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DROWSINESS MONITORING AND ALERTING SYSTEM FOR VEHICLE DRIVERS BASED ON COMPUTER VISION

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ABSTRACT

In the real world, a significant number of accidents occur due to tired drivers, and drowsy driving is a leading cause of fatalities, injuries, and accidents, according to the National Highway Safety Administration. To address this issue, we propose a strategy that utilizes computer vision to monitor the driver's eye blinks. The system detects eye blinks through real-time images of the driver and notifies them through various methods such as sound, vibration, phone calls, and water sprinkling when it detects prolonged eye closure. Additionally, the system sends pictures of the driver to a designated telegram account once drowsiness is detected.

Keywords—tiredness of driver, Computer vision, eye blinking, phone call, Water sprinkling, snapshots and telegram.

I. INTRODUCTION

Sleep is a crucial necessity for human beings as it helps maintain their overall functionality and performance, given that they get sufficient rest. However, disruptions to this activity, especially while driving, can significantly impair cognitive and psychomotor abilities such as reaction time, attention, judgment, and surveillance. When a driver is deprived of adequate sleep, they may attempt to sleep while driving, which is a clear indication of drowsiness. This often results in the driver being inattentive, accompanied by yawning, frequent attempts to close their eyes, and head movements from side to side. Unfortunately, this can lead to traffic accidents, which can be a devastating experience for the driver involved.

One of the most prominent signs of fatigue in a driver is when they attempt to sleep while driving due to inadequate rest. Typically, this leads to behaviors such as frequent yawning, struggling to keep their eyes open, and nodding their head from side to side. Unfortunately, this can ultimately result in a car accident that can negatively impact both the driver and any pedestrians involved.

As per the Instituto Nacional de Estadstica e Informática, a small fraction of road accidents in Peru (0.6%) are caused by drivers feeling tired and avoiding taking a short break to rest their eyes, as they fear it might lead to a loss of control over the vehicle.

The National Highway Safety Administration has reported that drowsy driving is responsible for over 100,000 accidents, 71,000 injuries, and 1,550 fatalities every year. To address this issue, we propose a technique that utilizes computer vision to monitor the driver's eye blinks. This technology alerts the driver through various means such as sound, vibration, and water sprinkling if the driver keeps their eyes closed for an extended period of time, thus preventing accidents caused by drowsiness. The National Highway Safety Administration has reported that drowsy driving is responsible for over 100,000 accidents, 71,000 injuries, and 1,550 fatalities every year. To address this issue, we propose a technique that utilizes computer vision to monitor the driver's eye blinks. This technology alerts the driver through various means such as sound, vibration, and water

sprinkling if the driver keeps their eyes closed for an extended period of time, thus preventing accidents caused by drowsiness.

II. LITERATURE SURVEY

To reduce the danger of an accident, Kai-Wei Ke et al. developed a drowsiness detection system employing ECG signal data. ECG signal was obtained from a sensor, sent over Bluetooth to an Android device, and used with the Hamming Window and FFT techniques to calculate the power ratio. As the ratio falls, the device will sound an alarm to let the driver know they are getting sleepy [1].

Myoware, a low-cost EMG that can be used to detect the closing of the eyelid without harming the eyes, was introduced by Dian Artanto et al. as a prototype for drowsiness detection on the driver. To help with this attachment, an eyeglass is employed. It has also been made feasible to develop a sleepiness level detector that can be tracked online via the internet thanks to the incorporation of ESP8266 [2].

The methodology that K. Sakthidasan Sankaran and colleagues proposed concentrates on eye closure using the efficient method known as % eyelid closure (PERCLOS). A parameter level is established by PERCLOS to identify sleepiness. The Viola-Jones detector is used for the detection, and it separates the driver's face and the detector's image of the eye [3].

Skin potential activity, which is unaffected by the aforementioned conditions, was studied by Takuma Sone et al. Drowsiness was measured in response performance during repetitive task using visual cues, and skin potential activity was compared [4].

Esra Vural et al. investigated which facial muscle movements are indicative of mild to severe sleepiness. By capturing temporal dynamics via an overcomplete representation of temporal Gabor Filters, the impact of temporal dynamics of action units on prediction performances is investigated. In the finished system, feature selection is used to create a classifier that can distinguish between moderate and acute sleepy episodes [5].

