International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET

Drowsiness Detection System Using Machine Learning

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ARTICLEINFO

Article History:

Accepted: 05 April 2023
Published: 20 April 2023

Publication Issue
Volume 10, Issue 2
March-April-2023

Page Number
693-699

ABSTRACT

Drowsy driving is a serious safety concern that affects millions of people worldwide. to prevent accidents caused by drowsy driving, a drowsiness detection system using ML is proposed in this project. The system uses computer vision and machine learning algorithms to detect signs of drowsiness in drivers and alert them while driving. According to various studies, the number of accidents caused by the drowsiness of drivers is much higher than the number of accidents caused by drunk driving. Most accidents are caused bydrowsiness and it can be reduced by having a system that can detect yawning and eye closure, and alert the driver to prevent major injuries. The system uses a camera to capture video of the driver's face and eyes. Then the captured video is processed using libraries of Python such as OpenCVto detect facial landmarks, eye blinks, and head movements. Machine learning algorithms are then used to analyze these features and determine whether the driver is drowsy or alert. The system gives real-time alerts to the drivers when signs of drowsiness are found. The driver can also set their own preferences for the alert based on their personal preferences as a sound or flash on their face. In conclusion, this project proposes a drowsiness detection system using Python that is accurate, reliable, and easy to use. The system can reduce the number of accidents caused by drowsy driving and improve road safety.

Keywords : Drowsiness, Eye closure, Yawningdetection, OpenCV, safety.

I. INTRODUCTION

A study in the United States showed that around 40% of drivers met with an accident and were admitted to hospitals for falling asleep while driving. An estimated 1 million drivers are involved in a drowsy driving-related crash in the past years. Fall- asleep crashes should be considered a serious problem. The drowsy-driving crashes are high, because of the higher speeds involved in it and combined with the delayed reaction time. However, most of these accidents are related to the drowsiness of drivers. And most car accidents

related to driver fatigue are more likely to be serious, leading to serious injuries and even deaths. At present, the Drowsiness Detection Systems monitoring the driver's condition needs complex computation and expensive equipment, which is not comfortable to wear while driving. Our Drowsiness detecting system works by using a camera that points directly toward the driver's face and captures real-time video. Once the video is captured then the process starts to monitor the face region and eyes in order to detect drowsiness. The system can be monitoring eyes and checks whether the eyes are in an open state or closed state. In case drowsiness is detected, a warning sign is issued to alert the driver to prevent an accident. If the driver's eyes are closed more than a standardvalue, then the system draws the conclusion that the diver is falling asleep, finally, it activates an alarm sound to alert the driver.

II. METHODS AND MATERIALS

EAR: EAR is the eye aspect ratio of the eye region. it is generally used for calculating the speed of right and left eye closures and consistency, in order to detect the drowsiness of the driver. In the study of EAR, Eye Aspect Ratio was utilized for the displacement changes of the eye points of facial paralysis patients in the Movement- image series, and then the difference in eye movements of facialparalysis patients was calculated based on the changes in the Eye Aspect Ratio.

YAWN DETECTION: Usually the drowsiness of a human can be observed by seeing at their face and behavior. In this detection system a method wheredrowsiness can be detected by mouth positioning and eye closure. Then the images were compared with the set of image data for yawning.

EAR and MAR ratio: The (DL) deep learning model will also be trained for detecting eye closure and its output will be added with Eye Aspect Ratio for detecting eye closure. If a person is detected as yawning and closing eyes less than a threshold value, then the alarm will alert the driver by makingsounds.

2.1 USE CASE DIAGRAM

The use case diagram for drowsiness detection using machine learning involves use cases such as Webcam, videos, image pre-processing, Harr detection, parameter measures, and Voice note. After the pre-processing of the images Harr detection, Harr detection is nothing but Harr cascade is an algorithm used for detecting the objects in the images and this Harr detection algorithm is not difficult and can use to solve real- world problems

