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Driver Drowsiness Detection Based on Face Feature and Perclos

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ABSTRACT

Driving vehicles are complex and require undivided attention to prevent road accidents. Fatigue and distraction are a major risk factor that causes traffic accidents, severe injuries, and a high risk of death. Some progress has been made for driver drowsiness detection using a contact-based method that utilizes vehicle parts (such as steering angle and pressure on the pedal) and physiological signals (electrocardiogram and electromyogram). However, a contactless system is more potential for real-world conditions. In this study, we propose a computer vision-based method to detect driver's drowsiness from a video taken by a camera. The method attempts to recognize the face and then detecting the eye in every frame. From the detected eye, iris regions for left and right eyes are used to calculate the PERCLOS measure (the percentage of total time that eye is closed). The proposed method was evaluated based on public YawDD video dataset. The results found that PERCLOS value when the driver is alert is lower than when the driver is drowsy.

Keywords : PERCLOS, Computer Vision, Web Camera, Road Accidents

I. INTRODUCTION

Deep learning methods aim at learning feature hierarchies with features from higher levels of the hierarchy formed by the composition of lower-level features. Automatically learning features at multiple levels of abstraction allow a system to learn complex functions mapping the input to the output directly from data, without depending completely on human-crafted features. Best to deal with unstructured data. Efficient at delivering high quality result. Features are automatically deduced and optimally tuned for desired outcome. Algorithms like Cluster Analysis, K means clustering, Anomaly detection uses Unsupervised Learning. The data set consists of both labelled and unlabelled data then we call it is Semi-Supervised learning. Graph-based models, Generative models, cluster assumption, continuity assumption use Semi-Supervised learning. Sometimes more time also required to process the data, it depends on the amount of data fed in. A huge number of layers like input, activation, the output will be required, sometimes the output of one layer can be input to another layer by making few small findings and then these findings are summed up finally in the soft max layer to find out a broader classification for final output. Model performance in prediction and accuracy. For each iteration in Deep Learning Model, the goal is to minimize the cost when compared to previous iterations.

II. LITERATURE SURVEY

A. Eye Blink Detection using Intensity Vertical Projection by H. Dinh, E. Jovanov and R. Adhami

Blinking is a spontaneous or voluntary action of human eyes. It has long been used for human-machine communication and human physiological detection. In these applications, detecting the eye's states, opened or closed, is an important step and affects the accuracy of detecting human intention or physiological states. In this paper, we present a robust method to detect eye blink based on the intensity vertical projection of eye's image. Unlike many previous works on eye blink detection based on edges of images, our work addresses blink detection by using the intensity of images. The method can deal with the variation of user's eye shape and distances between users and camera. Some of the Limitations are as follows, it does not support real time. It is extremely expensive to train due to complex data models.

B. Drowsy Driver Detection System using Eye Blink Patterns by T. Daniman, I. Bilasco, C. Djeraba and N. Ihaddadene

A driver drowsiness detection system is proposed that involves detection of driver drowsiness by use of an algorithm. For detection of drowsiness, the most relevant visual indicators that reflect driver's condition is the eye behaviour. The facial algorithm employed makes use of an eye aspect ratio and physical landmark measurements. Landmark detectors used in the algorithm demonstrate robustness against varied head orientations, facial expressions and lighting conditions. The proposed real time algorithm will estimate eye aspect ratio that measures eye open level in each video frame. It perceives eye blink pattern as EAR values. The proposed system under development can help prevent the same by providing non-invasive and easy to use specialized device. As a result, it is difficult to be adopted by less skilled people and also increases cost to the users.

C. Real-Time System for Monitoring Driver Vigilance by L.M. Bergasa, J. Nuevo, M.A. Sotelo and M. Vazquez

The face, a significant piece of the body, passes on a great deal of data. At the point when a driver is in a condition of weariness, the outward appearances, e.g., the recurrence of squinting and yawning, are not quite the same as those in the typical state. Right now, propose a framework, which identifies the drivers' exhaustion status, for example, yawning, squinting and span of eye conclusion, utilizing video pictures, without outfitting their bodies with gadgets. Inferable from the deficiencies of past calculations. we present another face following calculation to improve the following precision. It cannot support alert and it requires very large amount of data in order to perform better than other techniques.

