IJMRT: Volume (6), Issue 5, 2024
International Journal of Multidisciplinary Research Transactions
(*A Peer Reviewed Journal*)
www.ijmrt.in

ISSN (Print):2663-2381
ISSN (Online):2663-4007

Drowsiness Alert Control System using 68 Landmark Predictor

J Sathiaparkavi[1*], C Vennila[2]

[1]*Assistant Professor, Department of Computer Science and Engineering, Saranathan College of Engineering, Trichy, India.*
[2]*Professor, Department of Electronics and Communication Engineering, Saranathan College of Engineering, Trichy, India.*

[*]Corresponding author

DoI: https://doi.org/10.5281/zenodo.11350228

Abstract

This paper proposes a novel approach to detect drowsiness of driver by utilizing 68 landmark predictor which captures facial feature to avoid loss of human life due to accidents. Driver, emphasizing the need for advanced driver monitoring systems to create alertness. The 68 landmark predictor is based on the dlib library which precisely locates 68 key points on the face and captures subtle changes indicative of drowsiness. The paper employs computer vision techniques to continuously monitor the driver's facial landmarks in real-time. By analyzing variations in facial expressions, eye movements and head pose the system assesses the driver's alertness level. A machine learning model trained on labeled datasets, processes the extracted features to classify the driver's state as either drowsy or swooning. The system is integrated with the existing commercial vehicles and provides a non- intrusive solution for enhancing the driver safety. A graphical user interface is used to detect the level of alertness and triggers timely alert sound when drowsiness is detected. Additionally, the system interfaces with external modules such as automatic emergency services that contribute to an overall comprehensive safety framework. The proposed vigilance control system aims to mitigate the risks associated with driver fatigue by fostering safer reducing the likelihood of accidents. Through the utilization of facial landmarks, the project offers a robust and effective solution for real-time detection of drowsiness in diverse driving conditions.

Keywords: Drowsiness Alert, Control System, Machine Learning, 68 Landmark Predictor.

1. Introduction

Almost 1.2 million people lose their lives in road accidents every year around the world..Driver fatigue is one of the major contributing factor for road accidents. According to the National Highway Traffic Safety Administration, from 2011 to 2015 the accidents that are caused due to fatigue state of driver is almost 2.3%to2.5% which causes more than 800 fatalities and 60,000 crashes each year. Drivers who lost their consciousness are more likely to produce impaired safety performance. They may lose the ability of controlling their vehicles eventually. One of the most important approaches to reduce these crashes is to monitor the driver's mental state and alert him/her when necessary.

The system aims to enhance road safety by monitoring drowsiness of driver and create timely alerts to prevent potential accidents. This functionality will be integrated into an Advanced Driver Assistance System (ADAS) to actively contribute to driver safety. This technique consist of driver's data which is collected through computer vision, that can distinguish fatigue state from non-fatigue state quickly and precisely.

Over the past few decades, there have been significant developments of the facial landmark detection algorithms. The early works focus on the less challenging facial images without any facial variations. Later, the facial landmark detection algorithms focuses on68 key points on the face and facial features of the driver are usually collected using computer vision techniques. The system aims to produce accurate results by analyzing facial features and detect drowsiness of the driver to prevent road accidents.

1.2. Literature Survey

Several related works have been done in the area vigilance control system using 68 landmark predictors. Below are some examples:

1. " A Fatigue Driving Detection Algorithm Based on Facial Motion Information Entropy "by Feng You,Yunbo Gong,Haiqing Tu,Jianzhong Liang,and Haiwei Wang. This paper proposed a real-time detection algorithm involved in information entropy. Particularly, this algorithm relies on the analysis of sufficient consecutive video frames.
2. " Evaluation of driver drowsiness using respiration analysis by thermal imaging on a driving simulator "by Serajeddin Ebrahimian , Ali Nahvi , Hamidreza Bakhoda, Masoumeh Tashakori This paper proposed a real-time detection algorithm by collecting images of driver's respiration system that undergoes significant changes from active state to fatigue state and can be used to detect drowsiness of the driver.
3. " Driver Drowsiness Detection Based on Steering Wheel Data Applying Adaptive Neuro-Fuzzy Feature Selection "by Sadegh Arefnezhad, Sajjad Samiee, Arno Eichberger, Ali Nahvi,. This paper proposed that feature selector can select the most related features to the drowsiness level to improve the accuracy in classification. This method is based on the combination of the filter and wrapper feature selection algorithms using adaptive neuro-fuzzy inference system (ANFIS).
4. " Detection and prediction of driver drowsiness using artificial neural network models " by de Naurois C.J., Bourdin C., Stratulat A., Diaz E., Vercher J.-L. This paper proposed that 21 participants drove a car simulator for 110 min under conditions optimized to induce drowsiness.

