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Driver Drowsiness Detection System

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ABSTRACT
Machine learning technology is used to predict driver conditions and emotions, which provides information to enhance road safety. This is a practical intelligence application. Artificial intelligence is a technology that allows systems to automatically learn and develop without explicit programming. Through this driver status can be assessed by biomarker, driving behavior, and driver speech. This article Explains a comprehensive overview of the latest work related to driver drowsiness and warning systems. We also present various machine learning methods such as the PERCLOS algorithm, HAAR-based cascade classifier, and Open CV used to determine driver state. Finally, it identifies the challenges facing existing systems and presents relevant research opportunities.

Keywords:
- Artificial Intelligence
- Autonomous Vehicle Technology
- Drowsiness Detection
- Machine Learning

I. INTRODUCTION

Drowsiness is driving in a state of mental weakness due to lack of sleep. Sleep deprivation while driving is a leading cause of road accidents. Not getting enough sleep will affect your ability to function normally. When working skills are disrupted, response time increases and memory and judgment are impaired. Numerous studies have shown that sleep deprivation can have a profound effect on driving, just as alcohol does. About 20% of people admitted that they were drowsy while driving, and 40% admitted that this happened at least once in their driving career. Studies show that 40% of road accidents or accidents in India are caused by driving while sleeping, and more than 50% of all fatal road accidents involving two or more vehicles are related to alcohol. More than 65% of all motor vehicle accidents are related to alcohol consumption. Given these statistics, we need to improve driver safety systems. The development of such a system requires an assessment of the driver's position in the driver's seat. Below is a brief description of the updated articles. This article presents an arithmetic approach to solving sleep-related problems. Three steps were involved. This is facial detection, eye detection and eye tracking. This article provides an effective way to assess a driver's condition. The frame uses eye movements to determine the driver's position and issue a warning within half a second. Driver performance is specified as a graph. A new way of finding fatigue is revealed. YCbCr color space and curve detection method are used. These methods are used to determine driver fatigue. The alarm is turned off when the driver is drowsy. A separate program focused on computer visualization was developed. Software algorithm developed. This algorithm has been partially tested and found to be effective. Research is under way to develop an air-conditioned system. An improved system can detect sleep patterns faster. The system is able to distinguish between normal blinking of the eye and blinking of the eye accompanied by drowsiness. It can play under low light conditions even when the driver is wearing glasses. This can be further enhanced by adding different sensors. The upgraded system is based on computer vision. The system uses the Viola Jones algorithm and the CAMSHIFT algorithm. This paper is about building a software framework for achieving timely and accurate sleep. Many facial features were considered input. This paper proposes a method for determining sleep status based on the analysis of timeseries of angular steering speed. Compared with the traditional method, this method has several advantages. Ways to detect drowsiness are twofold. Based on driver and vehicle. It also gives an idea of the different ways in which drivers and vehicles work. Algorithms known as "shape prediction algorithms" and drowsiness-based systems are improved.

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II. LITERATURE REVIEW

The upgraded system is a real-time system. It uses image processing to detect eyes and faces. The HAAR-based classifier cascade is used for face recognition. An object tracking algorithm is used for continuous eye tracking. The PERCLOS algorithm is released to detect driver drowsiness. This paper focuses on building a non-disruptive system that can detect fatigue and issue timely warnings. The system will monitor the driver's eyes using a camera. By performing an algorithm, signs of driver fatigue can be detected early to avoid an accident. Once signs of fatigue have been identified, sound and seat belt come out to monitor the driver. The warning will be closed automatically rather than automatically. This paper uses a faster algorithm than PERCLOS. This system will detect driver fatigue by processing the eye area. After image detection, the first stage of processing is face detection. If the eyes blink normally no warning is issued. If the eyes are closed for more than 0.5 seconds, this program issues a warning to the driver. Notifications in the form of alarms and vibrations. Python is used for image processing. The system uses a flash number to determine if the driver is drowsy. The program uses OpenCV with a single camera view. The image processing algorithm is used to determine the shape of the eye. In this study, only eye condition was considered, not yawning frequency. Closed eyes are detected using a HAAR-based cascade classifier and an alcohol gas sensor that acts as a breathalyzer. This program contains two modules. Two modules are a face and eye detection module and a face tracking module. The CAMSHIFT algorithm is used for continuous face tracking. The system also uses a cascade classifier to improve the accuracy of facial recognition. The program is an invisible real-time model. To reduce the risk of drowsiness, various measures have been developed to detect drowsiness. This article discusses three ideas. The first idea is to create a data set to display a sleepy face. The second idea is to combine visual, invisible and motor functions into one. A recent idea is to make wearable items such as smart watches that get drowsy.