III. PROPOSED SYSTEM

In the proposed system, the driver fatigue and distraction are detected only by processing of eye region. The main symptoms of driver fatigue and distraction appear in the driver's eyes because of sleeping while driving. Nowadays, there are many fatigue detection methods and the best is capturing the eyes in real time using web camera to detect the physical responses in eyes. Moreover, the processing of the eye region instead of the processing of the face region has less computational complexity.

IV. ALGORITHM

PERCLOS

PERCLOS is the percentage of duration of closed-eye state in a specific time interval (1 min or 30 s). It is a well-recognized and effective measure of neurophysiological fatigue level. For each frame, a result will be output at the end of detection. Then fatigue can be detected by analysing PERCLOS and duration of closed-eyes state. The result could be open-eyes state, closed-eyes state, face exception,

and eyes exception. The PERCLOS is drawn in real time by counting detection results with certain frames in a fixed period. Then fatigue can be detected by analysing PERCLOS and duration of closed-eyes state.

CALCULATION

After eye area extraction, the next step is to detect driver fatigue based on PERCLOS (Percentage of eyelid closure over the pupil over time). PERCLOS is an established parameter to detect the level of drowsiness. Level of drowsiness can be judged based on the PERCLOS threshold value, PERCLOS is a parameter that is used to detect driver fatigue.

It is calculated as

"PERCLOS close 100% total n f N = x"

Let n be the number of eye-close frames over a period time. f is the total number of frames over a period time. When the driver is in a state of fatigue, the driver's PERCLOS value will be higher than normal. We set the PERCLOS threshold, when the driver's PERCLOS value is higher than this threshold, then the current driver is considered fatigue.

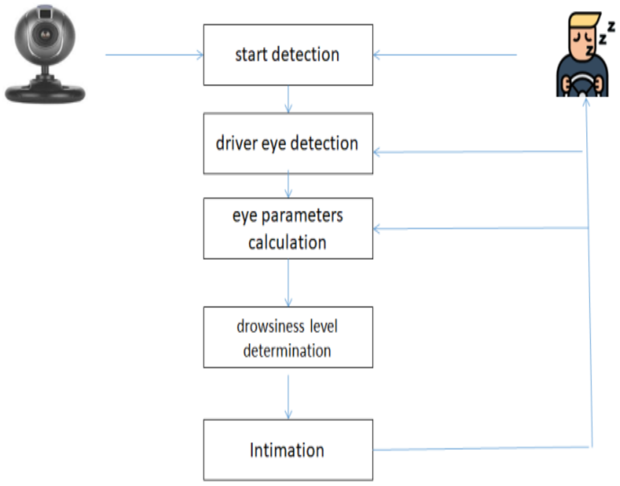

Fig 1: System Architecture

V. ADVANTAGES

1. Accidents can be avoided by alerting the driver's distraction and drowsiness using warning signals.
2. Comparing to the driver detection algorithm this PERCLOS system reduces the time complexity.
3. Warning alarm alerts the driver as well as the passengers to be conscious about the driver's behaviour.
4. Driver Drowsiness Detection system typically behaves as a user-friendly application.

VI. MODULES DESCRIPTION

A. *Start detection (Camera OpenCV)*

This the first module of this system, its used to open a camera with (OpenCV) library. After initialize the camera its ready to detect the human face or driver face.

B. *Driver Eye Detection*

This the second module with the help of this module to detect human eye through (haarcascade_frontalface_alt) this xml file. After with help of this haarcascade file to find the x,y coordinates of eye.

C. *Eye Parameters Calculation*

In this module for recognize the face of the ATM user. So, if the user covers the face using helmet or etc, this module going to detect that face covered or uncovered.

D. *Drowsiness Level Determination*

Different landmarks use to detect the opening and closing of eye. Landmark detector that captures most of the characteristic points on a human face image. The return value of the eye aspect ratio will be approximately constant when the eye is open. The value will then rapidly decrease towards zero during a blink.

E. *Intimation*

The capability to detect the real time state of the driver in day and night conditions with the help of a camera. The detection of the Face and Eyes applied based on the symmetry. Make alert for driver.

