MINOR PROJECT REPORT

Submitted in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

(Department of Computer Science and Engineering)

Submitted to

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHOPAL (M.P.)

Submitted by

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CERTIFICATE

This is to certify that the minor project report entitled **“Real time Driver Drowsiness Detection System”** is submitted by **Aditya Narayan Jaiswal** and **Jai Prakash Kushwaha** of Computer Science and Engineering Branch of Indian Institute of Information Technology Bhopal in fulfilment of the requirements of Bachelor of Technology in Department of Computer Science and Engineering. This project is an authentic work done by them under my supervision and guidance.

This project has not been submitted to any other institution for the award of any degree.

Date: 19/04/2023

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STUDENT DECLARATION

I hereby declare, that the work presented in the project report entitled "**Real Time Driver Drowsiness Detection System**" in partial fulfilment of the requirement for the award of degree of "**Bachelor of Engineering**" from **Indian Institute of Information Technology, Bhopal** is record of my own work.

I, with this, declare that the facts mentioned above are true to the best of our knowledge. In case of any unlikely discrepancy that may occur, we will be the ones to take responsibility.

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ABBREVIATIONS:

IIIT: Indian Institute of Information Technology

TPR: True Positive Rate

FPR: False Positive Rate

SVM: Support Vector Machine

ABSTRACT

Every year many people lose their lives due to fatal road accidents around the world and drowsy driving is one of the primary causes of road accidents and death. Fatigue and micro sleep at the driving controls are often the root cause of serious accidents. However, initial signs of fatigue can be detected before a critical situation arises and therefore, detection of driver's fatigue and its indication is ongoing research topic. Most of the traditional methods to detect drowsiness are based on behavioural aspects while some are intrusive and may distract drivers, while some require expensive sensors. Therefore, in this paper, a light-weight, real time driver's drowsiness detection system is developed and implemented on Android application. The system records the videos and detects driver's face in every frame by employing image processing techniques. The system is capable of detecting facial landmarks, computes Eye Aspect Ratio (EAR) and Eye Closure Ratio (ECR) to detect driver's drowsiness based on adaptive thresholding. Machine learning algorithms have been employed to test the efficacy of the proposed approach. Empirical results demonstrate that the proposed model is able to achieve accuracy of 84% using random forest classifier.

Closure Ratio (ECR) to detect driver's drowsiness based on adaptive thresholding. Machine learning algorithms have been employed to test the efficacy of the proposed approach. Empirical results demonstrate that the proposed model is able to achieve accuracy of 84% using random forest classifieClosure Ratio (ECR) to detect driver's drowsiness based on adaptive thresholding. Machine learning algorithms have been employed to test the efficacy of the proposed approach. Empirical results demonstrate that the proposed model is able to achieve accuracy of 84% using random forest classifies face, an important part of the body, conveys a lot of information. When a driver is in a state of fatigue, the facial expressions, e.g., the frequency of blinking and yawning, are different from those in the normal state. In this paper, we propose a system called DriCare, which detects the drivers' fatigue status, such as yawning, blinking, and duration of eye closure, using video images, without equipping their bodies with devices. Owing to the shortcomings of previous algorithms, we introduce a new face-tracking algorithm to improve the tracking accuracy. Further, we designed a new detection method for facial regions based on 68 key points. Then we use these facial regions to evaluate the drivers' state. By combining the features of the eyes and mouth, DriCare can alert the driver using a fatigue warning. The experimental results showed that DriCare achieved around 92% accuracy.

INTRODUCTION

In recent years, an increase in the demand for modern transportation necessitates a faster car-parc growth. At present, the automobile is an essential mode of transportation for people. In 2017, a total of 97 million vehicles were sold globally, which was 0.3% more than that in 2016. In 2018, the global total estimation of the number of vehicles being used was more than 1 billion. Although the automobile has changed people's lifestyle and improved the convenience of conducting daily activities, it is also associated with numerous negative effects, such as traffic accidents. A report by the National Highway Traffic Safety Administration showed that a total of 7,277,000 traffic accidents occurred in the India in 2016, resulting in 37,461 deaths and 3,144,000 injuries. In these accidents, fatigue driving caused approximately 20% − 30% traffic accidents. Thus, fatigued driving is a significant and latent danger in traffic accidents. In recent years, the fatigue-driving-detection system has become a hot research topic. The detection methods are categorized as subjective and objective detection.