2. Research Problem & Question

2.1. Research Problem

The problem addressed in this paper is the significant number of road accidents caused by driver fatigue, resulting in fatalities and injuries. Despite advances in vehicle safety technology, there remains a critical need for effective driver monitoring systems to detect drowsiness and prevent accidents.

1. Employ real-time image processing techniques to monitor temporal changes in these landmarks, integrating sophisticated algorithms to analyze subtle variations in facial expressions, eye movements, and head pose for early detection of drowsiness.
2. Conduct comparative studies with existing driver monitoring technologies, evaluating factors such as detection accuracy, false positive/negative rates, user acceptance, and system latency. Implementing Menu links for visually challenged persons.
3. Emphasize the system's role in early detection and intervention, preventing accidents caused by driver fatigue and improving overall road safety metrics.

3. Proposed System

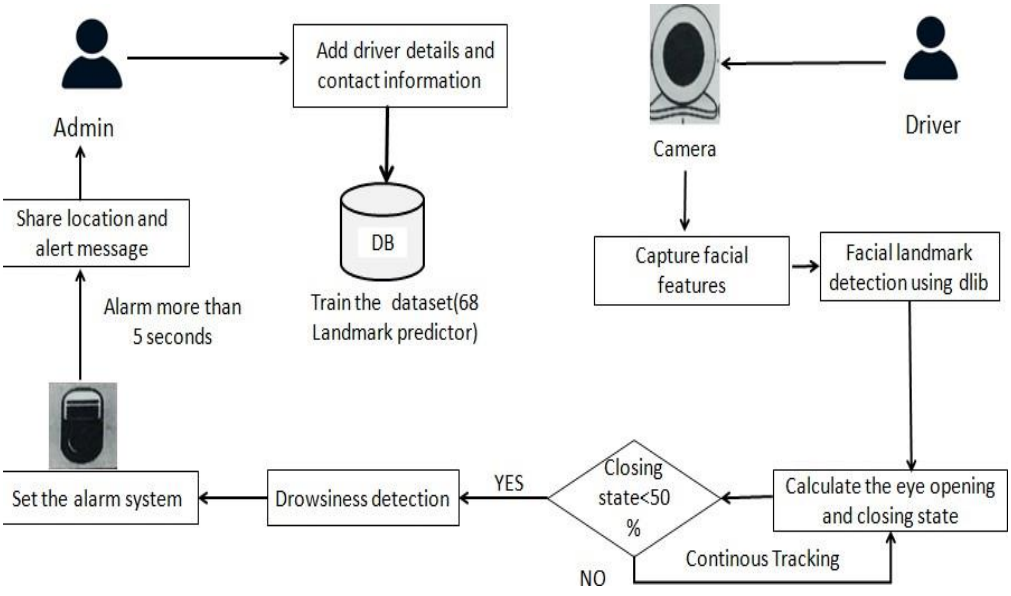

Figure.1. System Architecture

4. Methodology

4.1. Drowsiness and Swooning Detection

Eye Aspect Ratio Calculation: It defines a function eye_aspect_ratio() responsible for calculating eye aspect ratio based on the coordinates of facial landmark.

Drowsiness Detection Logic: The module contains the main logic for detecting drowsiness. This includes processing video frames, detecting facial landmark, calculating eye aspect ratio and determining drowsiness based on predefined threshold.

Facial Land Mark Detection: Utilizes the dlib library to detect facial landmark from webcam frames. These landmark are crucial for calculating the eye aspect ratio and determining drowsiness.

5. Alert Mechanism

Alerting Mechanisms: Define functions or methods to generate alerts when drowsiness is detected. This could include displaying text messages on the frame or producing alert sound.

Integration: Interacts with drowsiness detection logic to determine when alert should be triggered.

Alerting User: Utilizes appropriate methods to alert the user. For example it may use cv2.putText()to display a message on the video frame or win sound.Beep()to produce a sound alert.

