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DRIVER DROWSINESS DETECTION AND VEHICLE DIAGNOSTICS USING IOT

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ABSTRACT

Drowsiness is identified using eye blink count. The alcohol consumption is also verified during the starting process of the vehicle. Drunken driving is prevented. Continuously temperature monitoring. Eye blinks count and alcohol detection using IOT, buzzer indication if driver is not wearing seat belt. Motor controls the fuel tank for drowsy person to prevent accident. GPS location indication and SMS alert in case of accident.

Keywords: *drowsiness, Eye blinks,consumption,detection.*

1. INTRODUCTION

The Growing no of fatal accidents due to drivers negligence or not following safety precautions makes it necessary to develop a system which ensures safe driving which will in turn ensures safety of driver as well as co passengers. A system which will start ignition only if the driver passes test for driver authentication, alcohol consumption and seat belt. The driver will be allowed to start ignition only after he validates himself while the vehicle is in motion it will capture values for speed control, it will ensures engine temperature is maintained and the touch sensor ensures driver is holding steering while driving another feature of the system is the drowsiness sensor which start a buzzer or start interaction with the driver so he does not feel sleepy to access diagnostics data of the vehicle as early as possible is important to avoid serious faults. Early detection and correction will increase safety up to a very large extends using GPS the location of the vehicle can be obtained with the help of longitude n longitude values. ones the right defects are obtained then instruction can send to the driver as to how to handle the situation.SMS will be send to relatives in case of accidents.

1.1. Problem Statement

An IoT-based system is designed to avoid countless mishaps due to drowsy drivers' behavioral and psychological changes by focusing on driver's eye movements. In addition to monitoring the intensity of the collisions impacts during road accidents, it is also required to keep records of the location for taking supportive action.

1.2. Contribution to This Work

The drowsiness of driver and impact of collision monitoring or alert system is constructed using IoT technology along with Raspberry Pi. For finding the fatigue or sleepiness of driver, a Pi camera can be used during driving. Apart from it, the vehicle needs to be well mounted by crash sensor and FSR sensor for detecting the extremity of collision. When the drowsiness is detected, the driver is alerted by voice speaker and a mail sent to the vehicle owner. Similarly, suppose any sudden collision happens due to drowsiness. In that case, the data collected from the sensors and the alert message are messaged to the nearer hospitals nearby the prone location from Google Maps link where the mishap has happened.

2. LITERATURE REVIEW

Drowsiness of driver can be determined with different aspects using vehicle-based, psychological, and behavioral measurements implemented through different predictive algorithms as discussed in the following sections.

2.1. Face and Eye Detection by Machine Learning (ML) and Deep Learning (DL) Algorithms

Jabbar et al. [2] proposed Convolutional Neural Network (CNN) technique of the ML algorithm to detect microsleep and drowsiness. In this paper, detection of driver's facial landmarks can be achieved through a camera that is then passed to this CNN algorithm to properly identify drowsiness. Here, the experimental classification of eye detection is performed through various data sets like without glasses and with glasses in day or night vision. So, it works for effective drowsiness detection with high precision with android modules. The algorithm of Deep CNN was used to detect eye blink and its state recognition as provided by Sanyal and Chakrabarty [12]. Saleh et al. [13] developed an algorithm of LSTM and Recurrent Neural Networks (RNN) to classify driver's behaviors through sensors. Ed-Doughmi et al. [14] analyzed the driver's behaviors through the RNN algorithm. It specially focuses on construction of real-time fatigue detection to prevent roadside accidents. This system formulates a number of drivers' faces, which works on multilayered 3D CNN models to identify drowsy drivers and provide 92 percentage acceptance rate.

2.2. FPGA-Based Drowsiness Detection System

A low-intrusive drowsiness detection system using field-programmable gate array (FPGA) has been designed by Vitabile et al. [15]. This system focuses on bright pupils of eyes which are detected by IR sensor light source embedded in a vehicle. Due to this visual effect, the retinas identified up to 90%, which helps to find drivers' eyes for analyzing drowsiness through a number of frames for avoiding serious mishaps. Navaneethan et al. [16] implemented a real-time system to track human eyes using cyclone II FPGA.

2.3. Eye Recognition System Based on Wavelet Network Algorithm

Jemai et al. [17] introduced a technique for drowsy warning system using wavelet networking. That network tracks eyes with the help of classifying algorithms like Wavelet Network Classifier (WNC) that relies on Fast Wavelet Transform (FWT), which specifically leads to binary way decision (conscious or not). The physiological aspects are heart beat rate and electrocardiogram that are repeatedly extracted through wavelet transformation with regression technique for fatigue detection, designed by Babaeian et al. [18]. This principle worked on heart rate data classification through wavelet network which can find an average way of drowsiness alert system.