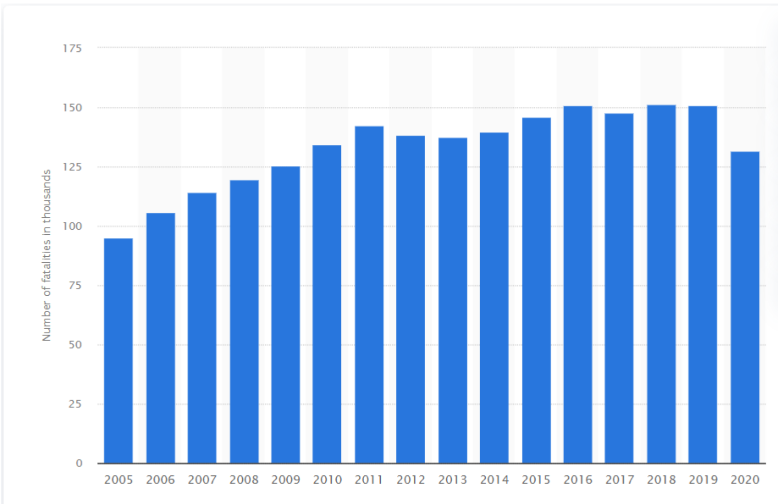

Fig 1: Number of deaths due to road accidents across India from 2005 to 2020*(in 1,000s)*

In the subjective detection method, a driver must participate in the evaluation, which is associated with the driver's subjective perceptions through steps such as self-questioning, evaluation and filling in questionnaires. Then, these data are used to estimate the vehicles being driven by tired drivers, assisting the drivers to plan their schedules accordingly. However, drivers' feedback is not required in the objective detection method as it monitors the driver's physiological state and driving-behaviour characteristics in real time. The collected data are used to evaluate the driver's level of fatigue. Furthermore, objective detection is categorized into two: contact and non-contact. Compared with the contact method, non-contact is cheaper and more convenient because the system that not require Computer Vision technology or sophisticate camera allow the use of the device in more cars. Owing to easy installation and low cost, the non-contact method has been widely used for fatigue-driving detection. For instance, Attention Technologies and Smart Eye employ the movement of the driver's eyes and position of the driver's head to determine the level of their fatigue. In this study, we propose a non-contact method called DriCare to detect the level of the driver's fatigue.

Our design uses each frame image to analyse and detect the driver's state. One of the major causes behind the casualties of people in road accidents is driver's drowsiness. After continuous driving for long time, drivers easily get tired resulting into driver fatigue and drowsiness. Research studies have stated that majority of accidents occur due to driver fatigue. Different countries have different statistics for accidents that occurred due to driver fatigue. Developing technology for detecting driver fatigue to reduce accident is the main challenge. According to the report by "Ministry of Road Transport & Highways there were 4,552 accidents reported every year in India, that took lives of thousands of people because of sleepy drivers (Road Accidents in India 2016). For instance, many vehicles are driven mostly at night such as loaded trucks. The drivers of such vehicles who drive for such continuous long period become more susceptible to these kinds of situations. Detecting drowsiness of drivers is still ongoing research in order to reduce the number of such miss-happenings and accidents.

Fig 2: Examples of Fatigue & Drowsiness Condition

Typical methods used to identify drowsy drivers are physiological based, vehicle based, and behavioural based. To encounter this worldwide problem, a solution that captures images in a succession, transmits real-time driver's data to the server, and determines drowsiness using EAR (Eye Aspect Ratio) and ECR (Eye Closure Ratio) has been proposed and implemented using Android application. The computed value via the system prompts the driver to take a break or rest for some time. The methods used are non-intrusive in nature; hence, no additional costs would be incurred during the course of the drowsiness detection method. It also details the components which are developed as a part of application to compute EAR and ECR.

RELATED WORK

In order to detect drowsiness of drivers, numerous approaches have been proposed. This section summarizes the existing approaches to detect drowsiness. Rateb et al. (R. Jabbar, K. Al-Khalifa, M. Kharbeche, W. Alhajyaseen, M. Jafari, and S. Jiang,2018) detected real-time driver drowsiness using deep neural networks. They developed an Android application. Tereza Soukupova et al. (T. Soukupova and J. Cech,2016) used EAR (Eye Aspect Ratio) as a standard measure to compute drowsiness of a person. They also detailed the types of systems used for detecting drowsiness of driver. For example, Active Systems (considered as reliable, but use special hardware that are expensive and intrusive like infrared cameras etc.) and Passive Systems (are inexpensive and rely on Standard cameras). Shailesh et al. (S. Sangle, B. Rathore, R. Rathod, A. Yadav, and A. Yadav,2018) used a camera fixed on the dashboard to capture and send images to Raspberry Pi server installed in the vehicle, to detect faces using Harr classifier and facial points using the Dlib Library. Vibin Varghese (V. Varghese, A. Shenoy, S. Ks, and K. P. Remya,2018) detected landmarks for every frame captured to compute the EAR (between height and width of eye) using the landmark points of face. After computing the EAR; (V. Varghese, A. Shenoy, S. Ks, and K. P. Remya,2018) determined the driver as drowsy if the EAR was less than the limit for 2 or 3 seconds (because the eye blink lasts approximately 100-400ms). Ashish Kumar (A. Kumar and R. Patra,2018) used Mouth Opening Ratio as a parameter to detect yawning during drowsiness. There are several other research works that have been conducted to determine vision-based drowsiness detection (I. García, S. Bronte, L. M. Bergasa, J. Almazán, and J. Yebes,2012)– (K. Srijayathi and M. Vedachary,2013), fatigue detection (A. Chellappa, M. S. Reddy, R. Ezhilarasie, S. Kanimozhi Suguna, and A. Umamakeswari,2015), eye-tracking to detect driver fatigue (2011). Thus, with reference to the literature work we have a proposed a system that detects driver’s drowsiness using EAR and ECR which are detailed in the following section. There are several existing techniques for driver drowsiness detection, each with its own advantages and limitations.

