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Driver Drowsiness Detection

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ABSTRACT

In order to drive the state of the art technology for Driver's safety, the demand for Artificial Intelligence and Machine learning delicacy approaches are popularly used in ultramodern Classrooms. This paper presents a Driver drowsiness detection architecture that may be placed within the vehicle as a standalone design unit. In this organized deep learning CNN framework, a comprehensive analytics strategy is employed to detect somnolence in automobilists. There are two distinct phases employed in this experimental framework namely image data acquisition followed by identification of the region of interest (ROI) in phase 1. In the coming phase, the deep learning algorithm is employed to classify and prognosticate the result. The object detection training is using the Haar Cascade Classifier which facilitates getting an accurate model. The model is trained by exploiting the open-source tools namely Keras alongside Tensorflow as backend. The hardware design includes Raspberry pi model 4 or 3b, camera, GSM Module, and a speaker. The video capturing, labeling of open or closed eyes and the score are attained as a real-time status with the speaker output to warn the automobilist during sleepiness state. The standalone hardware module is uploaded with the entire training AI software. Real-time image acquisition by the design platform and forecasting the driver drowsiness detection, depicts a delicacy of 95 to 96. The activation function ReLU used during the predicting state in CNN improves the computational effectiveness of the design My SQL model.

KEYWORDS: Driver Drowsiness detection, Raspberry Pi, Camera, My SQL, GSM Module & Speaker.

INTRODUCTION

Currently the accident rates are raising during night and dawn. Extreme day drowsiness is associated with lowered attention, which causes a considerable socioeconomic burden to the community. It hinders work productivity and increases the threats of traffic or accidents. Thus, a righteous cycle system that can monitor drowsiness or attention and deliver proper feedback is of vital significance both for enhancing work efficiency and for the safety of our society. There are two types of approaches preliminarily used, namely, task performance and biosignal- based methods. One representative illustration of the task performance-based method is Vehicle Motion (VM) monitoring. Still, its operation is confined to a driving condition only. Another representative approach is the psychomotor vigilance task (PVT), where subjects are asked to respond to certain stimuli (visual or audio) as fast as possible. Still, the limitation of PVT is that the subject must stop their ongoing task. monitoring is one of the bio signal-based methods. It tracks eye movement and blink pattern(e.g. frequency and speed) to detect sleepiness using a video camera or an infrared device.Currently electroencephalography (EEG) monitoring algorithms are used. These studies measure electrical conditioning of the brain associated with doziness, extract meaningful features from EEG, and use a classifier to distinguish various states of one's alertness and doziness. Some former works have adopted machine learning- based classrooms are driver monitoring and have shown promising class results.

LITERATURE REVIEW

A. TASK PERFORMANCE-BASED DROWSINESS DETECTION METHODS

The VM monitoring module, and therefore the PVT determine the drowsiness level by measuring task performance. The VM monitoring modules takes input of driving directions and from changes in lane-keeping. It's prone to downfall, road condition, and vehicle type. The PVT could also be a well- established measure of alertness or sustained attention. For the standard ten- minute PVT, the themes are needed to click a button with the dominant hand's thumb as soon as possible when the visual signals are presented in arbitrary intervals (2 – 10 seconds). response time may be a validated indicator of the alertness level. The PVT can measure changes in alertness caused by sleep disorder and deprivation. Sleep deprivation results in a change in sustained attention due to the interaction of involuntary sleep- initiating and counteracting wake- maintaining systems, thus resulting in lapses. Still, to end the given task, subjects have to be compelled to break within the continued task, thus hindering the working durability. Both PC-PVT and standard PVT have original functionality. PC-PVT uses anon-public computer, whereas PVT uses selected hardware. The labeled data are employed to educate the supervised classification- based drowsiness detection model.