2.4. Fatigue Detection Using Vehicle State (Steering Wheel) Algorithm

Arefnezhad et al. [19] proposed a noninterfering drowsy detection system based on vehicle steering data using neurofuzzy system with support vector machine and particle swarm optimization algorithm. Mutya et al. [20] established a system to resolve the problem of drowsiness using steering wheel algorithm. It is basically based on image-formed or pictorial-based steering movement and the CNN algorithm for proper classification of drowsiness, which can also reduce false drowsy detection rates.

2.5. Drowsy Alert System Designed Using Electroencephalography (EEG), Electrocardiography (ECG), Electrooculogram (EOG), and Electromyogram (EMG) Algorithm

Budak et al. [21] designed a drowsy detection system through EEG technique which is designed with various components like AlexNet method, VGGNet method, and wavelet transform algorithm. This process effectively analyses the state of sleepiness using the brain indicator signal (EEG), camera, and sensors that are activated with the help of machine learning method to alert drowsy driver. Hayawi and Waleed [22] proposed a method to observe drowsiness through signal of Heart Rate Variability (HRV) which is obtained using EEG sensors. Hayawi and Waleed [23] established an intrusive method for measuring eyeball movement using EOG technique to construct a fatigue alert system that is also embedded with an Arduino controller board with

Nearest Neighbors (KNN) classifier to improve the percentage of accuracy. Song et al. [24] proposed a system to identify the fatigue of driver through the movement of muscular skin of eyes which is processed using EMG sensors with the help of a human machine interface. Similarly, the closure of eyelids and muscle part movements are also observed through the EMG sensors signals that function with the help of ESP8266 to provide or monitor the drowsy data on the Internet, which is designed by Artanto et al. [25]. Ma et al. [26] designed a driving fatigue detection system by measuring the EEG signals. It provided a robust platform for detecting drowsiness which is based on a deep learning process to find the accuracy of fatigue through EEG signals. But the deep learning process is structured through a principal component analysis network (PCANet) that preprocesses EEG data to create accuracy of detection. This process was tested in small sample size and offline mode, but it violates the accuracy in a large population of samples in real-time situations. Due to that reason, the IoT module is used to test online or offline in large sample sizes. Ma et al. [27] proposed an efficient application for the detection of driver fatigue through facial expression. Here, the facial movement is observed by deep learning of multiblock local binary patterns (MB-LBP) and AdaBoost classifier. But it is also used to accurately and quickly detect drowsiness with the help of a fuzzy inference system. When the driver wears a glass, then the accuracy of detection is decreased. So IoT modules are used to make it more intelligent and to improve accuracy level of fatigue detection.

2.6. Fatigue and Collision Alert System Using Smart Technique

Chen et al. [28] implemented a smart glass to detect fatigue. The rear light of the vehicle is automatically flashed with a message being sent using the IoT module or cloud environment. Kinage and Patil [29] proposed a system to detect the drowsiness using eye

blinking sensors and any accidents or collisions that happened; then, the vibration sensor was integrated with heart rate measurement sensor for forwarding alert message to the authorized user. So, it is also attached to the GPS and GSM device for tracking the location and transmission of message. Siva Reddy and Kumari [30] introduced a system to control cause of unconditional mishaps using Arduino board with sensors which operated through camera. But, it is an efficient system with less estimation cost for construction of it. Jang and Ahn [31] implemented a system to detect an alcohol addict and drowsy drivers through sensors, where these elements are integrated with the Raspberry Pi controller module. So, the IoT modules are also used to send messages for any abnormal driver activities, which are properly invigilated with the help of a webcam (image processing) and controller unit. A new process has been developed for regular vigilance of facial detection and eye blink state, which predicts the driver's drowsiness. In addition to extra sensors, voice recognition application and machine learning methods are used to enhance the process of alert [32].In the existing system, the fatigue of the driver is calculated through the eye or facial movements, deep learning, FPGA-based, ECG or EEG or EOG, vehicle steering movement, etc. But the implementation of the IoT-based technique helps to smartly control the various issues of driver drowsiness by the automatic buzzing of alarm, easily tracing the mishap location, and warning to the owner by sending emails or messages.