Here are some common techniques:

Electroencephalography (EEG): This technique measures the electrical activity of the brain to detect changes in the brainwaves that are associated with drowsiness. EEG-based systems are considered to be highly accurate but require electrodes to be placed on the driver's scalp, which can be uncomfortable and inconvenient. Electrooculography

Figure 3: Examples of EEG Data Collecting

(EOG): This technique measures the electrical activity of the eye muscles to detect changes in eye movements that are associated with drowsiness. EOG-based systems are less accurate than EEG-based systems but are easier to implement and do not require any contact with the driver's skin. Video-based techniques: These techniques use cameras to monitor the driver's facial features, such as eye closure and head position, to detect signs of drowsiness. Video-based techniques are non-intrusive and can be easily integrated into existing vehicle systems, but they may not be as accurate as physiological measures. Heart rate variability (HRV): This technique measures the variation in time between heartbeats to detect changes in heart rate that are associated with drowsiness. HRV-based systems are non-intrusive and can be easily integrated into wearable devices, but they may not be as accurate as physiological measures. Steering behaviour analysis: This technique analyses the driver's steering behaviour to detect changes in vehicle control that are associated with drowsiness. Steering behaviour-based systems are non-intrusive and do not require any additional equipment, but they may not be as accurate as physiological measures. Overall, the choice of technique depends on various factors, including accuracy, ease of implementation, and comfort for the driver. Combining multiple techniques may improve the overall performance of driver drowsiness detection systems.

Facial feature-based driver drowsiness detection systems use image processing techniques to analyse the driver's facial features and detect signs of drowsiness. Here are some common steps involved in these systems: Face detection: The first step is to detect the driver's face in the camera image. This can be done using various face detection algorithms, such as Viola-Jones algorithm, which uses Haar-like features and a classifier to detect faces. Feature extraction: Once the face is detected, various facial features, such as eye closure, mouth opening, and head position, are extracted using techniques such as facial landmark detection and eye tracking. Feature selection: Not all facial features are equally important for detecting drowsiness.

Therefore, a feature selection algorithm is used to select the most relevant features that are indicative of drowsiness. Classification: The selected features are then used to classify the driver's drowsiness level using machine learning algorithms, such as support vector machines (SVM), random forests, and neural networks. Alert generation: If the system detects signs of drowsiness, an alert is generated to notify the driver to take a break or rest. Facial feature-based driver drowsiness detection systems have several advantages, including non-invasiveness, ease of implementation, and low cost. However, these systems also have some limitations, such as low accuracy in challenging lighting conditions, changes in facial expressions, and variability in driver appearance. To improve the performance of facial feature-based systems, researchers are exploring new techniques, such as deep learning-based methods, which can learn complex representations of facial features and improve the accuracy of drowsiness detection.

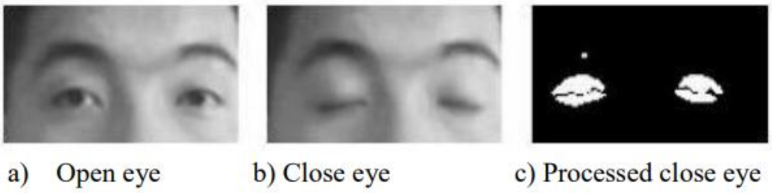

Fig 4: Examples of Eyelid Movement

Driver drowsiness detection can be divided into two types: contact approaches and non-contact approaches. In contact approaches, drivers wear or touch some devices to get physiological parameters for detecting the level of their fatigue. Warwick et al. implemented the Bio Harness 3 on the driver’s body to collect the data and measure the drowsiness. Li et al. used Ans mart watch to detect driver drowsiness based on electroencephalographic (EEG) signal. Jung et al. reformed the steering wheel and set an embedded sensor to monitor the electrocardiogram (ECG) signal of the driver. However, due to the price of contact approaches and installation, there are some limitations which cannot be implemented ubiquitously. The other method employs a tag-free approaches to detect the driver drowsiness, where the measured object does not need to contact the driver.

Yawning Detection Method According to, drowsiness of a person can be observed by looking at their face and behaviour. The author proposes a method where drowsiness can be detected by mouth positioning and the images were process by using cascade of classifier that has been proposed by Viola-Jones for faces. The images were compared with the set of images data for mouth and yawning. Some people will close their mouth by their hand while yawning. It is an obstacle to get good images if a person is closing their mouth while yawning but yawning is definitely a sign of a person having drowsiness and fatigue. Figure 5 are the examples of yawning detection method used in the research.

