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AI Based Driver Drowsiness Driver Alert System for Next Generation

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***Abstract*: Driver drowsiness detection is designed mainly to keep the driver awake while driving to avoid the accident due to sleepiness. The alert signal is generated from embedded device to awake driver from sleepy state. The Pi along with Raspbian camera is used to calculate the drowsiness of the driver in real time. The purpose of this paper way to devise a way to alert drowsy drivers in act of driving. One of the causes of car accident comes from drowsiness of the driver. Therefore, this study attempted to address the issues by creating an experiment in order to calculate the level of drowsiness .A requirement for this paper was the utilization of a Raspberry Pi camera and Raspberry Pi 3 module, which were able to calculate the level of drowsiness in drivers. The frequency of head tilting and blinking of the eyes was used to determine whether or not a driver felt drowsy. With an evaluation on ten volunteers, the accuracy of face and eye detection was up to 99.59 percent.**

***Keywords*: Camera, raspberry pi 3, monitor, alarm, relay.**

1. Introduction

Majorly in highways truck drivers ignore the speed limit. Speed kills and travelling above the speed limit is an easy way to cause accident. When the driver is drunk, he loses the ability to focus and function properly, hence it is dangerous when operating a vehicle. This is one of the most contributing factors of accident. Improper driving as in speeding up the vehicle or changing lanes too quickly or tailgating and many more can cause reckless driving. Reckless driving is when you're operating vehicle with deliberate disregard. Driving in daylight can be hazardous, but driving at night nearly doubles the risk of accident. When you can't see what's ahead you don't know what to anticipate as you drive towards it. Drowsiness is defined as an abnormally sleepy feeling which cannot be controlled by the person. It is identified as one of the reasons for road accidents especially on highways. Drowsiness is mainly caused when the person is not getting enough sleep, is tired, on night drives or if the person is under medication. Since falling asleep is not in the driver's hand an external entity is required to help him stay awake. The aim of this system is to reduce the accidents .The components used for this system are raspberry pi and image processing .Driver drowsiness detection is designed mainly to keep the driver awake while driving to avoid the accident due to sleepiness .The alert signal is generated from embedded device to awake driver from sleepy state. The purpose of this paper way is to devise a way to alert drowsy drivers in act of driving. Is caused due to the alertness of the driver. In order to reduce the accidents related to the driver drowsiness it is necessary to frame a system which accurately detects the drowsiness of the driver. By detecting the drowsiness level and providing a warning to the driver the accidents can be avoided".

2. Literature Survey

Vehicle based measures is one of the method which is used to measure driver drowsiness. This is done by placing sensors on different vehicle components, which include steering wheel and the acceleration pedal. By analyzing the signals from the sensors the level of drowsiness can be determined. Commonly using vehicle based measures for detecting the level of driver drowsiness are the steering wheel movement and the standard deviation in lateral position. A steering angle sensor which is mounded on the steering of vehicle is used to measure the steering wheel movement. The number of micro-corrections on the steering wheel reduces compared to normal driving when the driver is drowsy [1]. Based on small SWMs of between 0.5° and 5°, it is possible to determine whether the driver is drowsy and thus provide an alert if needed [2]. Another vehicle based measure used to measure the drowsiness of driver is SDLP. Here the position of lane is tracked using an external camera. The main limitation of this method is that it dependent on external factors such as road markings, lighting and climatic conditions. Therefore, these driving performance measures are not specific to the driver's drowsiness [3]. Physiological measures are the objective measures of the physical changes that occur in our body because of fatigue. These physiological measures can be utilized to measure the fatigue level and can provide alert for the drivers. These physiological changes can be simply measured by respective instrument such as electro cardiogram (ECG), electro oculography (EOG), electroencephalography (EEG) and electromyogram (EMG). Electrocardiogram is one of the physiological measures which can be utilized to measure the fatigue of driver. Here ECG electrodes are used to collect ECG signals from the body which provides the critical parameters related to Heart Rate (HR), Heart Rate Variability (HRV) and respiration rate or breathing

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frequency. Each of these are related to drowsiness [4]. Electroencephalography (EEG) is one of the most reliable physiological measures for drowsiness detection. EEG electrodes are placed at correct place and get data from brain. After preprocessing the data, which is acquired from the EEG electrodes can be divided into different frequency bands. Power spectrum of EEG brain waves is used as an indicator to detect the drowsiness of the driver. Here, EEG power of the alpha, theta bands increases and the power of the beta bands decreases. The EEG based drowsiness detection is not easily implementable. Because the driver has to wear an EEG cap while driving a vehicle. These devices are being distractive and this is the main disadvantage of this method.

3. System Requirements

1) Software specifications

- Operating system: Windows XP/Windows 7/8/10.
- Coding Language: Python.

2) Hardware specifications

- Raspberry Pi 3B
- Monitor
- Web Camera
- Alarm
- Relay
- DC pump
- DC motor
- Power supply

3) Python

Python is a dynamic object-oriented programming language that can be used for many kinds of software development .It supports multiple programming paradigms, including structured, object oriented and functional programming.

Fig. 1. Python

4) Raspberry Pi 3B

Is a credit card sized single board computer. The raspberry pi camera board plugs directly into the CSI connector on the raspberry Pi .It's able to deliver a crystal clear 5mp resolution image or 1080p HD video recording at 30fps.The module attaches to raspberry pi by the way of a 15pin ribbon cable , to the dedicated 15 pin MIPI camera serial interface which was designed especially for camera.