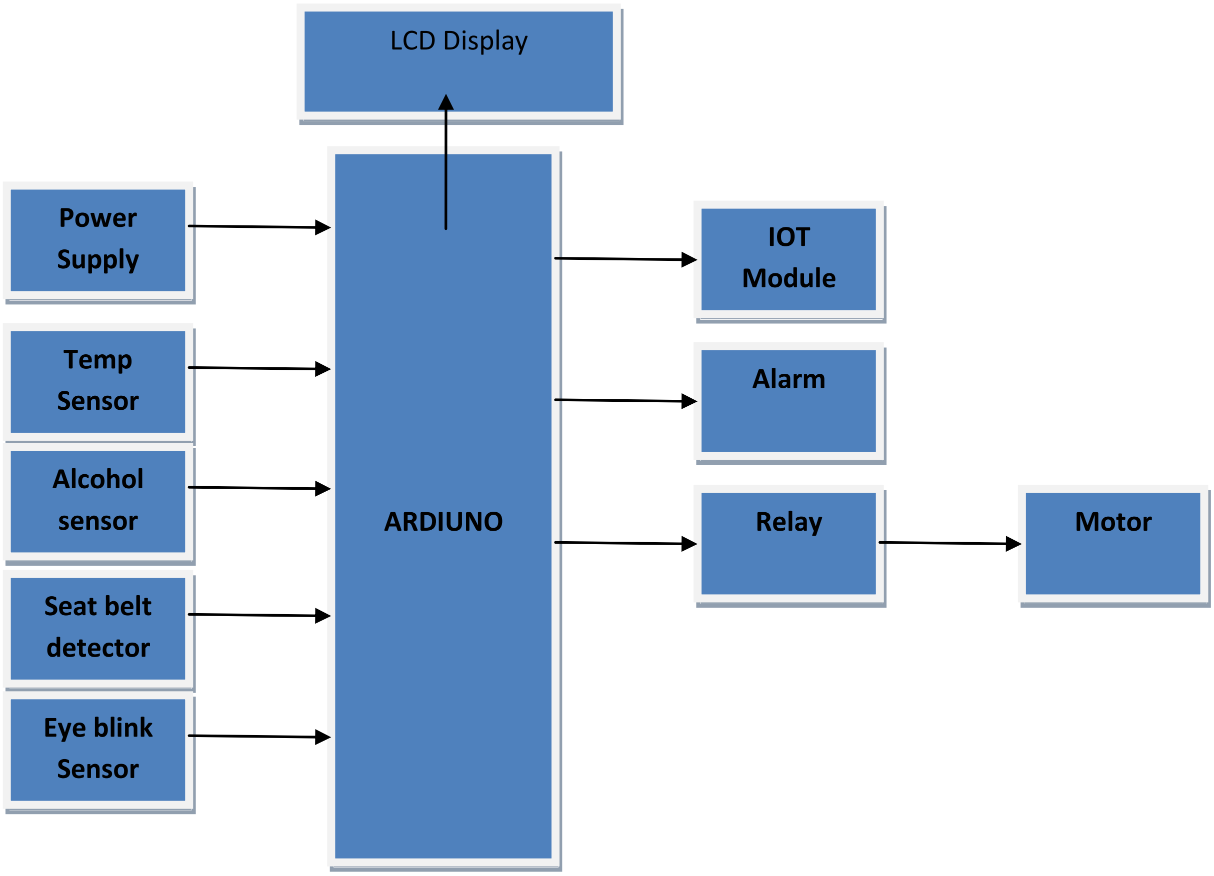
3. EXISTING SYSTEM

By using a non intrusive machine vision based concepts, drowsiness of the driver detected system is developed. Many existing systems require a camera which is installed in front of driver [4]. It points straight towards the face of the driver and monitors the driver□ s eyes in order to identify the drowsiness. For large vehicle such as heavy trucks and buses this arrangement is not pertinent. Bus has a large front glass window to have a broad view for safe driving. If we place a camera on the window of front glass, the camera blocks the frontal view of driver so it is not practical. If the camera is placed on the frame which is just about the window, then the camera is unable to detain the anterior view of the face of the driver correctly. The open CV detector detects only 40% of face of driver in normal driving position in video recording of 10 minutes. In the oblique view, the Open CV eye detector (CV-ED) frequently fails to trace the pair of eyes. If the eyes are closed for five successive frames the system concludes that the driver is declining slumbering and issues a warning signal [4]. Hence existing system is not applicable for large vehicles. In order to conquer the problem of existing system, new detection system is developed in this project work.

4. PROPOSED SYSTEM

In order to overcome this eye blink sensor is used. A spectacle with eye blink sensor is used to detect the driver drowsiness and alerts the driver with buzzer, if driver is affected by drowsiness. The various hardware components of project are mentioned below 1. Ardiuno microcontroller 2.Eyeblink sensor 3.Alcohol sensor 4.Temp sensor 5.Seat belt detector 6.LCD and buzzer 7. IOT The block diagram for the implemented project is shown in

BLOCK DIAGRAM



HYBRID TECHNIQUES

Road collisions are one of the leading cause of fatalities.In most cases, injuries are not serious and if victims arerescued in time, lives may be saved. Many factors contributeto accidents, including driver negligence, drowsy and drunkdriving etc. Thus a system that can detect as well as con-trols the factors contributing to accidents will be helpful inpreventing accidents and saving lives. Hybrid techniques aretechniques which use both accident detection and preventionmechanisms, as shown in Figure . Some of the systems basedon hybrid techniques are discussed below.