Figure 5: Examples of Person in Normal and Yawning Condition

PROPOSED APPROACH TO DETECT DRIVER'S DROWSINESS

This section details the proposed approach to detect driver's drowsiness that works on two levels. The application is installed on driver's device running Android operating system (OS). The process starts with capturing of live images from camera and is subsequently sent at local server. At the server's side, Dlib library is employed to detect facial landmarks and a threshold value is used to detect whether driver is drowsy or not (T. Soukupova and J. Cech,2016). These facial landmarks are then used to compute the EAR (Eye Aspect Ratio) and are returned back to the driver. In our context, the EAR value received at the application's end would be compared with the threshold value taken as 0.25(T. Soukupova and J.Cech,2016). If the EAR value is less than the threshold value, then this would indicate a state of fatigue. In case of Drowsiness, the driver and the passengers would be alerted by an alarm. The subsequent section details the working of each module.

DATA PROCUREMENT

For using the application, the driver performs a registration if using the application for the first time. After performing a sign-up, the driver adds a ride by entering the source and destination of the ride. Likewise, an interface for the passengers is also provided where the passengers can connect with the ride, added by the driver. The driver then starts the ride. The proposed application then captures the real-time images of the driver. Images are captured every time the application receives a response from the server. The process goes on until the driver stops the ride. For testing the efficiency of the proposed approach, a data set of 50 volunteers was collected. Every participant was asked to blink their eyes intermittently while looking at camera for capturing EAR values. The logs of the results that were captured by the application were collected and analysed with the help of machine learning classifiers.

FACIAL LANDMARK MARKING

To extract the facial landmarks of drivers, Dlib library was imported and deployed in our application (T. Soukupova and J. Cech,2016), (J. D. Fuletra,2013). The library uses a pre-trained face detector, which is based on a modification to the histogram of oriented gradients and uses linear SVM (support vector machine) method for object detection. Actual facial landmark predictor was then initialized and facial landmarks captured by the application were used to calculate distance between points. These distances were used to compute EAR value (K. C. Patel, S. A. Khan, and V. N. Patil,2018). EAR is defined as the ratio of height and width of the eye and was computed using equation 1. The numerator denotes the height of the eye and the denominator denotes the width of the eye and the details of the all the landmarks of eye are depicted.

After the facial features are extracted, they are represented as a set of numerical values or a feature vector. Each feature vector represents the facial features of the driver at a particular time instant. To detect changes in the driver's drowsiness level, these feature vectors need to be compared to each other over time. Euclidean distance is a metric used to measure the distance between two feature vectors in a feature space. In the context of driver drowsiness detection, the Euclidean distance between the current feature vector and a baseline feature vector (representing an alert driver) is calculated. This distance represents the deviation of the current feature vector from the baseline feature vector. The greater the distance, the greater the deviation and the higher the probability of the driver being drowsy. To detect drowsiness, a threshold is set for the Euclidean distance, and if the distance exceeds the threshold, an alert is generated to notify the driver to take a break or rest. Overall, Euclidean distance is a simple yet effective measure for comparing feature vectors and detecting changes in the driver's facial features over time. However, it has some limitations, such as sensitivity to variations in illumination, head orientation, and facial expressions. Therefore, other metrics and techniques, such as deep learning-based methods, are also being explored to improve the accuracy of drowsiness detection systems.

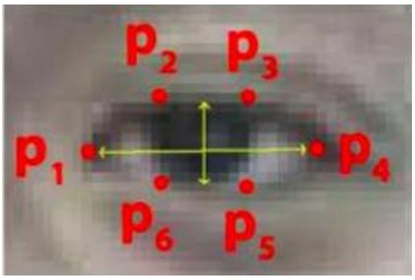

Fig 6. Landmarks of Eye

The Euclidean distance between two feature vectors x and y of the same dimensionality can be calculated using the following formula:

d (x, y) = sqrt((x1-y1) ^2 + (x2-y2) ^2 + ... + (xn-yn) ^2)

where x1, x2, ..., xn and y1, y2, ..., yn are the corresponding components of x and y.

In the context of real-time driver drowsiness detection using facial features, the feature vectors represent the driver's facial features at a particular time instant, and the Euclidean distance is calculated between the current feature vector and a baseline feature vector (representing an alert driver).

Eye aspect ratio (EAR) as a feature, the Euclidean distance can be used to measure the changes in EAR over time and detect drowsiness. The EAR is a measure of how open the eyes are, and it is calculated based on the ratio of the distances between certain facial landmarks around the eye. Specifically, the EAR is calculated as follows:

EAR = (||p2-p6|| + ||p3-p5||) / (2*||p1-p4||)

where p1, p2, p3, p4, p5, and p6 are the six facial landmarks around the eye.