VII. IMPLEMETATION

Drowsiness detection system created to reduce the risk of accident while driving. The system will records image of driver then face and eyes will be detected. Results of eyes detection, each frame value will be analysed if eyes are closed for 4 seconds. If eyes close for 4 second then system will decide that driver is sleepy and alarm will sound.

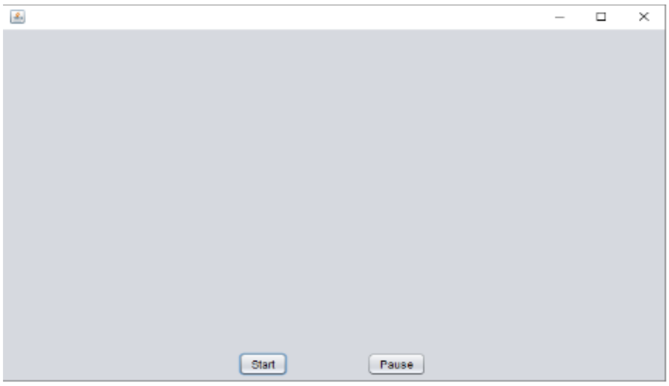

Fig 2: Start Detection (Camera OpenCV)

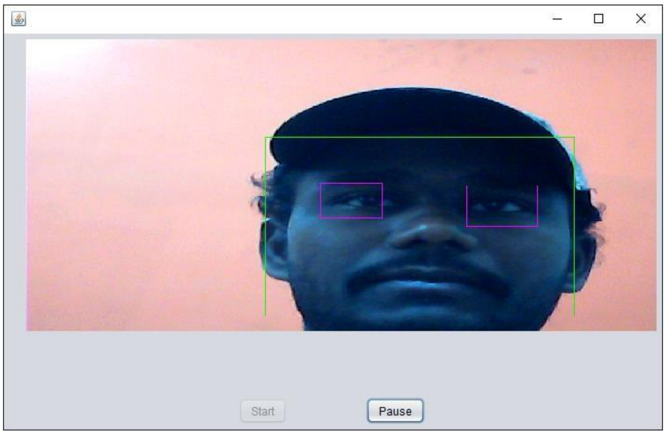

Fig 3: Driver Eye Detection

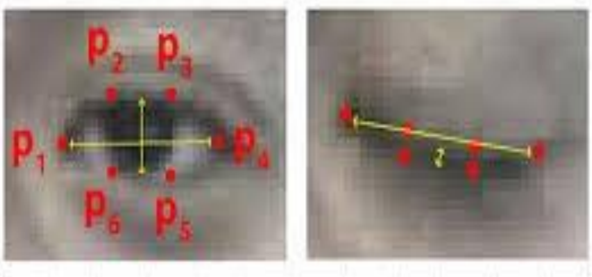

Fig 4: Eye Parameters Calculation

Fig 5 : Drowsiness level Determination

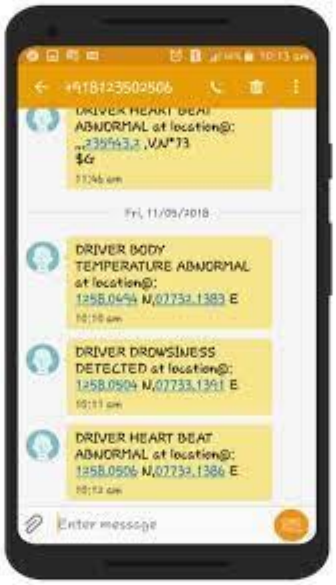

Fig 6: Intimation

VIII. CONCLUSION

Presented the concept and implemented a system to detect driver drowsiness using computer vision which focuses to notify the driver if he is drowsy. The proposed system has the capability to detect the real time state of the driver in day and night conditions with the help of a camera. The detection of the Face and Eyes applied based on the symmetry. We have developed a non-intrusive prototype of a computer vision-based system for real-time monitoring of the driver's drowsiness.

IX. FUTURE ENHANCEMENTS

For future work, the objective will be to reduce the percentage error, that is, reduce the number of false alarms. To achieve this, development of additional entities or experiments will be done, using better drivers and incorporating new analysis modules, for example, facial expressions (yawns).

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