6. Alert Message and Emergency Call

Credentials: The module stores Twilio credentials (account_sidandauth_token) along with other essential details such as the Twilio phone number and emergency contact number. These credentials are used for authentication when accessing Twilio's services.

Send Alert Message: This function sends an alert message to the designated emergency contact number. It uses the Twilio client to create and send an SMS message containing the alert message.

Make Emergency Call: This function initiates an emergency call to the designated emergency contact number. It uses the Twilio client to create and initiate a phone call. The call is made from the Twilio phone number specified in the credentials.

7. Location Sharing

Credentials: Similar to Twilio, this module might store API keys or credentials required for accessing Google Maps services.

Functionality: It would contain functions for tasks such as obtaining the user's location, reverse geocoding coordinates to obtain an address, or calculating distances and routes.

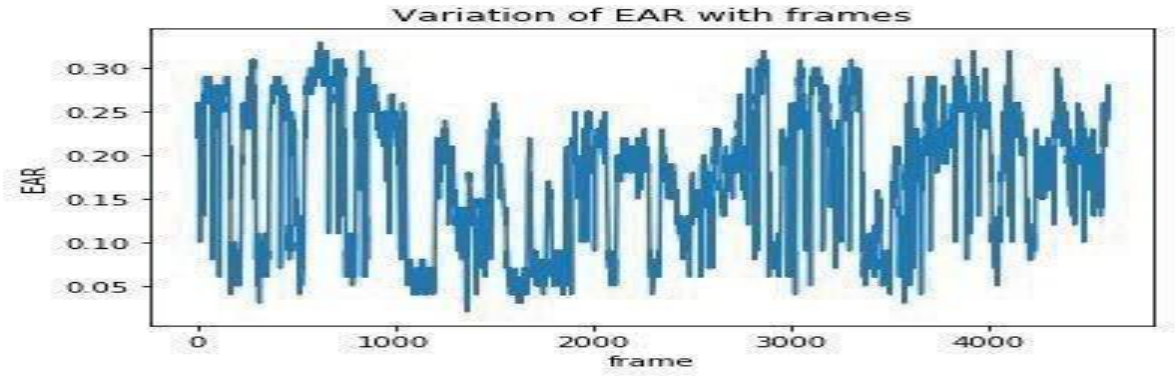

Figure.2. Variation of eye-aspect ratio with time

8. Result

The frontal camera captures subtle facial changes indicative of drowsiness, ensuring high accuracy in real- time monitoring.

By employing computer vision techniques, the system continuously analyzes facial expressions, eye movements, and head pose to assess the driver's alertness level. The camera

captures and continuously monitors the driver's facial landmarks in real-time, analyzing variations in facial expressions, eye movements, and headpose to assess alertness levels. If there is any change in the facial expression, immediately alert message will be sent to stored mobile number

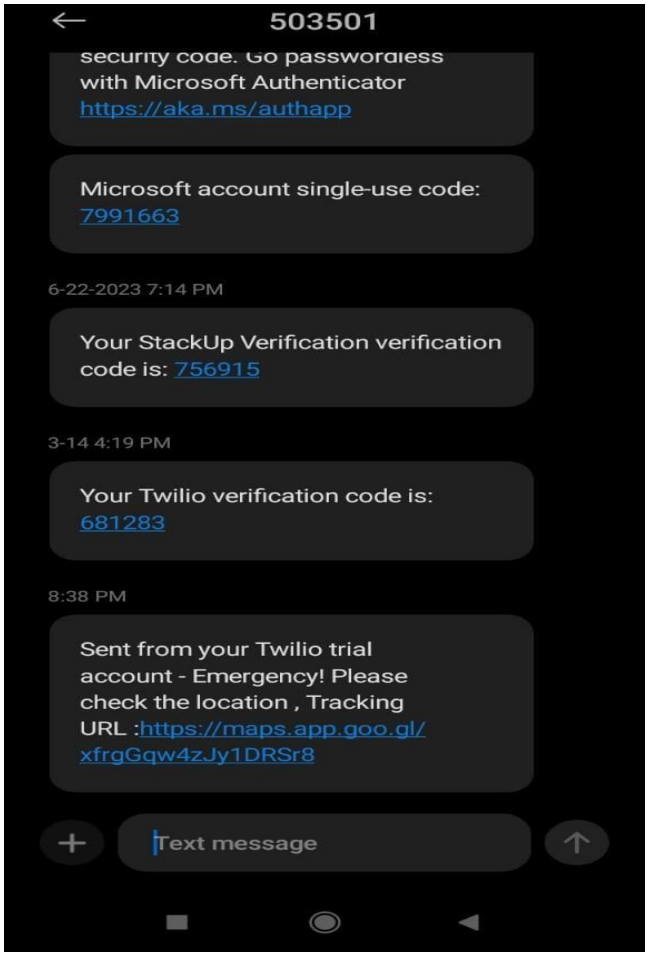

Figure.3. Alert Message

The "Send Alert Message" function utilizes the Twilio client to create and send an SMS message containing the precise alert message to the designated emergency contact number.