Oraan Khunpisuth et al did an experiment to determine the degree of tiredness in an effort to remedy the problem. The use of a Raspberry Pi Camera and Raspberry Pi 3 module, which could estimate a driver's level of drowsiness, was a necessity for this work. The frequency of eye blinking and head tilting was employed to gauge a driver's level of drowsiness. with 10 volunteers evaluated [6]

K. Satish et al. suggested a novel approach based on two parameters for identifying tiredness in a person. Detection and capture come first. The second is employed for integration. Arduino is used to verify the results [7].

Anushka Vijay Sant et al. suggested that if the alert alarms go above a threshold, the driver's current position be transmitted to their emergency contacts. Convolutional Neural Networks are used by the system to efficiently evaluate the driver's levels of exhaustion and drowsiness [8].

The study by Menchie Miranda et al. focuses on eyelid movement, which was not covered in the earlier study. The proposed technology continuously monitors the driver's eyelid movements and, if drowsiness is found, immediately alerts him with a random-sounding siren. The online programme automatically delivers the report to the vehicle owner via internet access [9].

III. THE PROPOSED METHODOLOGY

The aim of the sleepiness detection system is to minimize the occurrence of accidents involving both personal and commercial vehicles. By detecting the initial signs of fatigue before the driver completely loses focus, the system alerts them that they can no longer safely operate the vehicle. However, relying solely on this device does not guarantee that the driver will remain fully alert and prevent accidents. Rather, it is a tool designed to enhance driver safety, especially for long-distance truck drivers,

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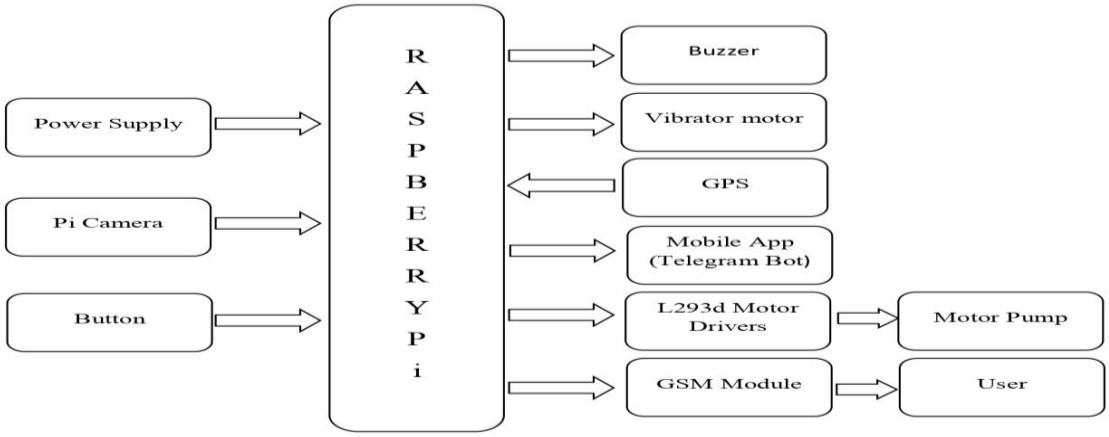
nighttime drivers, solo long-distance travelers, and individuals who may be experiencing sleep deprivation.

We propose a method to avoid fatigue-related accidents by utilizing computer vision technology to monitor the driver's eye blinks. Through real-time analysis of the driver's video feed, we can detect instances of eye blinking.

If the driver keeps their eyes closed for an extended period, the system will alert them using sound, vibration, and water sprinkling. Additionally, the system will take snapshots of the driver and send them to a designated email address as soon as drowsiness is detected.