To use the Euclidean distance to detect changes in EAR over time, we can calculate the distance between the current EAR value and a baseline EAR value (representing an alert driver). The Euclidean distance can be calculated using the following formula:

d (EAR_current, EAR_baseline) = sqrt ((EAR_current - EAR_baseline) ^2)

If the Euclidean distance between the current EAR value and the baseline EAR value exceeds a certain threshold, it indicates that the driver is drowsy and an alert is generated. The Euclidean distance can be used to compare the EAR values of the driver's eyes over time and detect changes that indicate drowsiness. By setting a threshold for the Euclidean distance, the system can generate an alert when the driver's eyes become too closed or droopy, indicating that the driver is at risk of falling asleep.

the numerator calculates the distance between the upper eyelid and the lower eyelid. The denominator represents the horizontal distance of the eye. When the eyes are open, the numerator value increases, thus increasing the EAR value, and when the eyes are closed the numerator value decreases, thus decreasing the EAR value. In this context, EAR values are used to detect driver's drowsiness. EAR value of left and right eyes is calculated and then average is taken. In our drowsiness detector case, the Eye Aspect Ratio (K. C. Patel, S. A. Khan, and V. N. Patil,2018) is monitored to check if the value falls below threshold value and also it does not increase again above the threshold value in the next frame. The above condition implies that the person has closed his/her eyes and is in a drowsy state. On the contrary, if the EAR value increases again, it implies that the person has just blinked the eye and there is no case of drowsiness. Figure 2 depicts the block diagram of our proposed approach to detect driver's drowsiness. Figure 3 represents a snapshot of facial landmark points using Dlib library, which are used to compute EAR. Table 1 details the facial landmark points for left and right eye which were used for computation.