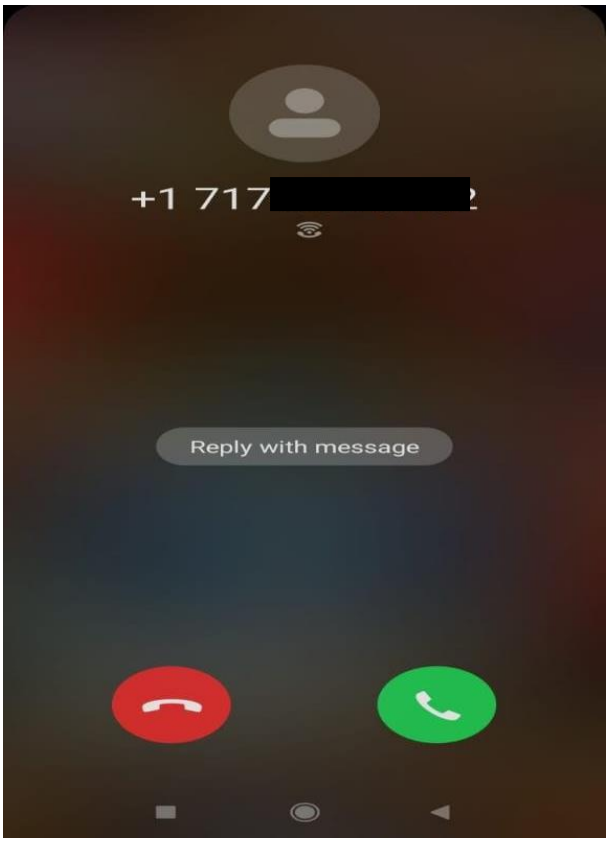

Figure.4. Emergency Call

The "Emergency Call" function leverages Twilio's API to promptly initiate a phone call to the designated emergency contact number using the specified Twilio phone number, ensuring rapid communication for swift assistance in critical situations.

9. Conclusion

Drowsiness detection is a very challenging problem, the method described. It is cost-effective compared to other approaches and can be used by any user by providing camera permissions. This paper on a vigilance control system using a 68 landmark predictor concludes that this approach shows promise inaccurately detecting drowsiness or fatigue in drivers. Despite its advantages in capturing detailed facial features for analysis, challenges like computational complexity need addressing for real-time implementation. However, the practical implications are significant, suggesting integration into existing systems for enhanced vigilance control. Future research could focus on algorithm efficiency and real-world

validation, with the overall impact potentially improving safety and performance in various domains.

REFERENCES

[1]. Feng You,Yunbo Gong,Haiqing Tu,Jianzhong Liang,and Haiwei Wang , "A Fatigue Driving Detection Algorithm Based on Facial Motion Information Entropy", Journal of Advanced Transportation ,Hindwai ,Volume 2020.

[2]. Serajeddin Ebrahimian , Ali Nahvi , Hamidreza Bakhoda, Masoumeh Tashakori, "Evaluation of driver drowsiness using respiration analysis by thermal imaging on a driving simulator", ACM digital library Multimedia Tools and Applications Volume 79 Issue 25, pp 17793–17815, Jul 2020.

[3]. Sadegh Arefnezhad, Sajjad Samiee, Arno Eichberger, Ali Nahvi,"Driver Drowsiness Detection Based on Steering Wheel Data Applying Adaptive Neuro-Fuzzy Feature Selectio"n, in MDPI- Sensors, 19(4), 943, 2019.

[4]. De Naurois C.J., Bourdin C., Stratulat A., Diaz E., Vercher J.-L, "Detection and prediction of driver drowsiness using artificial neural network models", in Elseiver Accident Analysis and Prevention, Volume 126, pp 95-104, May 2019.