B. EOG-BASED DROWSINESS DETECTION METHODS

This method uses a camera to analyze eye movements like speed, blink, frequency, and winding. Day sleepiness is nearly associated with several optical parameters (e.g., slow movements, increased stop time, and increased blinking frequency). R100 (Phasya, Belgium) is a lately developed EOG-based methodology. The R100 exploits spectacles equipped with a high-speed camera to sense eye movement. It can continuously monitor the level of sleepiness with minimum or no disturbance of the ongoing task and deliver a task-independent measure of sleepiness. In this method, the R100 device is used to acquire the length of drowsiness information. The attained information is used to define the drowsiness state label.

C. EEG-BASED DROWSINESS DETECTION METHODS

EEG changes are nearly related to alertness oscillations.Alloway et al reported that the alpha band power increases when the eyes are open but decreases when they close.

In the former studies, the drowsiness label was similarly defined. The approaches for labeling can be distributed into three types. The first order is a questionnaire- based approach such as the Epworth and Karolinska sleepiness scale. A simple question like "Are you sleepy now?" is given to the subject. The alternate approach is task performance evaluation that uses VM detection modules or response time to specific stimuli. The third type is EOG- based approach.

D. FEATURE EXTRACTION FOR EEG SIGNALS

Numerous types of feature extraction strategies have been proposed to recoup useful EEG information and apply it to drowsiness detection studies. The most extensively used characteristic is band power (BP). Especially theta ($4 - 8$ Hz) and alpha ($8 - 16$ Hz) bands have played a vital part. To achieve more detailed frequency information than BP, some studies have used power spectral density (PSD) estimation or wavelet decomposition. Still, the PSD- based approaches suffer from high bias and variance in estimation. A single-taper PSD (SPSD) approach was developed to address high bias issues. Nevertheless, the SPSD approach wasn't capable to fix the high variance in estimation. To break this issue, a multitaper PSD (MPSD) approach has been developed.

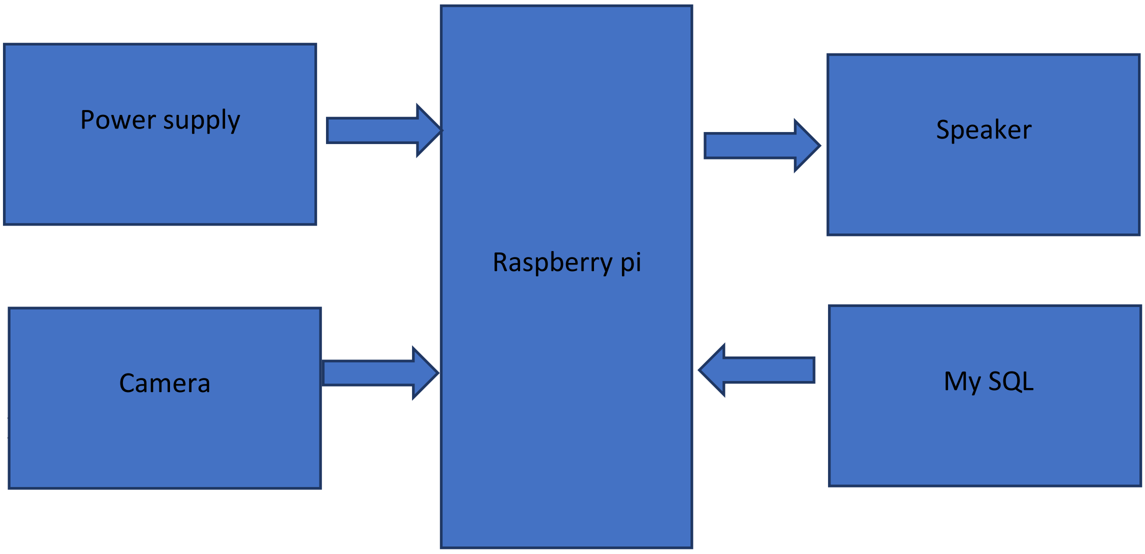
E. MACHINE LEARNING METHODS FOR DROWSINESS DETECTION

Numerous studies based on machine learning techniques have been proposed for detecting drowsiness. In drowsiness detection, Linear regression was first applied. Since then, several studies have used artificial neural networks (ANNs) and support vector machines (SVMs). In our study, we use the extreme gradient boosting (XGBoost) approach, which offers the following benefits ease of use, scalability, accuracy, and computational effectiveness. Likewise, we can estimate the significance of each input point by using the branch gain in XGBoost. Thereby, enhancing performance and reducing resource inputs in unborn studies.