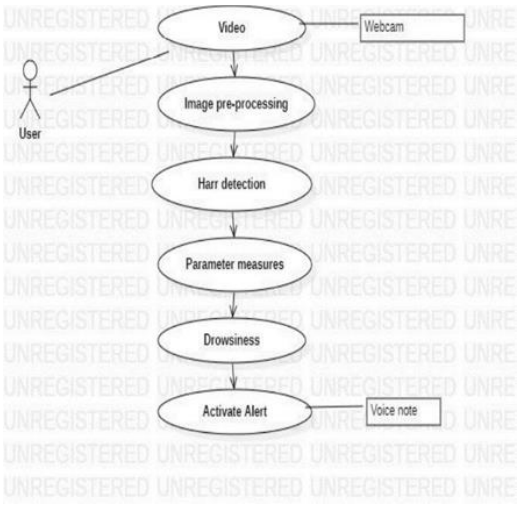

Fig 2.1: Use Case Diagram

2.2 CLASS DIAGRAM

It contains the classes involved and shows the connections between the various classes. A class that handles the video streaming and performs various levels of drivers. A class that extracts from the frames a process to get a set of the features like eye aspect ratio, eye blink ratio, etc.

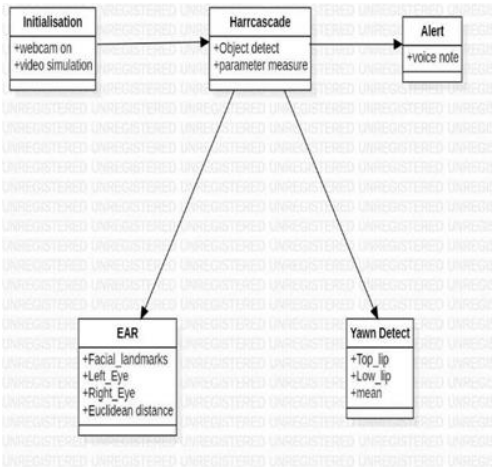

Fig 2.2: Class diagram

2.3 SEQUENCE DIAGRAM

It shows the sequence of the steps that are carried out throughout the process of execution. It involveslifelines or a lifetime of a process that shows the duration for which the process is alive while the steps are taking place in a sequential manner. Sequence diagram specifies the order in which the various steps are executed.

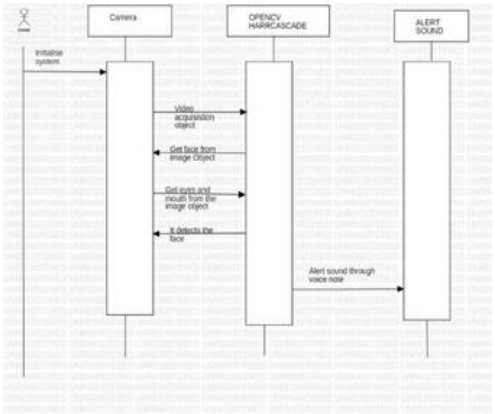

Fig 2.3: Sequence diagram

2.4 ACTIVITY DIAGRAM

It shows the flow of the various activities that are undergone from the beginning till the end. It consists of the activities that are held and carried throughout the session from starting to the ending stage. If the activity diagram starts with the start system, then moves on to starting the camera to initialize the camera. The system features from the video frames to extract activity.

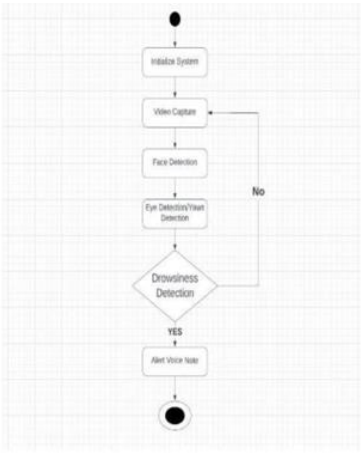

Fig2.4 : Activitydiagram

III. RESULTS AND DISCUSSION

The drowsiness detection system using machine learning has shown promising results in the drowsiness detection of drivers and alerting them on time to prevent accidents caused by drowsydriving. When our drowsiness detection system detects signs of any drowsiness, it immediately sends an alert to the driver to wake up and stay alert by making sounds and preventing accidents caused by drowsy driving. The drowsiness detection system's monitoring capabilities and accurate detection of drowsiness make it a promising and effective solution for preventing accidents caused by drowsy driving. Overall, our drowsiness detection system using machine learning is providing promising results in detecting drowsiness in drivers and providing an effective warning by making sounds to prevent accidents caused by drowsy driving. The system's reliability, accuracy, and real-time monitoring features make it a valuable tool for improving driver safety on theroad.

