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Review of Implementation Techniques for Drowsiness Detection

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I. INTRODUCTION

In 21st century, the transportation is one of the biggest means of connectivity. Transportation by road is the only mode that can give maximum service to one and all. This mode of transportation has the maximum flexibility for travel with respect to route, direction, time and speed of travel. India has the second largest road network in the world, spanning a total of 5.89 million kilometres. This road network transports 64.5% of all goods in the country. 90% of India's total passenger traffic uses the road network to commute.
The road traffic has increased enormously in past few years. Though there are several road safeties rules have been implemented to keep the vehicle drivers safe still road accidents are one of the major causes for fatal deaths of people. According to the latest report of American National Highway Traffic Safety Administration and various studies conducted have suggested that around 20% of all road accidents are due to fatigue. Recent statistics estimate that annually road accidents increased by 16.8% and 1.73 lakh people have died in Traffic Accidents in India in 2021.

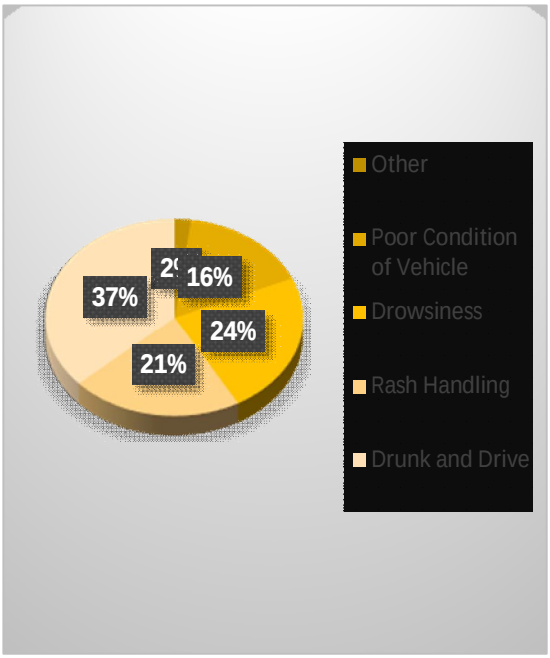


Fig. 1 Analytical Representation of causes of road accidents.

The use of technology in any and every aspect of road safety is essential. We will have to take a systematic approach and encourage innovation in automotive components, vehicle safety and road engineering, including leveraging vehicle data management, connectivity, driving apps and dark spot identifications, as these will play a major role in improving road safety on roads. Following are some technology solutions that could help to make roads safer

1) Driver fatigue detection and warning
2) Intelligent speed adaption
3) Speed governors
4) LIDAR gun

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In this paper, we have studied different methodologies for implementation of drowsiness detection. We made use of machine learning techniques for drowsiness detection (eyes, yawning) and alerts the vehicle driver's drowsy situation. There are different factors associated with the drowsiness of the vehicle driver, this system uses the movement of eyes and mouth to predict the drowsiness.

II. AIM

Traveling and transportations has been playing major role in human life to greater extent. As we know road travels are popular choice among the people around the world.

Road travel is one of the most important major of connectivity, also it plays vital role in the increased of business and various other things. Considering the importance of road travel and transport, it is important to seek the safety procedures for the vehicle drivers.

We plan to develop a Travel buddy software system which detects the driver's condition and predicts whether he/she is getting tired or not based on their eye movement and yawning.

III.LITERATURE SURVEY

When a driver is drowsy or sleepy, the body is in a position where it is transitioning from being awake to being a sleepy. At this point, they may lose focus and be unable to respond to situation such as avoiding head-on collision or using the brakes in a timely manner. There is obvious sign that suggest a driver is drowsy, such as

1) Frequently yawing
2) Inability to keep eyes open
3) Swaying the head forward

Many nations and governments officials are paying attention to the implementations of solution to increase driving safety as a result of these incidents which have inspired researches to test ways for early warning drowsiness detection and warning. Drowsy driving is characterized by the following

a) Driving with less than 6-7hrs of sleep.
b) Driving if you have been awake for more than 12 hours.
c) Yawning frequently.
d) Difficulty focusing frequent blinking and heavy eyelids
e) Unable to remember the last few miles you have driven.
f) Drifting from your lane, swerving or tailgating.[7][4]

Following are the reasons to increase the risk of drowsy driving:

- Have had less than 7 to 8 hours of sleep.
- Take medication that causes drowsiness.
- Drive at night or the early afternoon.
- Consistently have difficulty getting to sleep or staying asleep at night.
- Drive frequently for long periods on monotonous highways or rural roads.
- Work the night shift, especially when driving home after the shift.[7]