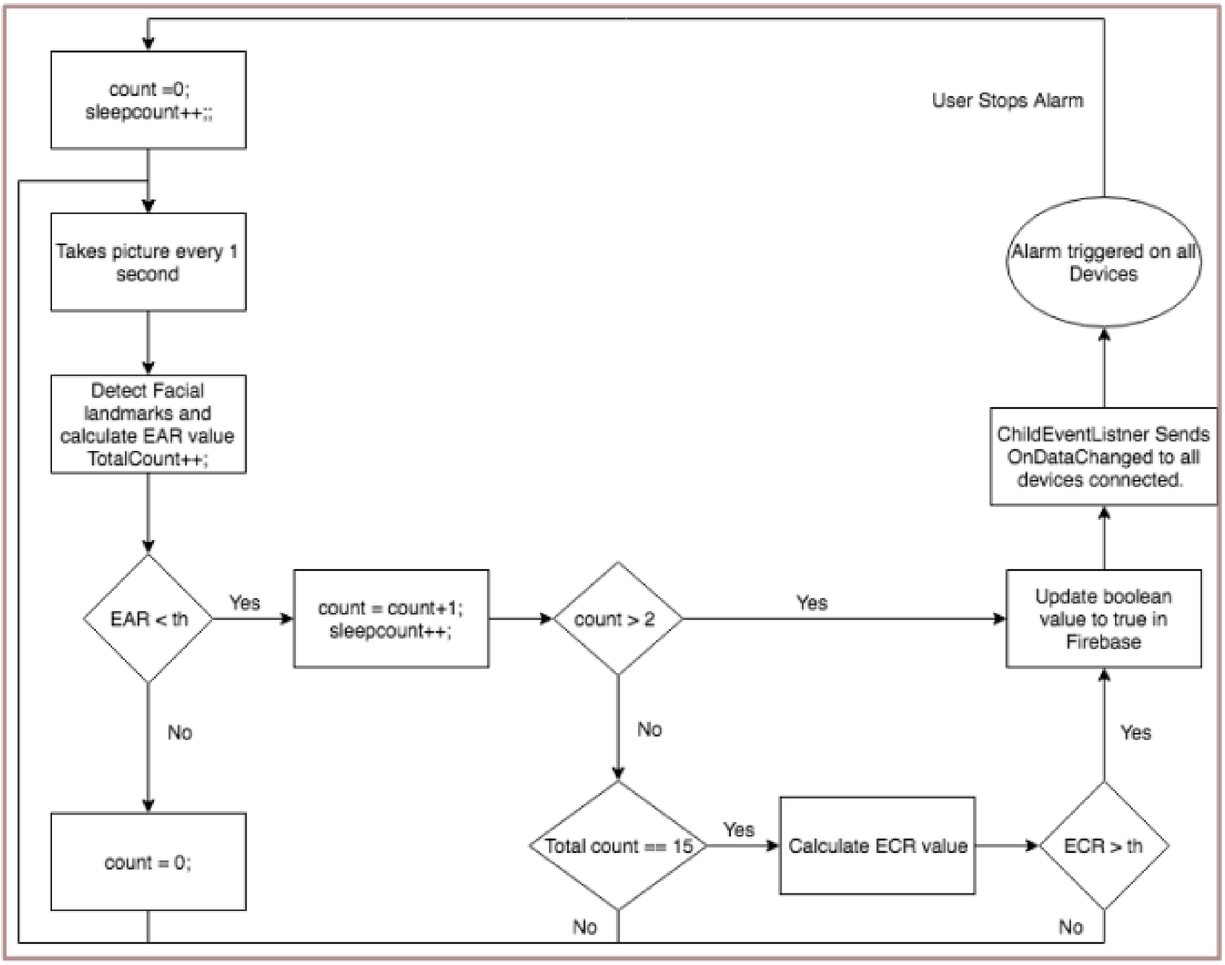

Fig 7: - Block Diagram of Proposed Drowsiness Detection Algorithm

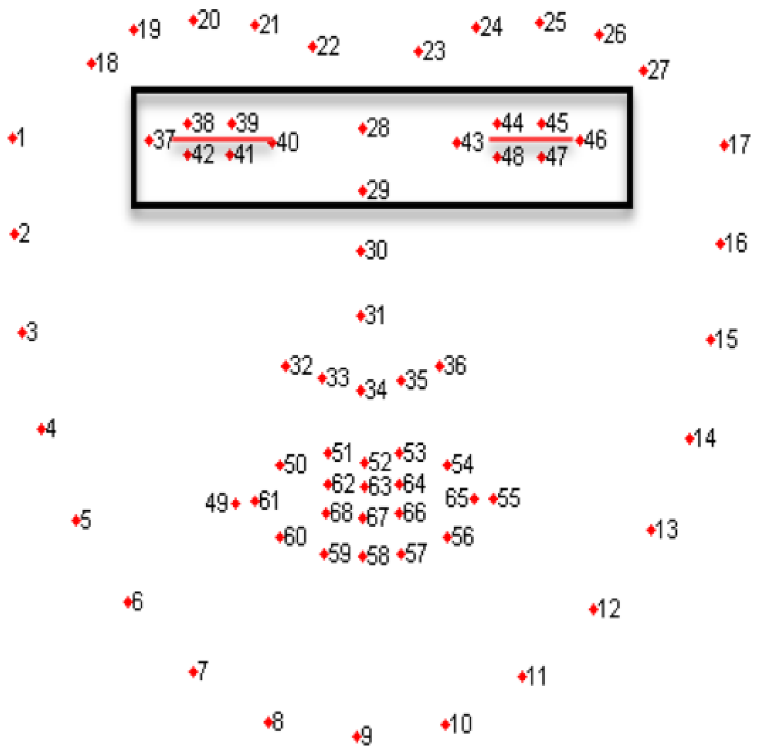

Fig 8: Facial Landmark Points according to Dlib library

Table 1 – Facial Landmarks

Part	Landmark Points
Left Eye	37-40
Right Eye	43-46

CLASSIFICATION

After capturing the facial landmark points, EAR value computed by the server is now received at the android device of the driver and compared with the threshold value which was earlier set to be 0.25(T. Soukupova and J. Cech,2016). If the value is less than the threshold then the counter value is incremented, else the counter value is set back to zero. If the counter value reaches to three, an alarm is triggered in the android device. In addition, another variable (Sleep Counter) is maintained which counts the number of times the EAR value is less than threshold value. Variable (Total Counter) stores the total count of responses from the server side and is used to calculate the ECR (Eye Closure Ratio). It is defined as the ratio of Sleep Counter.

$$ECR = \frac{\text{Sleep Counter}}{\text{Total Counter}}$$

In our context, the value of ECR was calculated for every 15 consecutive frames (captured from camera). As soon as the frame number reaches to 16, the value of total counter becomes one and sleep counter becomes zero. Whenever the ECR value exceeds the threshold value which is set to 0.5, then a notification is generated in the android app to indicate drowsy state of the driver.

ALGORITHM

Algorithm for a real-time driver drowsiness detection system using facial features:

1. Acquire video input: The system should be able to acquire video input of the driver's face in real-time. This can be done using a camera mounted on the dashboard or steering wheel.
2. Face detection and tracking: The system should use a face detection and tracking algorithm to locate the driver's face in the video stream and track its movement. This can be done using techniques such as Haar cascades or deep learning-based face detection algorithms.
3. Facial feature extraction: The system should extract facial features from the driver's face using techniques such as the Viola-Jones algorithm or deep learning-based facial feature extraction. The features that can be extracted include eye aspect ratio (EAR), mouth aspect ratio (MAR), head pose, and facial landmarks.
4. Euclidean distance calculation: The system should calculate the Euclidean distance between the current feature vector and a baseline feature vector (representing an alert driver) for each feature. If the Euclidean distance exceeds a certain threshold, it indicates that the driver is drowsy and an alert is generated.
5. Alert generation: If the system detects that the driver is drowsy, it should generate an alert to notify the driver. The alert can be in the form of a visual alert (flashing lights on the dashboard) or an audio alert (beeping sound).
6. Calibration: The system should be calibrated to adjust the threshold values based on the driver's individual characteristics, such as age, gender, and driving habits.
7. Continuous monitoring: The system should continuously monitor the driver's facial features in real-time and update the Euclidean distances and alerts accordingly.

Overall, the algorithm involves capturing the driver's facial features in real-time, comparing them to a baseline to detect changes, and generating alerts when the driver becomes drowsy.

