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Driver Drowsiness Detection and Smart Alert System

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ABSTRACT: In recent years, the detection of a sleepy driver has become a necessary procedure in order to prevent any road accidents, possibly globally. This project's purpose is to develop a comprehensive warning system for intelligent cars that can automatically prevent damage caused by a tired driver from occurring. The human body is capable of drowsiness, and it occurs for a variety of causes. In order to avoid the cause of the accident, it is vital to create a powerful warning system. Video Stream Processing (VSP) is used in this study to construct a drowsy driver warning system that uses the EAR and Euclidean distance to evaluate video streams in the blink of an eye. Adoption of a facial recognition algorithm can be detected visually as well. Any time the IOT module detects driver fatigue, a warning message is sent out, along with information on the conflicting impact of local knowledge. Face landmark algorithm is also used as a proper way to eye detection. When the driver's fatigue is detected, the IOT module issues a warning message along with impact of collision and location information, thereby alerting with the help of a voice speaking through the Raspberry Pi monitoring system.

I. INTRODUCTION

Driver fatigue has been the main issue for countless mishaps due to tiredness, tedious road condition, and unfavorable climate situations .Every year, the National Highway Traffic Safety Administration (NHTSA) and World Health Organization (WHO) have reported that approximately 1.35 million people die due to vehicle crashes across the world. Generally, road accidents mostly occur due to inadequate way of driving. These situations a rise if the driver is addicted to alcohol or in drowsiness.

The maximum types of lethal accidents are recognized as a severe factor of tiredness of the driver. When drivers fall asleep, the control over the vehicle is lost. There is a need to design smart or intelligent vehicle system through advanced technology. This paper implements a mechanism to alert the driver on the condition of drowsiness or daydreaming.

A camera monitors the driver' eye blinking, eye closure, face detection, head posture, etc. with face landmark algorithm and Euclidean distance in the behavioralbased approach. These characteristics help to measure driver fatigue and instantly alert him with the help of voice speaker and forwarding an e-mail to a person (owner of vehicle) who can make him conscious an e-mail is being transmitted to a destination using IOT module, which relies on wireless transmission.

But, the proposed system is being integrated by a credit card-sized computer known as Raspberry Pi 3 and Pi camera which can trace an eye movements thereby monitoring intensity of collision effects that happen at the time of accident and alerting the emergency ward of the hospitals or owners that are nearby to the accident spot along with GPS location of the accident

II.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 proposed convolutional Neural Network (CNN) technique:

ML algorithm to detect micro sleep 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

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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 . Developed an algorithm of LSTM and Recurrent Neural Networks (RNN) to classify driver's behaviors through sensors. 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 .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. Implemented a real-time system to track human eyes using cyclone II FPGA.

2.3. Eye Recognition System Based on Wavelet Network Algorithm:

Introduced a technique for drowsy warningsystem 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 .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:

proposed a non-interfering drowsy detection system based on vehicle steering data using neurofuzzy system with support vector machine and particle swarm optimization algorithm. 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:

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. Proposed a method to observe drowsiness through signal of Heart Rate Variability (HRV) which is obtained using EEG sensors. 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 K Nearest Neighbors (KNN) classifier to improve the percentage of accuracy. 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, A driving fatigue detection system by measuring the EEG signals. It provided a robust platform for detecting 2 Wireless Communications and Mobile Computing 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. 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:

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 . 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

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device for tracking the location and transmission of message.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. 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 messagesfor 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. 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.

3.1. Pi Camera Module V2:

This Raspberry Pi Camera module v2 can be used instead of the original camera module, to capture high-definition video with still picture with the help of Sony IMX219 8-megapixel sensor .It operates with 1080p30, 720p60, and VGA90 video modes which connect to a CSI port via a 15 cm ribbon cable on the Raspberry Pi module that is depicted.

3.2. Raspberry Pi3 Model B Module:

It is a credit card-sized computer which is embedded with Quad Core 1.2 GHz Broadcom BCM2837 64-bit CPU, 1 GB RAM, and other parts. Raspbian OS is integrated in it, and its microprocessor is designed for Windows operating system.

3.3. Speaker:

It is an audio- or voice-generating device which can convert electromagnetic waves into sound. If the driver's drowsiness is detected, then a voltage is supplied as an alert to generate regular programmed voice sound.

3.4. Crash Sensor:

It is an electronic equipment that provides safety and detects an impact through vibrations. Due to drowsiness, any type of crash may happen; then, it detects the impact of collision

3.5. Force Sensitive Resistor Sensor (FSR):

Specialtypes of resistor known as force sensitive resistor, whose resistance may differ, according to pressure or force on it. So, it is made by a thick polymer sheet which is operated in different environments . Due to good shocking resistance, it is integrated in this system.

3.6. GPS Module:

This module is used to track the vehicle's location, if any serious collision occurs with a drowsy driver. It is the main component to detect the latitude and longitude of any area on the Earth with date and time from satellite. In this system, the mishap location is easily traced and the location is forwarded using GPS.