III. METHODOLOGY

After surveying a number of different papers, the following methodologies have been identified:

A. PERCOLS

Initially, in order to identify the driver’s drowsy state using PERCLOS,
we need to perform the following steps as per:

• Perception of face and face pursuit.
• Position of eye and eye pursuit.
• Identification of the state of the eyes.
• Identification of the drowsy state. PERCLOS is one of the measures to notice the state of drowsiness.

B. CAMSHIFT

In the wake of looking over various changed papers, the accompanying methodology have been distinguished:

A. PERCOLS

At first, to recognize the driver's sleepy state utilizing PERCLOS,we really want to play out the accompanying strides according to:

• Perception of face and face pursuit.
• Position of eye and eye pursuit.
• Recognize the condition of the eyes.
• Identification of the drowsy state. PERCLOS is one of the actions to see the condition of fatigue.

B. CAMSHIFT

A robust and nonparametric technique is used. It implements the CAMSHIFT algorithm.

CAMSHIFT (persistently versatile mean-shift) is a proficient and lightweight following algorithm. It depends on the idea of mean shift It is appropriate for following focuses in straightforward cases. It isn't proficient in that frame of mind in complex circumstances. An identification calculation can be applied to progressive edges of a video arrangement to follow a solitary objective. As per the recognition calculation can be portrayed by the accompanying advances:

1. Introduce the size as well as the place of the pursuit window.
2. Ascertain the mass community (Xc, Yc) of the window.
3. Change focal point of the window to mass focus.
4. Rehash 2 and 3 until distance of the two places (focus of the window and the mass community) is not exactly some limit esteem

C. HAAR TRAINING

The OpenCV library gives various capacities to face and component (eyes, mouth, shades, and so on) location. A piece of these limits can be used to develop classifiers. The classifiers can be prepared for the course of identification of face this is known as HAAR preparing object. Here, a wellspring work is ready from different pictures, both positive and negative. Each component is a solitary worth got by taking away amount of pixels under different districts of the pictures. The pixels utilized for extraction is different for each element. Every one of the separated elements won't be valuable for the necessary interaction.

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The Adaboost method is utilized to remove the pertinent highlights. Every single component is applied on the preparation pictures. The best still up in the air for each element which arranges pictures from positive to negative. Features which provide the least error rate are chosen. At first each element is given an equivalent weight. As the cycle proceeds, the loads are refreshed by the outcomes got to work on the exactness. The weighted amount of the frail classifiers is the last classifier.

D. VIOLA JONES ALGORITHM

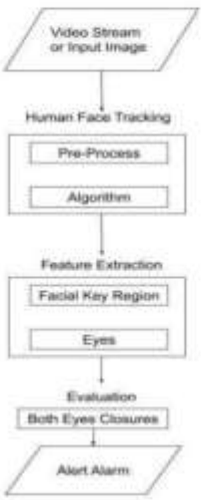
Viola Jones algorithm utilize the following techniques in its algorithm. They are:

- HAAR based features
- Integral Image Formation
- AdaBoost Technology
- A cascade of classifiers

Highlights are chosen in light of the pixel powers in HAAR based include portrayal. It doesn't think about, the upsides of the pixel. HAAR based features are scalar thing between the image and some HAAR designs.

Integral image formation is used for feature calculation. It examines only four corners of the image. Versatile helping (AdaBoost) is utilized to choose the necessary elements. Due to the use of Adaptive Boosting, there is a lessening in the computational time of the estimation.

Fountain of classifiers is utilized to foster areas of strength for a chain. The OpenCV library gives an order brief preparation utility called HAAR-preparing which creates a classifier in XML design when given positive and negative instances of the item to be recognized.



BLOCKDIAGRAM

DATA SET

FIGURES: -

Figure 1. System overview

As shown in Figure 1, the system receives 600 frontal images of the driver, corresponding to the last 60 s recorded by a camera placed on the vehicle (for example, on the driver's dash) at 10 frames per second (FPS). These images are received by the preprocessing module, whose objective is to transform the received image into data that can be used by the drowsiness detection model.

The preprocessed information are then shipped off the analysis module, which plays out the weakness location undertakings and evaluates the degree of drowsiness of the driver at that point, in view of the data from the last 60 s. At last, the decided drowsiness level is conveyed to the alarm activation module, which uses the last levels of laziness to choose if it is essential to alert the driver or not.

As referenced over, one of the principal goals of the caution actuation module is to limit the quantity of bogus up-sides of the framework (drowsiness alerts when the driver is actually awake), since a high number of false positives disturbs the driver and increases the possibility of turning off the system. This is one reason that inspire the trial and error over recordings rather than edges and make the tests seriously demanding, since the initiation of a solitary caution in a 10 min video intends that, paying little heed to what is

distinguished previously or after that second, the grouping of the video will be thought of "sleepy".
Once the system has made its decision on whether to alert the driver or not (a yes/no possible outcome), it will communicate its decision to the human–computer interaction system responsible for warning the driver by using visual and/or sound stimuli. The three modules (preprocessing, analysis and alarm activation) of alternative solutions are described below

Alternative

Recurrent and Convolutional Neural Network The principal elective, in spite of the fact that it is centered around utilizing deep learning procedures, utilizes one man-made brainpower method (straight SVM joined with HOG) to preprocess the driver's picture and concentrate the face. This new picture is sent off the analysis module, that applies deep learning methods to examine the exhaustion of the driver by then.