The system should be accurate, reliable, and responsive to ensure the safety of the driver and other road users.

COMPARISON WITH STATE OF ART APPROACH

We have used the EAR (eye aspect ratio) and proposed a way to compute ECR (Eye Closure Ratio). Compared to other methods from the literature, our proposed algorithm provides better accuracy and reduces response time of calculating the EAR at server as the server is locally setup and also the returned EAR value is locally checked in the android device of the driver thereby improving the results of alertness as soon as the driver feels drowsy. Moreover, in other intrusive methods (T. Hwang, M. Kim, S. Hong, and K. S. Park,2016), (S. Junawane, S. Jagtap, P. Deshpande, and L. Soni,2017), a number of machines and devices need to be attached to the driver's body were required, thereby making it uncomfortable for the driver to concentrate on his driving. Moreover, in previous approaches a setup needs to be performed every time, whenever the driver starts the ride. However, these intrusive methods involve a good amount of cost to measure pulse rate, heartbeats, etc. In our suggested measure, we have just used an android device and a local server to detect drowsiness that removes the factors of cost of machines and interruption in driver's concentration. In comparison to the usage of external camera in the intrusive methods, we have used the android device, which is often used by people for navigation and various purposes. The proposed algorithm has worked well in conditions having good lightning. It also works for people wearing spectacles. Following section describes the performance evaluation of the proposed approach.

PERFORMANCE EVALUATION WITH EXPERIMENTAL RESULTS AND DISCUSSION

The section presents the performance evaluation of the proposed approach by performing an empirical analysis of obtained results. First, the system collects the real-time data of the drivers depicted by Figures 9-a, 9-b and 9-c. It then determines drowsiness of the drivers based on the EAR values that are computed based on the images captured of the user and its response from the server. It also detects the drowsiness using ECR values.

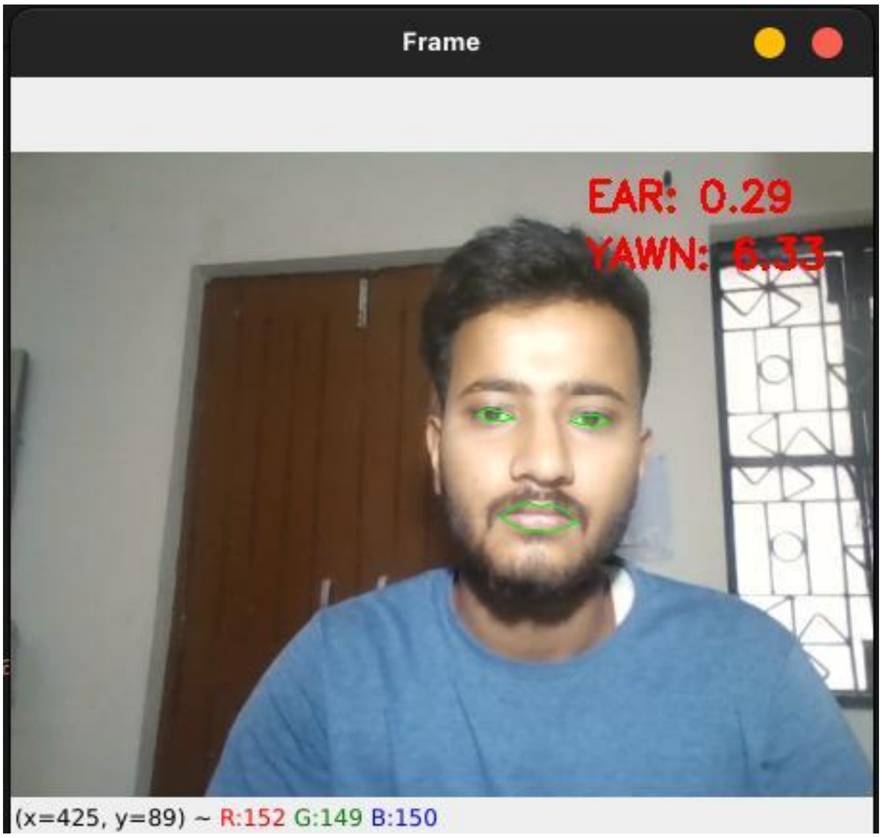

Fig. 9 (a) - Results when eyes are open (Without Spectacles)

Fig. 9 (b) - Results when eyes are closed (Without Spectacles)