III.PROBLEM STATEMENT

Driver drowsiness poses a significant risk to road safety, leading to accidents with potentially severe consequences. To address this issue, a driver drowsiness detection and alert system is essential. This system aims to monitor the driver's behavior and physiological signals using sensors such as cameras and wearables . By analyzing these signals, the system can detect signs of drowsiness, such as eyelid movements and head position changes. Upon detection, the system issues timely alerts to wake up the driver or notify the vehicle owner or designated contacts, thereby preventing potential accidents caused by drowsy driving. Furthermore, the integration of such a system into vehicles has the potential to enhance overall road safety and reduce the societal burden associated with drowsy driving-related incidents. Therefore, developing an efficient and scalable solution to tackle driver drowsiness is imperative for mitigating its adverse impacts on road safety and public health.

IV.EXISTING SYSTEM

The current drowsiness detection systems include the usage of the devices that detect the respiration rate, heart rate, blood pressure, etc. These devices can cause the driver to be uncomfortable for driving. Cannot be assured that the drivers wear these devices all the time while driving.Mayget lost or improper functioning which may lead to low

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accuracy in the result. The existing system does not produce good results in low light conditions. If the light conditions are dark or too low it is unable to detect the face and eyes of the driver which results in lower accuracy. Road accidents have become common in the present era, causing the severe damage to the property and also to the lives of people travelling. There are many reasons of road accidents like: rash driving, inexperience, ignoring signboards, jumping signal etc.

V.PROPOSED SYSTEM

The goal of this suggested system is to reduce the number of accidents caused by fatigued drivers. These days, driver drowsiness is a global issue that occasionally results in traffic accidents. Thus, these actions ought to be necessary in order for the system's goal of implementing a smart alert system or vigilance in a vehicle to be handled automatically. Measurements of the driver's face movement and eye blinking are used to assess various behavioral or visual-based attitudes. The primary purpose of this eye blink is to identify the driver's level of sleepiness. An EAR's threshold value is over 0.25 and is unaffected by depletion. The EAR threshold value drops below the specified value when a driver automatically shuts down.

An EAR's threshold value is over 0.25 and is unaffected by depletion. The EAR threshold value drops below the specified range when a driver shuts down on its own. The number of video frames in which the driver's eyes are closed is represented by the threshold value of the drowsy eye blink sample. The driver is considered to be sleepy if the number of consecutive counting frames rises above the threshold value's range. Here, the entire movement of an eye is regularly captured using a Pi camera, allowing the threshold value of an EAR to be determined. It also has a counter built in to count the number of times frames appear. Assume that it went over the 30-range.
In that scenario, a speaker sounds, and a call or SMS is immediately placed to a designated recipient within the car. These notifications are often issued at the moment when the vehicle detects drowsiness. The modules as mentioned are compatible with the Raspberry Pi3, which is running Python programming.

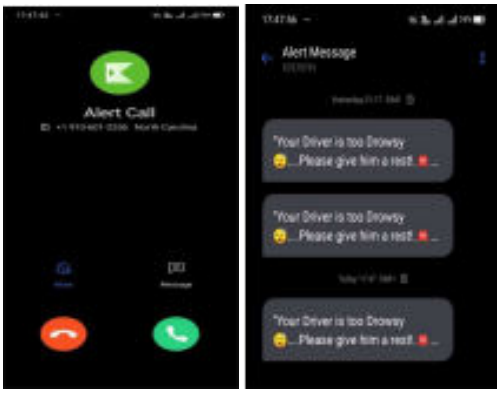

Fig:1.Owner's Alert

VI.METHODOLOGY

Vehicle based : Vehicles environment including changes in speed, steering wheel movement etc…
Behavioural approach: Drivers focus on his driving by observing the drivers head movements eye, yawning, or facial expression etc...

BEHAVIORAL APPROACH

EYE DETECTION:
STEP 1: Take images input from a camera
STEP 2: Detect the face using image processing
STEP 3: Detect the eye using the EAR classifier
STEP 4: Classifier the categorize whether eyes are open are closed.
STEP 5: Calculate the person is drowsy or not
STEP 6: If the level of fatigue is more than given an voice alert to the driver
STEP 7: The voice alert sounds until the drivers wakeup

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ANALYSIS EYE BLINKING AND YAWN DETECTION:

STEP 1: Take image as input from a camera
STEP 2: Detect the face in the image and capture to extract frames one by one.
STEP 3: Detect the eyes region and mouth region
STEP 4: Each extracted frame is analyzed at time to study the pattern of facial features
STEP 5: Calculate EAR for each frame
STEP 6: Then voice alert keeps on ringing until the driver wakes up.