The system implemented by the eye blink patterns has shown detection an autonomous sleepy driver monitoring and accident prevention system based on variations in eye blink length. The detection system is composed of video camera and software system. Our suggested technique identifies visual changes in eye positions by utilising the claimed horizontal symmetry property of the eyes. Our novel approach identifies eye blinks in real-time using a conventional camera at 110 frames per second with a 320x240 resolution. The suggested approach identifies eye blinks with high accuracy and a 1% false positive rate in the JZU eye-blink database.[1]

Another drowsiness detection system implemented makes use of Cb and Cr components of YCbCr colour space; system locates the face with vertical projection function and the eye with horizontal projection function. This system deals with automatic driver drowsiness detection based on visual input and Artificial Intelligence. Using the Hough Transform The study has presented a method for locating, tracking, and analysing the driver's face and eyes in order to calculate PERCLOS, a scientifically established measure of tiredness associated with sluggish eye closure.[2]

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The study implemented by the fusion of eye closure and yawning detection has shown the efficient implementation for the drowsiness detection. In this method, a camera put in the automobile captures the driver's face look. The system has extracted the eyes in the facial region utilizing SSIM (Structural Similarity Measure), the SSIM offer better performance compared to conventional measures such as Peak Signal to Noise Ratio (PSNR) and Mean Squared Error (MSE). The facial region is recognised and tracked in the collected video sequence in the first stage using computer vision algorithms. The eye and mouth portions of the face are then removed and analysed for indicators of driver weariness. Finally, during the fusion phase, the driving condition is assessed, and if sleepiness is identified, a warning message is issued to the driver.[3]

Drowsiness detection can divide into three main categories

- Vehicle based
- Behavioural based and
- Physiological based.

In the physiological based measures: The correlation between physiological signals ECG (Electrocardiogram) and EOG (Electrooculogram). Drowsiness is detected through pulse rate, heart beat and brain information. The study has given emerging technologies and various other approaches in order to prevent the fatalities caused by drowsiness and the accidents. [8]

Another study shows the implementation of drowsiness detection by the implementation of machine learning techniques such as Support Vector Machines (SVM), Convolutional Neural Network (CNN), Hidden Markov Models (HMM) These techniques are trained using features and labelled outputs to build models that can be used for drowsiness prediction.[9]

IV. PROPOSED-SYSTEM ARCHITECTURE

The system features have three main parts.

First, the system uses camera to collect the necessary data to locate drivers face region and eyes, second; the system analyses the capture data and based on the input it gives the output.

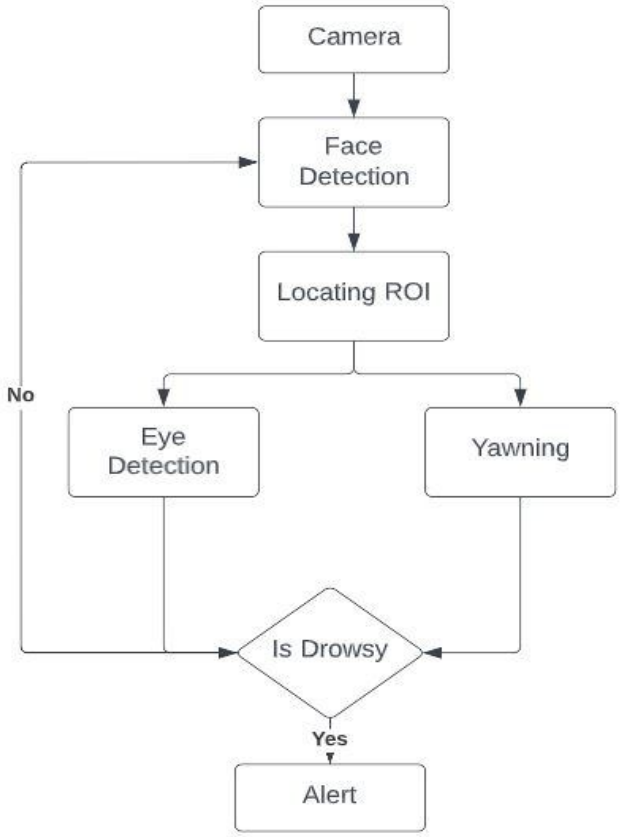


Fig. 2 System Architecture for travel buddy

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While driving for the considerable distance driver may feel sleepy to detect it, we start from the capturing the real time input from the camera. Camera captures the drivers face movement.

After the face detection we are locating ROI (region of interest). A region of interest (ROI) is a portion of an image that you want to filter or operate on in some way.

We have two ROI that is eye blinking and yawning detection. Eye blinking frequency is calculated based on which drowsiness is detected, along with-it movement of mouth is monitored for yawing and alert. Hence the drowsiness of driver is detected and he/she is fed with the alert to take break.