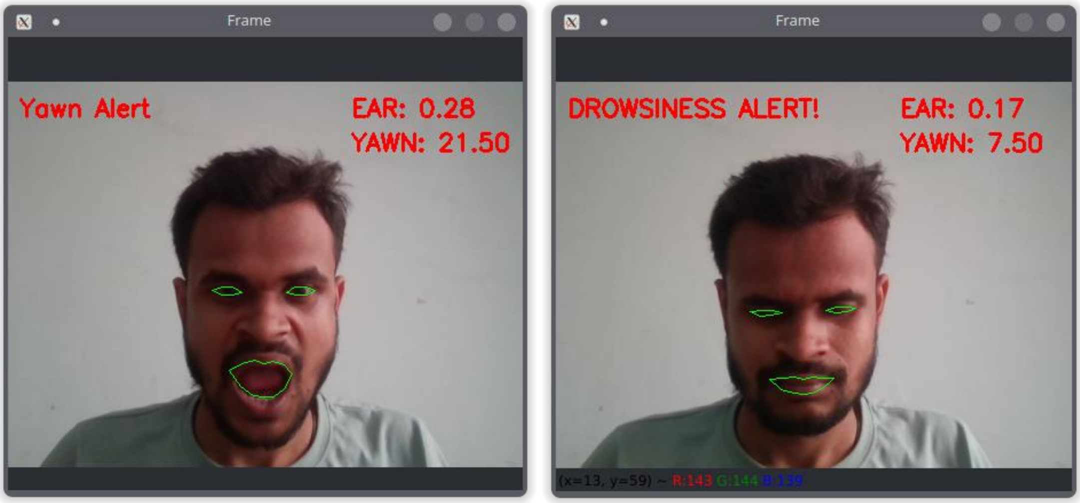

Fig. 9 (c) - Results when eyes are open (With Spectacles).

Two-way analysis has been performed in our work. Our first phase includes the results obtained by the android application when the driver faces the camera. Data is collected from this phase, is further used in the second phase where detailed analysis of the results has been performed using machine learning classifiers to test the effectiveness of the proposed approach. Classifiers that were employed for empirical analysis were Naive Bayes, Support Vector Machine and Random Forest (K. Das and R. N. Behera,2017). To evaluate the performance of the classifiers, we compared the results obtained based on standard performance metrics. Naive Bayes Classifier is used to identify objects by applying Bayes Algorithm. Random Forest Classifier is an ensemble algorithm which generates a set of uncorrelated decision trees by randomly selecting the subset of training set and then aggregates them to arrive at a conclusion. SVM (Support Vector Machine) is a discriminative classifier that finds out a line that demarcates the classes. Table 2 enumerates the results obtained by employing different classifiers.

Table-2: Results (in percentage) obtained after applying different classifiers

S. No.	Classifier	TPR	FPR	Accuracy	Precision	Recall	F-Measure
1.	Naïve Bayes	80	20.7	80	80.7	80	79.8
2.	SVM	80	20.4	80	80.1	80	79
3.	Random Forest	84	16.1	84	84	84	84

From table 2 we enumerate that Random Forest classifier give the best classification results with the accuracy of 84%

RECOMMENDATION

The main goal of this project is to develop a simulation system that can detect drowsiness using a webcam. The system must meet certain requirement which is detecting drowsiness throughout the video frames. Thus, the driver can avoid accident. Secondly, it has to detect only drowsiness signs so that the system will not misinterpret any random signs that it received from the driver. Improvement on the algorithms to detect eyes and mouth need to be done for future implementation. Luminance changes have to be encounter to ensure the detection of the gradient of eyes is sufficient to improve the detection results. The quality of the video or images used in detecting drowsiness affects the result of the detection. Therefore, a good quality and high frame rate of images (number of pixel) is one of the factors to get better detection. Better techniques can be used to compare which technique is more reliable in detecting drowsiness. Implementing other method to detect drowsiness is also one of the improvements to the system so that it can ensure the system to be reliable to detect drowsiness. Besides that, a better internal specification of laptop or device can be used to run the system in order to obtain a smooth execution of the algorithm and a reliable system. Thus, by making this project successful, the numbers of road accident can be reduced when this project is implemented in the vehicle to detect the drowsiness of the driver.

CONCLUSION AND FUTURE WORK

In this work, a real time system that monitors and detects the loss of attention of drivers of vehicles is proposed. The face of the driver has been detected by capturing facial landmarks and warning is given to the driver to avoid real time crashes. Non-intrusive methods have been preferred over intrusive methods to prevent the driver from being distracted due to the sensors attached on his body. The proposed approach uses Eye Aspect Ratio and Eye Closure Ratio with adaptive thresholding to detect driver's drowsiness in real-time. This is useful in situations when the drivers are used to strenuous workload and drive continuously for long distances. The proposed system works with the collected data sets under different conditions. The facial landmarks captured by the system are stored and machine learning algorithms have been employed for classification. The system gives best case accuracy of 84% for random forest classifier.

The future work can include integration of the proposed system with globally used applications like Uber and Ola. The system, if integrated, can reduce the number of casualties and injuries that happen regularly due to these drowsy states of the drivers. This experiment can run as a part of pilot plan i.e., for a few days/months in different regions of the world where such incidents occur regularly. Thus, our proposed approach also gives the same accuracy for the people wearing spectacles. Accuracy of our proposed system improves with the increase in brightness of the surrounding environment. The work can be extended for different types users such as bike riders or in different domains like railways, airlines etc.

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PROJECT LINK

GitHub: https://github.com/AdityaNarayan05/Real-Time-Driver-Drowsiness-Detection-System