ADVANTAGES:

- Prevention accidents
- Improved reaction time
- Reduced insurance cost
- Enhanced comfort and convenience

VII. FLOW DIAGRAM

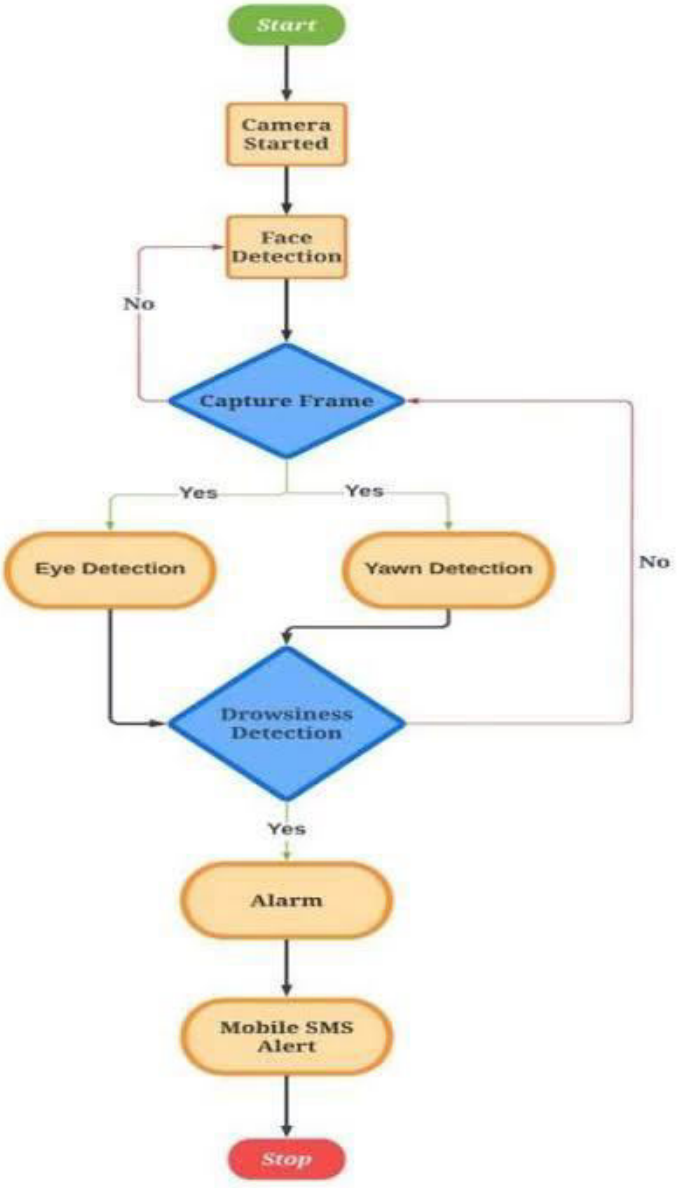

Fig: Drowsiness Detection System

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VIII.FUTURE SCOPE

Future driver drowsiness detection systems will feature voice alert technology integrated with advanced machine learning algorithms for personalized alerting strategies tailored to individual driver behavior and environmental factors. Enhanced sensor capabilities, coupled with real-time physiological monitoring, will ensure accurate and timely detection of drowsiness indicators, thereby enhancing road safety and preventing accidents caused by driver fatigue. Additionally, integration with in-car assistance systems and connectivity features for remote monitoring and assistance will expand the scope of these systems, providing comprehensive support to drivers and enhancing overall road safety. As these technologies continue to evolve, driver drowsiness detection systems with voice alert capabilities will play a crucial role in mitigating the risks associated with driver fatigue and promoting safer driving practices.

IX.CONCLUSION

Purpose of our project is to help solving real life problem in very cost effect way. It alerts the truck driver as well as the owner of the company. Whenever the driver feels drowsy and closes his eyes for more than a second, the voice alert. As a result, it alerts the driver. It also warns the owner of the truck driver by sending him text messages. As a result the accident ratio decreases. Hence, our project if commercially developed will help in saving the precious life of truck driver & money of the owner. The current study developed an automated system for detecting drowsiness of the driver. The continuous video stream is read from the system and is used for detecting the drowsiness. If the value remains 0 for some amount of time then it detects as sleepy and alerts driver by activating an voice alert. If the value remains constant for longer periods then the driver is said to be distracted then also an voice alert is activated.

REFERENCES

[1] Mittal, A., Kumar, K., Dhamija, S., & Kaur, M. (2016, March). Head movement-based driver drowsiness detection: A review of state-of-art techniques. In 2016 IEEE International Conference on Engineering and Technology (ICETECH) (pp. 903-908). IEEE.
[2] Carney, C., McGehee, D., Harland, K., Weiss, M., & Raby, M. (2015). Using naturalistic driving data to assess the prevalence of environmental factors and driver behaviors in teen driver crashes.
[3] Hsu, R. L., Abdel-Mottaleb, M., & Jain, A. K. (2002). Face detection in color images. IEEE transactions on pattern analysis and machine intelligence, 24(5), 696-706.
[4] Jayaprakash, Stanly, Manikanda Devarajan Nagarajan, Rocío Pérez de Prado, Sugumaran Subramanian, and Parameshachari Bidare Divakarachari. "A systematic review of energy management strategies for resource allocation in the cloud: Clustering, optimization and machine learning." Energies 14, no. 17 (2021): 5322.
[5] Tabrizi, P. R., & Zoroofi, R. A. (2008, November). Open/closed eye analysis for drowsiness detection. In 2008 first workshops on image processing theory, tools and applications (pp. 1-7). IEEE.
[6] Czarnecki, K. (2018). „Operational Design Domain for Automated

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