We have used the machine learning techniques such as python interpreter, OpenCV for capturing the real time face movement. [10]

V. ALGORITHM

System starts to run when user open the software while driving for long hours. Steps for the same for as follows: -

1) Real time face capturing with the help of camera.
2) Detecting the landmarks on the on the face.
3) Locating the ROI (Region of Interest), ROI maps the targeted area with the landmarks captured at the time of face detection.
4) After locating the ROI, continuous monitoring is done with the help of function.
5) Function calculates the value for eyes blinking and for yawning.
6) The values are compared and alert is given to driver.

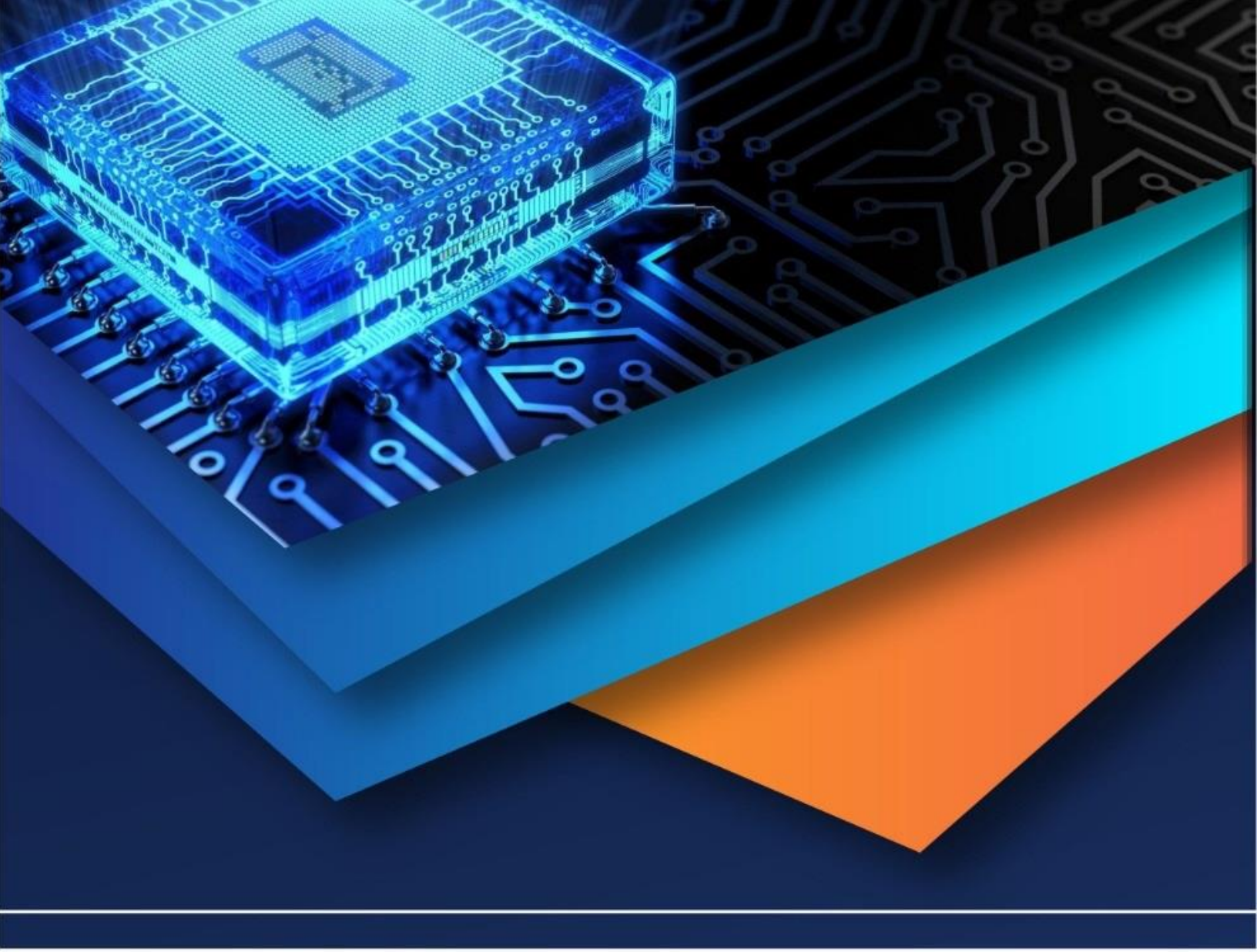
VI.CONCLUSION

In this paper we have studied various implementations done in order to achieve the drowsiness detection. We propose to implement the given solution with the help of machine learning techniques and have comparative study of methodologies over the different metrics such as accuracy and recall.

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