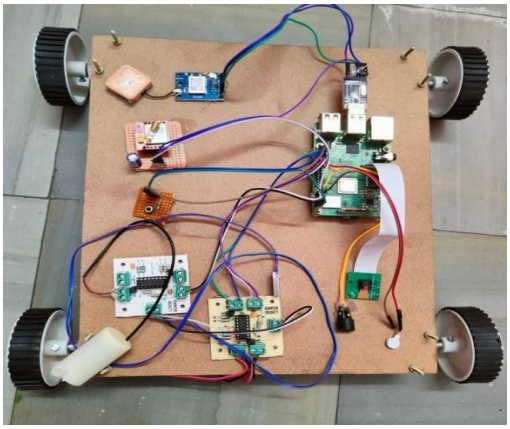
The system in question is designed to detect signs of fatigue in drivers using a pre-loaded dataset of photos featuring sleepy individuals. When the system detects that the driver in front of the camera has closed their eyes for a predetermined length of time, an alert is triggered to notify the driver. In case the driver fails to wake up after the alert, the system is equipped with a water sprayer that activates to help prevent accidents that could occur as a result of the driver nodding off.

BLOCK DIAGRAM



OBSERVATIONS AND RESULTS

The primary objective of this study is to detect signs of driver fatigue during vehicle operation while the power source is connected to the system.



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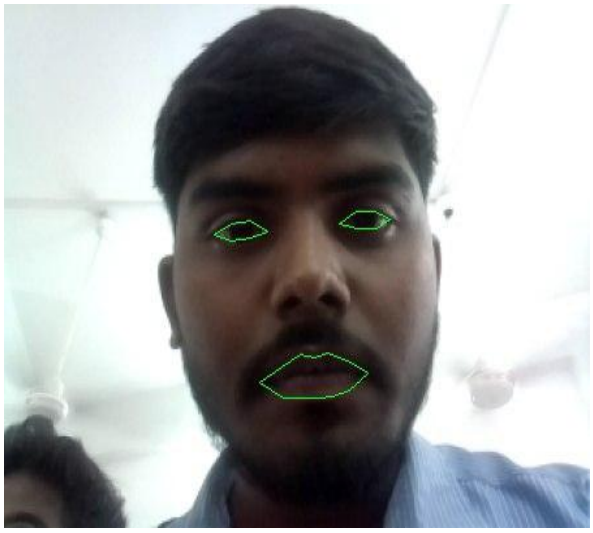
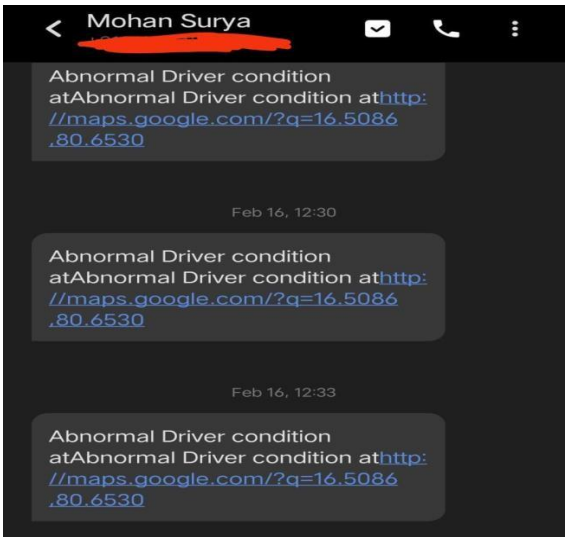
Model of the project

Before the drowsiness detection process begins, the driver should ensure they are properly seated in front of the camera. If the system detects that the driver's eyes have remained closed for a certain amount of time, it will identify the driver as sleepy and send photos to a designated Telegram account. Once drowsiness is detected, an alert system will activate, starting with a buzzer. If the driver does not respond by pressing a button within a short timeframe, a water sprinkler will be activated. If the driver still doesn't open their eyes, the car will gradually come to a stop and send its location to a designated recipient. Additionally, the alert system will call a specified mobile number.



Drowsiness detection



Location of vehicle sent to a specified contact

IV. CONCLUSION

In conclusion, our system monitors the driver's degree of drowsiness and initiates several actions when detected. This feature could be incorporated into actual vehicles to help decrease accidents and minimize the fatalities resulting from this problem. The pictures taken and saved when cars are donated for fundraising purposes can serve as evidence. Moreover, there is no need to worry about collisions while the driver is asleep as the vehicle also comes to a stop during the final phase.

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