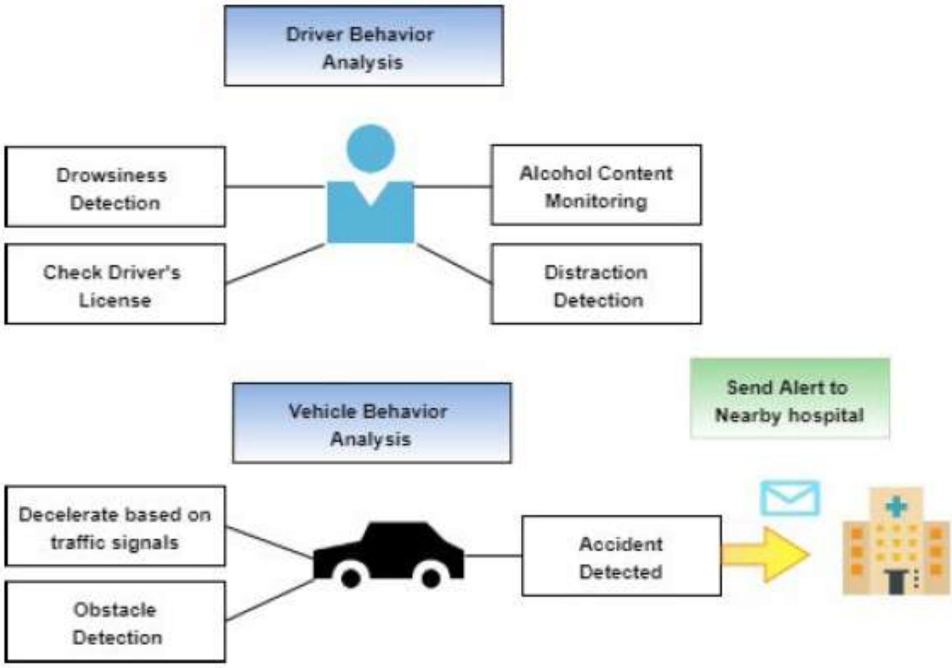


FIGURE . An accident detection and prevention system.

5. RESULT DISCUSSION AND PERFORMANCE ANALYSIS

This section provides a successful experimental consequence which is obtained from the proposed method at the time of driving. The drowsiness is calculated through the observation of EAR of the driver. This process provides the status of eyes if they are open or closed thereby providing data about collision impact on the website.

5.1. Prediction of Drowsiness

When the EAR value is greater than 0.25, it indicates the eyes are open. This test shows that the driver has not fallen into drowsiness that is graphically represented in Figure 8 and detected the face is not recognized as a drowsy one which is shown in Figure 9. Similarly, the drowsiness of the driver is detected due to the EAR value being less than 0.25 as graphically plotted in Figure 8 and finally, a drowsy face is detected as shown in Figure 9. The EAR values are frequently changed due to movements of the eyelids as shown in above figure. When the drowsiness is found, then the driver is alerted with repeated voice sound and an email message is forwarded to the owner or related authority. Here, speech speaker is implemented instead of buzzer for more vigilance; if it fails, then the owner will provide any warnings after receiving the message from its mail as represented in Figure 10.

6. CONCLUSION

This research provides a robust method for detecting drowsiness of drivers and collision impact (severity) system in the present time. This method generally combines two different systems in one integrated system. But, the existing techniques are based on psychological or vehicle-based approach to detect drowsiness of drivers and also, the severity of collision is separately measured, but such technique is highly intruding as well as fully turns on the physical environment. So, the proposed system is used to construct a nonintruding technique for measuring drowsiness of the driver with severity of collision due to braking or mishap. This system's main components are the Raspberry Pi3 model B module and Pi camera module that are used for persistent recording of face landmarks that are localized through facial landmark points then to calculate EAR. However, if the calculated EAR value increases from the threshold range, then the eyes are kept open and no change in the state of system occurs. Similarly, if the EAR value falls from the threshold range, then the system urgently alerts using speech speaker and warning e-mail to the authority (owner) for extra supportive alertness to the driver. In addition, measurement of collision severity (impact) is made through implementation of sensors with the GPS module to properly track the location of accident thereby alerting the nearer medical service centre to serve emergency diagnosis.

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