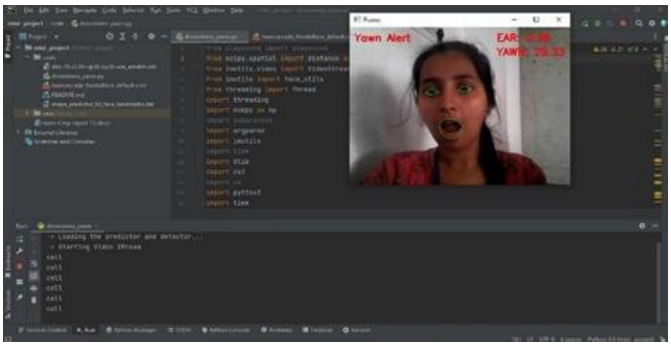

Fig 3.1: Representation of the yawning alert

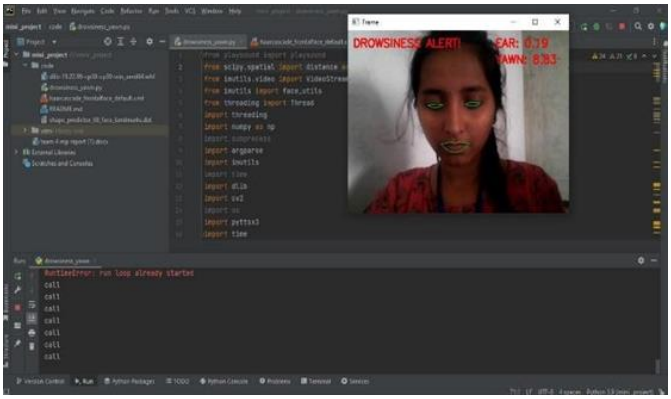

Fig 3.2: Representation of Drowsiness

IV. CONCLUSION

It is an automated system for detecting the drowsiness of the driver and alerting them on time to prevent accidents. The continuous video stream is read and processed from the system and then used for detecting the drowsiness i.e., eye closure and yawning of the drivers. It is detected by using the algorithm called Haar cascade. The Haar cascade algorithm utilizes Haar features to detect the eye and face. these features are already defined and are used for detecting different objects. If in case, the value remains 0 for some amount of time, then it concludes it as sleepy and alerts the driver by activating an alarm. In case of the value remains constant for longer periods, then the driver is said to be distracted then also an alarm is activated. In this system, we reviewed the different methods available to find the drowsiness state of a driver. Finally, it can reduce the accidents that are caused due to drowsiness of the driver.

V. ACKNOWLEDGEMENTS

The authors wish to thank the chief editor, the associate editor, and the anonymous reviewers for their helpful feedback to improve the quality of this paper.Our profound gratitude goes out to Mr. G. Sreenivasulu, our head of the department, and Dr.P. C. Krishnamacharya, our principal, for providing us the chance to work on this incredible project, “Drowsiness Detection System using Machine Learning.”We thank JBIET, Department of Computer Science Engineering, and Assistant Professor Mrs. Pavani madam for her guidance and support in this projectwork.

VI. COMPETING INTERESTS

The authors declare there are no competing interests.

VII. AUTHORS’ CONTRIBUTION

As authors of a “Drowsiness Detection System using Machine Learning” that uses only Python and a few Python Libraries, R. NAGARAJ was responsible for front-end development, S. Sai Kiran for back-end development, Sai Chandu for System Testing, and G. Hemanth for the drowsiness detection system development. Our contributions were essential in creating reliable, accurate, and real-time monitoring features making it a valuable tool for improving driver safety on the road. Our approach allowed us to develop a Drowsiness Detection System that provides the driver’s safety thereby reducing the number of accidents caused by drowsydriving.

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Cite this article as :

R. Nagaraj, G. Hemanth, S. Sai Kiran, H. Sai Chandu, Mrs. S. Pavani, "Drowsiness Detection System Using Machine Learning", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 10 Issue 2, pp. 564-568, March-April 2023.
Journal URL : https://ijsrset.com/IJSRSET2310297