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RESEARCH ARTICLE

DRIVER DROWSINESS DETECTION SYSTEM

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Abstract

It uses machine learning technology to predict driver conditions and emotions, providing information to improve road safety. This is an artificial intelligence application. Artificial intelligence is a technology that allows systems to automatically learn and improve without being explicitly programmed. The driver's condition can be evaluated by biomarkers, driving behaviour, and the driver's expression. This article presents a comprehensive overview of recent work related to driver drowsiness detection 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.

Inroduction

Insomnia driving is driving in a state of psychological weakness due to lack of sleep. Lack of sleep while driving is a leading cause of road traffic accidents. Not getting enough sleep will affect your ability to function normally. When functional abilities are impaired, reaction time increases and memory and judgment are impaired. Many studies have shown that lack of sleep can affect driving just as much as alcoholism. 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 traffic accidents or accidents in India are due to sleep driving, and over 50% of all fatal traffic accidents involving two or more vehicles are alcohol related. Over 65% of all fatal car accidents are related to alcohol consumption. Given these statistics, we must develop driver safety systems. The development of such a system requires an assessment of the condition of the driver in the driver's seat. Below is

a brief description of the articles reviewed.

This article presents an arithmetic method for solving problems related to drowsiness detection. Three steps were involved. These are face detection, eye position detection and eye tracking. This article provides an efficient way to check the status of a driver. The framework uses eye movement to determine the driver's condition and issues an alert within half a second. Driver performance is deciphered into a graph. A new fatigue detection method is presented. The YCbCr color space and edge detection method are used.These methods are used to determine driver fatigue. An alarm is activated when the driver becomes sleepy. A separate system was developed focusing on the concept of computer vision. A software algorithm was developed. This algorithm has been partially tested and has been found to be effective. Research is in progress in order to develop a fullblown system. The developed system is capable in identifying the state of drowsiness quickly. The system is capable of differentiating between normal eye blink and the eye blink associated with drowsiness. It is capable of performing under low light conditions and when the driver is wearing spectacles. This can further be developed by adding different sensors. The developed system is based on computer vision. The system utilizes Viola Jones algorithm as well as the CAMSHIFT algorithm. This paper is concerned with the development of a software framework for the timely and precise detection of drowsiness. Multiple facial features were considered as inputs. The paper proposes a method for detecting the drowsy state based on the timeseries analysis of the angular velocity of the steering wheel. Compared with the traditional method, this method has several advantages. Drowsiness detection methods fall into two types. It is based on the driver and vehicle. It also provides an overview of the different ways drivers and vehicles work. Algorithms known as "shape prediction algorithms" and drowsiness detection systems that rely on eye blink rate have been developed.

Literature Review

The developed system is a real-time system. It uses image processing to detect eyes and faces. A HAAR-based cascade classifier is used for face recognition. An object tracking algorithm is used for continuous eye tracking. The PERCLOS algorithm is issued for driver drowsiness detection. The paper focuses on developing a nonintrusive system which can detect fatigue and issue a warning on time. The system will monitor the driver’s eyes using a camera. By developing an algorithm, the symptoms of driver fatigue can be detected early enough to avoid accident. When the signs of fatigue have been identified output in the form of sound and seat belt vibration is provided to alert the driver. Warning will be deactivated manually rather than automatically. This paper uses a faster algorithm than PERCLOS. This system will detect driver’s fatigue by the processing of the eye region. After image acquisition, the first stage of processing is face detection. If eyes are blinking normally no warning is issued. If the eyes are closed for more than 0.5 seconds, this system issues warning to the driver. Alerts in the form of alarms and vibrations. Python is used to process images. The system uses the number of blinks to determine if the driver is drowsy. The system uses OpenCV with single camera view. An image processing algorithm is used to obtain the eye condition. In this study, only the condition of the eyes is considered, not the frequency of yawning. Closed eyes are detected using a HAAR-based cascade classifier and alcohol gas sensor that acts like a breathalyzer. This system contains two modules. The two modules are the face and eye detection module and the face tracking module. The CAMSHIFT algorithm is used for continuous face tracking. The system also uses a cascade classifier to improve the accuracy of face recognition. The system is an unobtrusive real- time model. In order to reduce accidents caused by drowsiness, various methods for automatically detecting drowsiness have been developed. This article discusses three ideas. The first idea is to create a sleepy facial expression dataset. The second idea is to combine visual, non-visual and automotive functions into one. The latest idea is to develop wearable devices such as smartwatches that detect drowsiness.

