAR cascade.

I. INTRODUCTION

Driving without taking proper rest is the major cause of drowsiness. Drowsy driving is a major contributor to motor vehicle collisions. According to the National Highway Traffic Safety Administration (NHTSA), in 2017 drowsy driving led to at least 91,000 crashes, resulting in roughly 50,000 injuries and 800 Deaths. This data likely underestimates the impact of drowsy driving because it's often impossible to definitively determine whether drowsy driving caused an accident, especially after fatal crashes.

In light of this, other studies calculate that drowsy driving causes up to 6,000 deadly crashes every year. Researchers estimate that around 21% of fatal car accidents are involve a person driving while drowsy. Drowsy driving is also known as sleep deprived driving, fatigued driving or tired driving. Driving in this state leads to slow, decreased reaction time and judgment of stimuli. In some cases, the driver may also fall asleep behind the wheel. According to the statics report of National Highway Traffic Safety Administration estimates that 100,000 accidents are the direct result of driver fatigue each year.

Drivers who slept 4 hours less had 10 times the crash rate of drivers who slept for regular times.Driver distraction contributes 20 to 30 percent of all road collisions. Distraction can be explained by the act of competing activity and doing other things in the vehicle. Driver distraction has become worse when there are a lot advanced technologies that easily use even in vehicles. Mobile phone is one of the technologies that have been widely used. Almost everyone all across the globe is using mobile phone as it is considered as necessary item to have and it is affordable as well.

II. RELATED WORK

We had surveyed various technologies and research done on this project related topic which gives better insights of the project. It offers the better understanding about various technologies that has been used up till now to make the drowsiness and distraction project better .The literature review has been carried out on the topic of the current drowsiness detection technologies for facial landmark detection , blink detection, and yawn detection. There are many techniques that have been used to provide better results on this project such has computer vision,CNN, machine learning and deep learning algorithms and techniques. Research has been done on Eye Aspect Ratio to provide better results and accuracy in results . In this paper, we have designed a drowsiness system that is based onconvolution neural network and with the help of python libraries such as opencv and keras to provide better results. If the driver is feeling drowsy or is distracted for more than 6 to 7 seconds and remains like that for a while than he will be alerted by the system by beeping and alarm sound . As a result, the system detected the driver's drowsiness and showed successful

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performance in the trial run. The Eye Aspect Ratio was used to detect if the eyes are closed or open. Then, a buzzer was used to generate an alert and a to make driver to come out of the drowsy or distracted situation. HAAR cascade algorithm is used to detect faces in the images or in the real time video. HAAR cascade algorithm provides better results and accuracy and are very fast in generating results.The paper provides an set of rules for detection of the attention-blinks in photograph sequences. The trained picture processing strategies encompass answers, such as Haar-like face detection and template matching based eye tracking, as well as newly evolved algorithms for skin color segmentation and modified active contour model with ellipse becoming for eye-blink detection. The developed set of rules became used for human fatigue tracking and as a middle of the eye-blink managed human-pc interface.PercentageOf Closure Of Eyes (PERCLOS) is a commonly used method for detection of driver fatigue. It determines the percentage of eye closure by taking the number of frames in which driver's eyes are closed and dividing this by the total number of frames over a specified period of time. Different researchers have used different time windows for PERCLOS calculation such as 20 seconds 30 seconds or 3 minutes.

III. PROPOSED SYSTEM

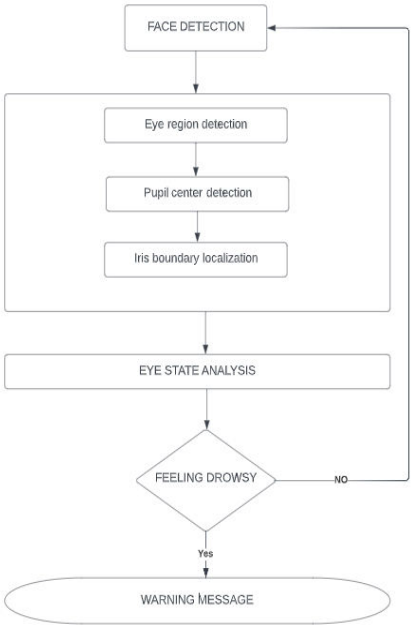

Fig1. Outline structure of proposed system

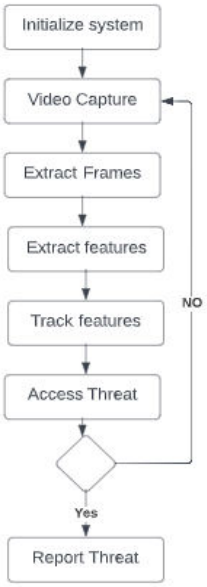

Fig 2. Flowchart of activity diagram

IV. METHODOLGY

Step 1: **Taking images as input from the webcam**.

- As application will be opened Webcam will be started and images will be captured.
- For capturing the images, OpenCV is used.

Step 2: **Face detection and creation of ROI**.

- The image captured using opencv is in grayscale image as opencv algorithm takes grayscale images.
- For detection of faces haar cascade classifier will be used. Anhaar cascade XML file will be used for that purpose.
- After that as an output we will be getting array of detection with x, y coordinates , height and width of the boundry box of the object.

Step 3: **Detection of eyes from ROI.**

- The same procedure will be followed for detection of eyes.

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- First we set cascade classifier for eyes and then we detect eyes.
- Now only eye's data needs to be extracted so boundary box of the eyes will be extracted and only eye images can be pulled out of the frame.
- This than will be fed to the CNN classifier which will predict whether eyes are open or closed.