For this situation, the examination module is made out of a repetitive and convolutional brain organization (which we will call "intermittent CNN"). This repetitive CNN is liable for distinguishing the exhaustion of the driver at the flow second by working out a mathematical result that addresses the assessed fatigue level of the driver. This worth is shipped off the caution enactment module, where it is chosen whether or not to initiate the comparing alert.

Figure 2 shows a diagram representing the process followed by the system, divided in 3 stages that are detailed in this section.

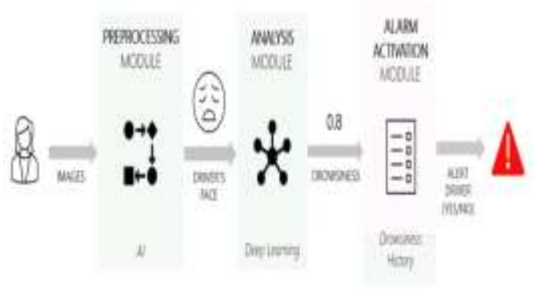


Figure 2. Alternative I overview

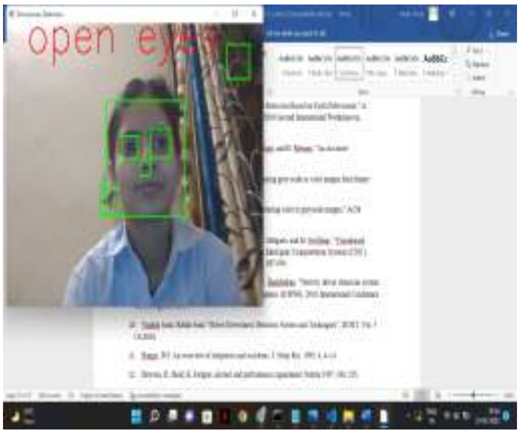


Figure 3 : Open eyes displayed in a normal condition

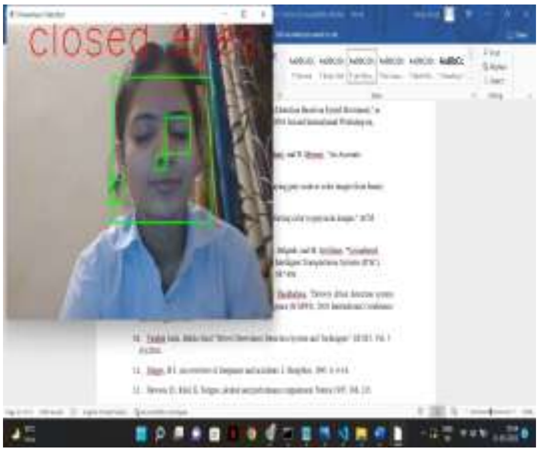


Figure 4: Closed eyes displayed when we closed the eyes

Figure 5: Exception and Detection graph w.r.t time

IV. CONCLUSION

This paper provides comparative research in papers related to driver drowsiness detection and a warning system. In order to provide a solution to the problem of finding a sleep state, an arithmetic method is used. This system uses eye movements to detect fatigue. Eye movements are detected using a camera. This is done to show signs of fatigue to avoid accidents. It depends on the abstraction of eye tracking. Photographs of 150 different people were used to obtain more accurate

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results. The alarm is activated when fatigue is detected. Use computer vision for embedded systems. Software algorithm developed. Slightly tested and shown to be effective. There are many opportunities for further development. The proposed system gets drowsy when the eyes are closed for more than 4 frames. The detection system separates normal blink and drowsiness. The upgraded system is a non-invasive system. The system can be further enhanced by adding different types of sensors. The program is based on a computer perspective. It uses the Viola Jones algorithm, the AdaBoost classifier and the CAMSHIFT algorithm. A cheap application can be built using this program using the raspberrypi module. The main purpose of this paper is to develop a software tool for diagnosing fatigue. This is just a timely and accurate strategy. Here the input is captured on camera, the Raspberrypi module is processed, and the output is displayed as a bass to alert the user when drowsiness is detected. The methods of detecting drowsiness are twofold: driver-based and vehicle-based. It also gives an idea of the different ways in which drivers and vehicles operate. The system is based on a prediction algorithm. Provides an unobtrusive way to get drowsy. In the future, yawning frequency can also be used as a parameter to find drowsiness. Certain facial features have been identified for sleep apnea. This program uses the concept of video processing. Other shortcomings of the proposed system and how to overcome these problems are also mentioned.

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