Driver Drowsiness Detection Using Raspberry Pi

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I. ***ABSTRACT:-*** DRIVER DROWSINESS IS A SIGNIFICANT FACTOR CONTRIBUTING TO ROAD ACCIDENTS WORLDWIDE. THIS PAPER PROPOSES A NOVEL APPROACH TO MITIGATE THIS PROBLEM BY DEVELOPING A DRIVER DROWSINESS DETECTION SYSTEM (DDDS) USING RASPBERRY PI. THE SYSTEM UTILIZES IMAGE PROCESSING TECHNIQUES TO MONITOR THE DRIVER'S FACIAL FEATURES AND DETECT SIGNS OF DROWSINESS IN REAL-TIME. A COMBINATION OF COMPUTER VISION ALGORITHMS AND MODELS IS EMPLOYED TO ACCURATELY IDENTIFY FATIGUE-RELATED SYMPTOMS SUCH AS EYE CLOSURE AND HEAD NODDING. THE PROPOSED SYSTEM OFFERS A COST-EFFECTIVE AND EFFICIENT SOLUTION FOR ENHANCING ROAD SAFETY BY ALERTING DRIVERS WHEN THEY EXHIBIT SIGNS OF DROWSINESS, THEREBY REDUCING THE RISK OF ACCIDENTS.

Keywords: Driver Drowsiness Detection, Raspberry Pi, Image Processing, Computer Vision, Road Safety.

II. INTRODUCTION

Drowsiness can be a state of feeling sleepy or abnormal all the time. Drowsiness may be caused by a variety of medical conditions, medications and lifestyle changes. Fatigue can also affect the driving ability of all the drivers. Some of the common causes of drowsiness are:

1) Insufficient sleep 2) Changes in sleep schedule and sleep disorders 3) Unhealthy lifestyle 4) Stress or worry. Due to drowsiness the accident ratio is rising day by day. As per the new statistics 21 percent of all fatal accidents are due to driving in drowsy condition and according to NHTSA 1,00,000 accidents in the country are the result of driver fatigue every year. Past year statistics estimates that 60 % of drivers and about 168 million drivers have met with accidents due to drowsy driving.

A study conducted in 2020 by Safe Life Foundation and Mahindra revealed that truck drivers in India drive 12 hours covering a distance of about 500km and 60% of them admitted that they felt sleepy while driving and due to which some of them have met an accident. This is a serious issue which is increasing day by day. Our main motive of the project is to make safe system and ensure safety. In this way, a system is designed that checks driver's drowsiness condition and alert the driver as soon as possible before it's too late. In addition to this the system also checks whether the driver is drunk or not so that the driver should be alert. For this there is a need of a system which can scan the driver's eyes and detect whether the eyes of the driver are open or closed by monitoring the state of eyes. This system will capture the video with the help of camera and starts processing it, and it will alert the driver based on the results. This system has overcome few of the limitations of the existing systems. This system will provide an alert to driver with the help of a buzzer if the driver is feeling sleepy

III. OBJECTIVES

1. Accident Prevention: The primary objective is to prevent accidents caused by drowsy driving. By detecting signs of driver drowsiness in real-time, these systems can alert the driver or intervene to prevent potential collisions.
2. Early Warning: Providing early warning signs to the driver when fatigue is detected allows them to take corrective actions, such as taking a break, drinking coffee, or switching drivers.
3. Enhancing Driver Awareness: Drowsiness detection systems aim to increase drivers' awareness of their own fatigue levels. By alerting them to signs of drowsiness, drivers can make informed decisions about their driving behavior and take appropriate measures to stay alert.

IV. LITERATURE SURVEY :

A lot of steps have been taken in the development of the systems for drowsiness detection based on the factors like movement of eyes, blinking of eyes. A drowsiness detection system has been developed which scans the eyes of driver and check the level of drowsiness and a sensor which will detect the drunk state of the driver. In this detection technique, in accordance with the parameters the system will work according to the steps as Camera is used to detect whether the eyes of the person are open or

closed and when image is detected a Region of Interest is created which is fed to the classifier where it identifies and checks whether if the eyes of the person are open or closed. At a certain point where the eyes of the person are closed for about 2-3 seconds, a warning sign is issued to the driver also with the help of MQ3. This system monitors drowsiness and provides an early warning system. This proposed system ensures safe driving by real time detection.