Fig. 2. Raspberry Pi 3B

5) Relay

A 5V Relay can be used for the purpose. This is achieved by the usage of relay in the circuit. The output signal of the processor changes from high to low and this causes the switching action of the relay causing the completion of the solenoid circuitry.

Fig. 3. Relay

6) DC motor

A DC Motor is an electrical machine which converts electrical energy into mechanical energy. Standing 30 type DC motor. It's operating Voltage: 4.5V to 9V

Fig. 4. DC motor

4. Block Diagram

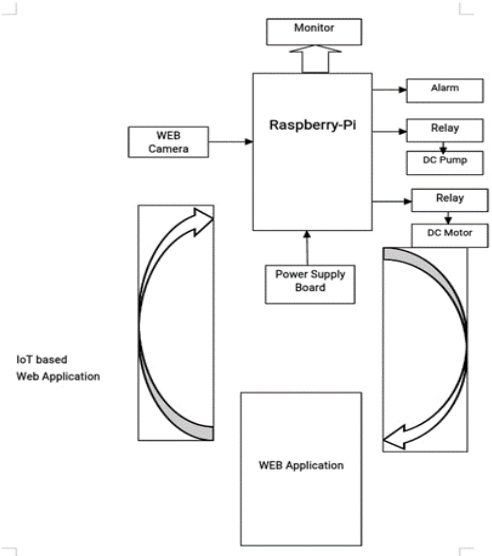

Fig. 5. Block diagram

In the proposed system, the drowsiness detection is done with the help of Raspberry PI B+, DC motor, Relay, Raspberry PI camera module. Whenever the fatigue is detected on the driver face then , Raspberry pi camera module monitors the eyes of the driver and alarm gets activated and alerts the driver by giving the beep sound along with water pumping , vehicle gets slow down and a message is sent to a concerned person by IOT based web application. Driver's face is continuously monitored using a camera. In or der to detect drowsiness the first step is to detect the face using the series of frame shots taken by the

camera. Then the location of eyes is detected and retina of the eye is continuously monitored. The captured image is sent to the Raspberry Pi board for image processing. The Raspberry Pi converts the received image to digital signal using open CV. The digital signal is transmitted from transmitter to receiver. The camera captures the image and sends to the raspberry PI which consists of 32 bit memory card installed with open CV which helps in image processing. If the signal crosses threshold of 2 seconds, it will automatically makes the alarm beep and the vehicle gets stopped. Otherwise the signal is rejected and next signal is processed. Second, this status is detected by the IR sensor and the buzzer is blown to make the driver conscious and the text message is sent to the owner immediate.

5. Methodology

Each year there are thousands of truck accidents, leading to injuries and fatalities, expensive insurance claims and lengthy traffic jams as wreckage is cleared. When a commercial truck is involved in a serious accident, the driver is usually the spotlight. Usually size and weights of trucks requires the driver to be both highly skilled & focused on controlling these multi-ton behemoths. Due to severity of injuries and property damage commercial truck accidents often produce large claim amounts. One of the most common fault of the truck driver is their failure in checking blind spots, known in the trucking industries as “no zones”, before turning or changing lanes. They are on the all four sides of the semi, and many accidents happen when the trucker manoeuvres into the spots without carefully checking for clearance first. They are operating a dangerous vehicle, driving the rig defensively is part of truckers’ “expanded duty” to protect us. Other truck driver errors are similar to those that anyone can make, such as not paying attention to surrounding, speeding, not knowing routes, exhaustion and driving under the influence of alcohol or drug .This project involves controlling accident and saving driver’s life as well as owner’s problem of compensating every time even if it’s the fault of the driver. In this project we design goggle/spectacles in which IR sensors and buzzer are fitted. This entire set up is worn by the driver. This entire setup works in this way, as soon as the driver wears the goggle IR sensors checks weather the eyes are closed or not, if the eyes are not closed then it again checks for it, this loop continues until the eyes are found closed. AS soon as the eyes are found closed, it again goes for a second check and again if the eyes are found closed then the buzzer is blown and red LED is on and it continues blowing for 1minute and then buzzer and LED will be off. After 1minute. We over here set a condition if the frequency is more than 50 then the driver is not drowsy as soon as it reads frequency less than 50 then the driver is drowsy. On the other hand as soon as the driver is found drowsy the message is sent to the owner via GSM module which reads as “Driver is found short we can say whenever the driver feels drowsy his eyes starts to blink for more than one second, this status is detected by the IR sensor and the buzzer is blown to make the driver conscious and the text message is sent to the owner intermediate.

6. Results

Fig. 6. Normal person without drowsiness output

Fig. 7. Person with drowsiness detection output

In this particular output, the eyes of the user remain closed for more than the required frames per second and hence the drowsiness level is detected. This is now notified to the concerned authority to alert the user.

7. Advantages

- Reduces accident
- It is used to develop nonintrusive system which will decent the fatigue and drowsiness of the driver.
- Environmental friendly.

8. Conclusion

The drowsiness detection and correction system developed is capable of detecting drowsiness in a rapid manner. The system which can differentiate normal eye blink and drowsiness which can prevent the driver from entering the state of sleepiness while driving. The system works well even in case of drivers wearing spectacles and under low light conditions also. During the monitoring, the system is able to decide if the eyes are opened or closed. When the eyes have been closed for about two seconds, the alarm beeps to alert the driver and the speed of the vehicle is reduced. By doing this many accidents will reduced and provides safe life to the driver and vehicle safety. A system for driver safety and car security is presented only in the luxurious costly cars. Using drowsiness detection system, driver safety can be implemented in normal cars also.

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