Step 4: **Classifier will tell whether eyes are open or closed.**

- **CNN** classifier will be used for prediction of eye status.
- Before feeding image to the classifier colour image will be converted to grayscale image and resized to 24*24 pixel as model was trained on 24*24 pixel images.
- Now we predict each eye with our model .
- Perclos algorithm is used to check whether the eyes are open or closed.

Step 5: **Calculate score to check whether person is Drowsy or Distracted.**

- Score is basically a value used to determine how long the person has closed his eyes.
- If both eyes are closed the score will keep increasing if eyes are open in between then the score will be decreased.
- 15 is the threshold value i.e. if the score reaches 15 then the alarm will start beeping.
- Same goes for distraction. If the system doesn't detects the Driver's face for too long the alarm will start beeping after the score reaches 15.

V. RESULTS

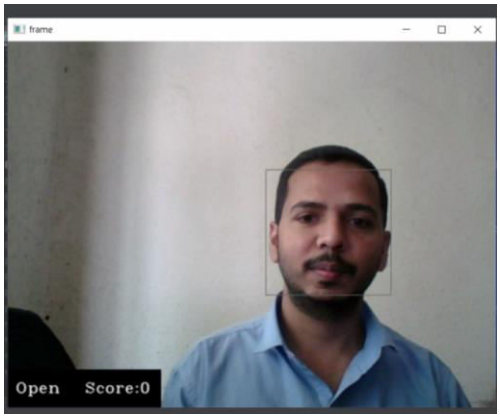

Fig 3. Eyes open so the score is 0

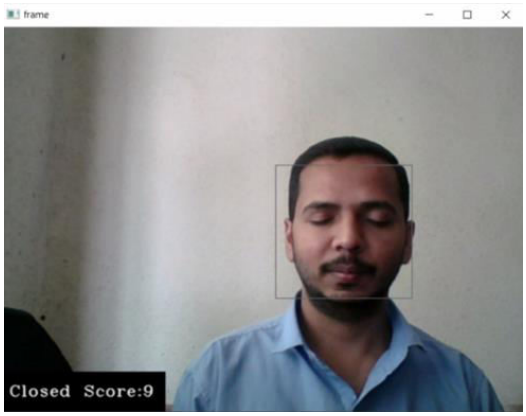

Fig 4. Eyes are closed so score is increasing

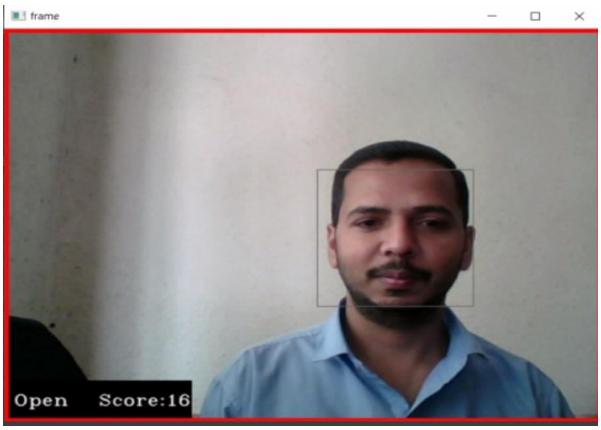

Fig 5. Score has reached its threshold value and alarm is beeping.

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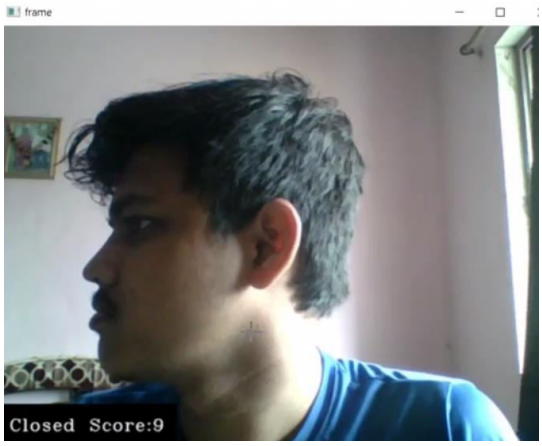

Fig 6. Score starts increasing when distracted.

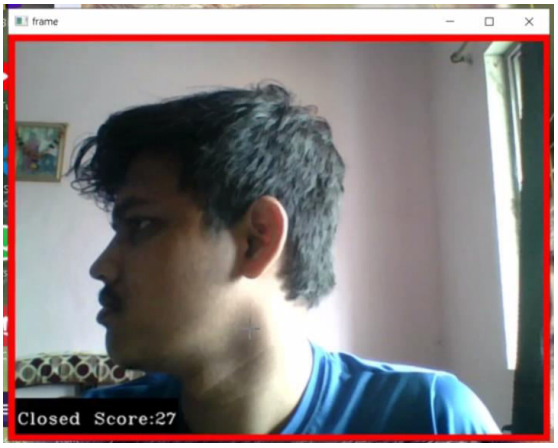

Fig 7. Score has reached its threshold value.

VI. CONCLUSION AND FUTURE WORK

The system absolutely meets the goals and requirements of the project.The proposed system will help the drivers from causing accidents or major injuries.The buzzer is responsible for alerting the driver by passing sound signals, which efficiently awakens the driver in real-time to avoid road accidents. The eye-detection using the Haar cascade classifier by calculating the Eye aspect ratio also reduces the false eye detections, a problem faced by the models using only the OpenCV library. Hence, the false positives are negligible, which increases the capability of the system. The Eye aspect ratio of consecutive frames will help us to remove those negligible errors and calculate drowsiness effectively.The work can be extended by extracting the features of mouth where the driver can be detected as drowsy through yawning. If the driver yawns repeatedly for more number of times then we can say that he is in sleepy mode. If the number exceeds a limit then we can alert the driver that he can take rest for a while.This work can also be extended by implementing in full night light using IR web cam. It is camera which uses infrared radiations to detect whether the person is drowsy or not.

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