V. PROBLEM STATEMENT

- Driver's sleepiness detection using Python and Opencv.
- Developing driver alert system, which gives an alert to the driver by observing driver's eyes for drowsiness while driving a vehicle and alarming the driver.
- Develop a real-time driver drowsiness detection system using computer vision techniques to mitigate road accidents caused by driver fatigue. The project aims to analyze facial features and head movements captured by an in-vehicle camera to identify signs of drowsiness. The system will employ deep learning algorithms to classify driver states as alert or drowsy and trigger timely audio-visual alerts to notify the driver. Through extensive testing and evaluation, the effectiveness of the proposed system in detecting and preventing drowsiness-related accidents will be assessed, contributing to enhanced road safety and reduced fatalities on the highways.

VI. PROPOSED APPROACH

This section details the proposed approach to detect driver's drowsiness that works on two parameters. The process starts with capturing the live video stream from the camera and is processed to be sent to the model to predict drowsiness. Using the OpenCV library, the video stream is cropped into the eye region and the face. Each frame is checked for checking the state of the eyes as open or closed. Suppose the state of the eyes is closed for more than a specific time set in the system. If drowsiness is detected, the system will alert the driver and the passengers with an alarm. The subsequent section details the working of each module.

VII. THEORY

Raspberry Pi: It is a low-cost credit card sized computer which is attached to a monitor or TV, and using a keyboard and mouse as it has its own display screen. It is a very small device which enables people of all ages so that they can scan a computer, and learn to edit in languages like Scratch and Python.[2] It is able to do everything whatever is expected by a desktop computer, from browsing the Internet and playing high-definition video, creating spreadsheets, word processing, and playing games.

Fig.Webcam

Fig.3 Buzzzer [3]

Fig. 5 Connector Pins [3]

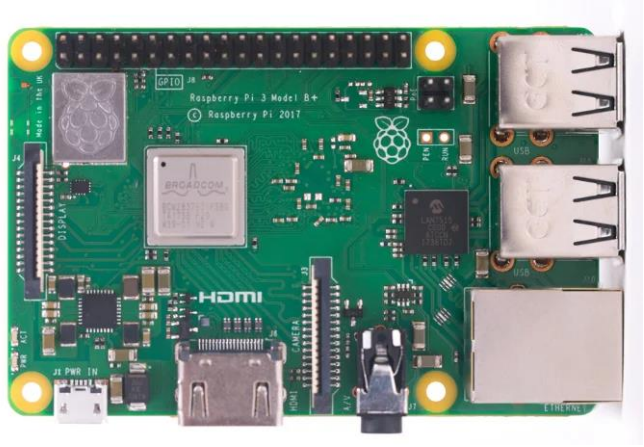


Fig.Raspberry pi

Fig.LCD

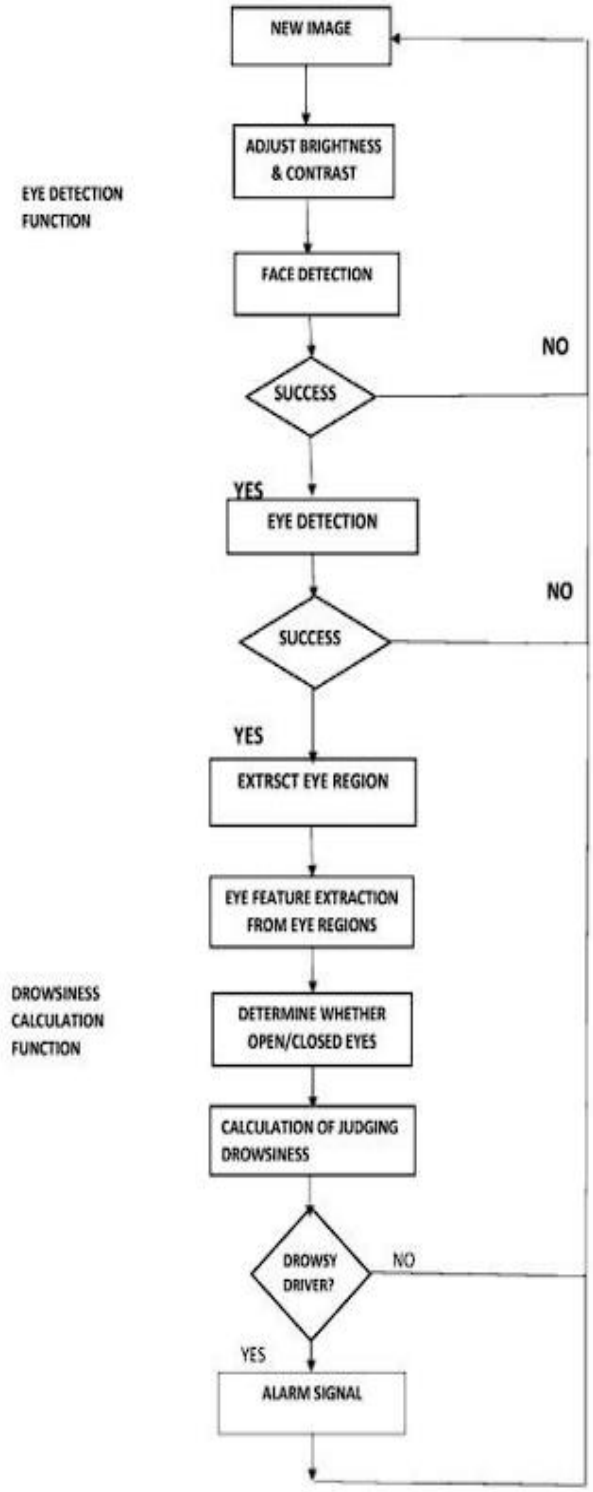
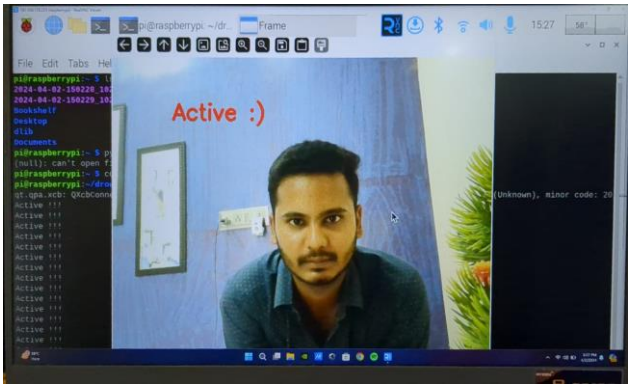