Methodology

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

A. Perclos

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.
- Calculation of percentage of eyelid closure.
- Identification of the drowsy state.
  PERCLOS is one of the measures to notice the state of drowsiness

B. Camshift

A robust and nonparametric technique is used. It implements the CAMSHIFT algorithm.CAMSHIFT (continuously adaptive mean-shift) is an efficient and lightweight tracking algorithm. It is based on the concept of mean shift It is suitable for tracking targets in simple cases. It is not efficient in tracking objects in complex situations A detection algorithm can be applied successive frames of a video sequence to track a single target. According to the detection algorithm can be described by the following steps:

1. Initialize the size as well as the position of the search window.
2. Calculate the mass centre (X_C, Y_C) of the window.
3. Adjust centre of the window to mass centre.
4. Repeat 2 and 3 until distance of the two centres (centre of the window and the mass centre) is less than some threshold value.

C. Haar Training

The OpenCV library provides numerous functions for face and feature (eyes, mouth, sunglasses, etc) detection. Some of these functions can be used to train classifiers. The classifiers can be trained for the process of detection of face This is known as HAAR training. Object. Here, a cascade function is trained from a number of images, both positive and negative. Each feature is a single value obtained by subtracting sum of pixels under various regions of the images. The pixels used for extraction is different for each feature. All the extracted features will not be useful for the required process.

The Adaboost technique is used to extract the relevant features. Each and every feature is applied on the training images. The best threshold is determined for each feature which classifies images from positive to negative. Features which provide the least error rate are chosen. Initially each feature is given an equal weight. As the process continues, the weights are updated according to the results obtained in order to improve the accuracy. The weighted sum of the weak classifiers is the final classifier.

D. Viola Jones Algorithm

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

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

Features are selected based on the pixel intensities in HAAR based feature representation. It does not take into consideration the values of the pixel. HAAR based feature representation. It does not take into consideration the values of based features are scalar product between the image and some HAAR templates.
Integral image formation is used for feature calculation. It considers only four corners of the image. Adaptive boosting (AdaBoost) is used to select the required features. Due to the use of Adaptive Boosting there is a reduction in the computational time of the algorithm.
Cascade of classifiers is used in order to develop a strong classifier chain. The OpenCV library

provides a command prompt training utility called HAAR-training which generates a classifier in XML format when given positive and negative examples of the object to be detected

Conclusion

This paper provides a comparative study on papers related to driver drowsiness detection and alert system.

In order to provide a solution to the problem of detecting the state of drowsiness, an arithmetic based method is used. This system uses eye movement in order to detect fatigue. Eye movement is detected using a camera. This is done to recognize the symptoms of fatigue in order to avoid accidents. It is based on the concept of eye tracking. Images of 150 different people were used to obtain more accurate results. An alarm is activated when a fatigue condition is detected. Use computer vision with embedded systems. A software algorithm was developed. It has been partially tested and has been shown to be effective. There are many opportunities for further improvement. The proposed system detects drowsiness when the eyes are closed for more than 4 frames. A detection system distinguishes normal blinking from drowsiness. The developed system is a non-invasive system. The system can be further developed by adding various types of sensors. The system is based on computer vision. It makes use of the Viola Jones algorithm, AdaBoost classifier and CAMSHIFT algorithm. A lowcost application can be devised by implementing this system using a raspberrypi module. The main aim of the paper is to develop a software tool detection of the state of fatigue. This turned out to be a timely and accurate technique. Here the input is captured by the camera, processed by the Raspberrypi module, and the output is displayed as a buzzer to alert the user when drowsiness is detected. Drowsiness detection methods fall into two types: driver-based and vehicle-based. It also provides an overview of the different ways drivers and vehicles work. The system is based on a shape prediction algorithm. It provides an unobtrusive approach to drowsiness detection. In the future, yawning frequency could also be used as a parameter to detect drowsiness. Specific facial features were identified to detect drowsiness. This system uses the concept of video processing. Some shortcomings of the proposed system and how to overcome these shortcomings are also mentioned.

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