PROPOSED SYSTEM

The Proposed System for Machine Learning detecting the drowsiness of the Drivers. First of all, the system captures images through the webcam, and after capturing it detects the face through the haar cascade algorithm. It uses haar features that can detect the face. If the system finds it as a face it will proceed to the next phase i.e eye detection. Haar Cascade algorithm is used to detect eye and blink patterns. The state of the eye will be detected using perclos algorithm. Through this algorithm, we can find the percentage of time the eyelids remain closed. If it found eyes in the closed state then it detects the driver in a drowsy state and alerts him by an alarm.The driver's face is analyzed continuously to detect any drowsiness. If found then an alarm is activated by the system through speaker. And if the same pattern continues for a period of time a message will be sent to the manager or owner of the vehicle.

BLOCK DIAGRAM



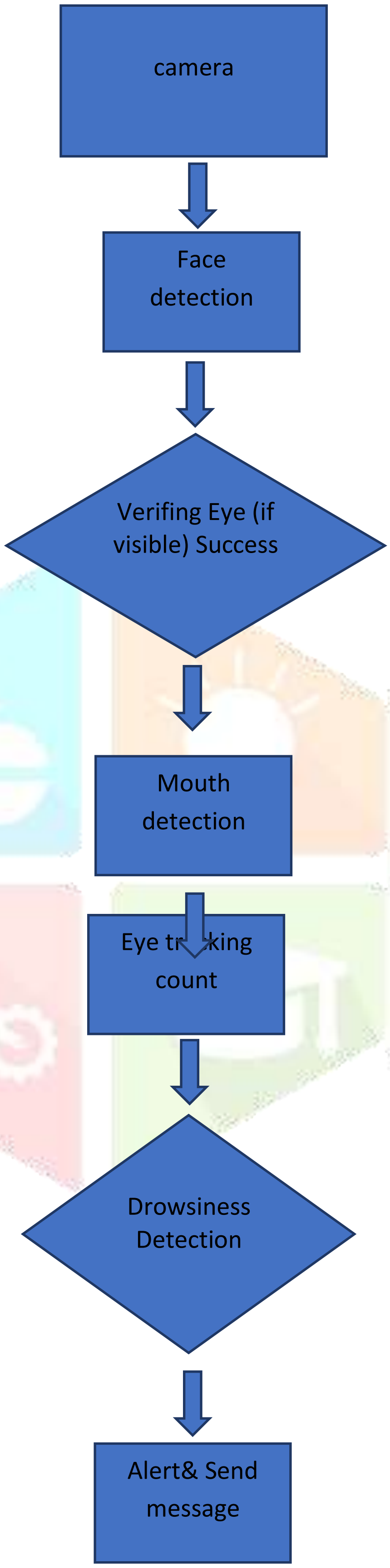
HARDWARE COMPONENTS:

- RASPBERRY PI
- CAMERA
- SPEAKER
- GSM MODULE

SOFTWARES USED:

- RASPIAN
- PYTHON
- MySQL

FLOW CHART


camera
Face detection
Verifing Eye (if visible) Success
Mouth detection
Eye tracking count
Drowsiness Detection
Alert& Send message

CONCLUSION

The current study developed Machine learning for detecting drowsiness for drivers. The continuous video stream is read from the system and is used for detecting drowsiness. It is detected by using the haar cascade algorithm. The haar cascade algorithm uses haar features to detect faces and eyes. Haar features are predefined are used for detecting different things. The haar features are applied to the image and blink frequency is calculated using the perclos algorithm. If the value remains 0 for some amount of time, then it detects as sleepy and alerts the driver by activating an alarm. If the value remains constant for longer periods, then the driver is said to be distracted then also an alarm is activated and the message is sent to the owner or manager.

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