Fig. Flowchart

VIII. OUTPUT



IX. CONCLUSION

In this project we have made a system which will help to reduce number of accidents and fatalities caused due to drowsy driving. The features added to this project are enough smart in themselves for proper functioning of the whole system so that number of accidents will decrease. The purpose of this paper is to highlight the importance of the need of systems and also how to implement such systems. This real time project will give approximate accurate results.

X. ACKNOWLEDGEMENT

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devices

XI. FUTURE WORK

In the realm of driver drowsiness detection, the future holds promise for innovative advancements across several key areas. One avenue for exploration involves leveraging emerging technologies such as artificial intelligence and deep learning to enhance the accuracy and efficiency of detection algorithms. By incorporating sophisticated neural network architectures and large-scale datasets, researchers can develop more robust models capable of recognizing subtle signs of drowsiness with higher precision.

Moreover, there's growing interest in the integration of multimodal sensor data, including facial expressions, eye movements, physiological signals, and vehicle dynamics. By fusing information from diverse sources, such as EEG signals, heart rate variability, and steering behavior, researchers can gain a more comprehensive understanding of the driver's cognitive and physiological state, leading to more reliable drowsiness detection systems.

Furthermore, future research may delve into personalized drowsiness detection approaches that account for individual differences in response to fatigue. By considering factors like age, sleep patterns, and driving experience, tailored models can adapt their detection thresholds and alert strategies to suit each driver's unique characteristics.

XII. REFERENCES

1. L. Satish, A. Lalitesh in IEEE conference 2020 proposed a paper on Driver's drowsiness detection which proposed CNN model which detects the drowsiness based on the closing of the eyelids of the driver and this model can be easily installed inside the vehicles easily when integrated Raspberry Pi and powered with vehicle's battery. [1]
2. Ashish Pondit, Ashim Dey & Annesha Das in IEEE conference in Dec 2020 has proposed "Real time driver monitoring system based on visual cues" which leverages precise graphs representing program execution flows and deep neural networks for automatically learning defect

features and control flow graphs and multi- view and layered directed CNNs are also constructed to observe the drowsiness.[2]

3. Tariq Jamil, Medhat H. Awadalla in IEEE Conference of July 2016 presented "Drowsiness and Alcohol Detection" using Machine Learning and Raspberry Pi which proposed machine learning techniques which support vector support machines, CNN and also Marcov techniques which can help in accurate face detection. [4]
4. Harshit Meda, Ashish Sahani in IEEE conference in 2021 introduced Machine Learning Models for Drowsiness Detection proposed for a model enough compatible to detect the driver's eyes by calculating the EAR so that an alert can be generated which can avoid number of road accidents.[5]
5. Dung Chin Lin, Cheng Jia Wang in 2018 IEEE conference gave Real-Time Car Detection and Driving Safety Alarm System with Google TensorFlow which uses Tensor Flow object detection API which makes a rectangular region around eyes and then calculates the ratio which defines that the alert should be generated or not.[6]