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# *Embedded System for Detection of Driver Drowsiness*

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***Abstract***

*Driver weariness has emerged as one of the main factors in traffic accidents in recent years. A complete way of assessing driver fatigue is the condition of the driver's drowsiness. Therefore, it is crucial to identify drowsy driving in order to protect people and property. The creation of a system that can detect tiredness is the aim of this research. This prototype is a real-time system that records pictures continuously, evaluates the eye's condition using the described method, and issues a warning if required. Although there are several techniques to measure driver weariness, this method is completely non-intrusive and has no impact on the driver, revealing the driver's true condition. To detect fatigue, the persistence value of the eye is calculated. The driver is regarded as sleepy when their eye closure exceeds a particular threshold.*

***Keywords: -****Driver fatigue, Fatigue detection, Driver monitoring system, Face detection.*

## INTRODUCTION

Insufficient sleep, prolonged periods of nonstop driving, or any other physical ailment, such as brain issues, among others, can all cause drivers' concentration levels to decline.

Driver weariness is believed to be a contributing factor in 40% of all traffic accidents, according to multiple studies. Excessive fatigue and drowsiness occur when a person drives for longer than is typical for a human, which leads the driver to pass out or lose consciousness [1].

The driver's degree of awareness and consciousness declines when they are drowsy, a complex occurrence. There are several indirect methods that may be used to detect tiredness even if there are no direct methods [2]. A tired driver can cause serious consequences, including fatalities, injuries, and vehicle damage. As the most crucial safety factor, immediate action must be made to improve the working conditions for the driver in order to prevent the negative effects of a tired driver. By providing essential services in a range of industries relevant to multiple facets of life, computer science and engineering play a significant role in the development and improvement of society.

There are several methods for determining driver fatigue, including vehicle-based monitoring, physiological tests, and behavioural tests [3]. These techniques might be used to develop an intelligence system that can warn the driver when they are drowsy and avoid accidents. Based on the advantages and disadvantages, the most precise method is selected and presented. The whole system development process is then covered. The next step is to look at each shot and decide which face appears first. The next stage is to locate the eyes if a face is found. When a detection is successful, the amount of eye closure is measured and contrasted with the reference values for the eye in the sleeping condition. In the event that the driver is found to be drowsy, the driver is notified; in the absence of this, the process of finding the face and determining tiredness is repeated [4].

- The main objective is to develop a prototype that is reliable in delivering pertinent auditory alarms in real-time and accurate in detecting driver fatigue based on eyelid movement.
- Other objectives include creating a prototype that continuously monitors the driver's eyes in order to identify signs of driving fatigue. The device should alert the driver if his eyes are closed for a short period of time. Even if the driver is wearing glasses, the gadget still functions.

## AN OVERVIEW OF EXISTING SYSTEM

Driver tiredness detection and monitoring technologies are developing, with some now in development, validation testing, or early implementation. Previous research looked at methods and technologies for predicting and detecting fatigue [4]. One approach is the vehicle-based methodology survey route position, which keeps track of the location of the vehicle

as it locates path markers and records steering wheel movement data to establish levels of fatigue ranging from low to high. EEG is another technique for measuring driver fatigue. It is very expensive to sell and complex noise reduction is needed. In essence, none of these are capable of recognising a driver's external surroundings or of adapting to different users [5]. By offering up-to-date details on cutting-edge new fatigue detection and alertness monitoring technology, this research advances earlier studies. Strong, non-intrusive eye detection and tracking prototypes, together with significant developments in video camera and computer processing technologies, have made it possible to characterise and monitor a driver's degree of awareness in real time under a variety of driving conditions [5].

**PROPOSED SYSTEM**

The most crucial method is based on physiological considerations of humans. Using this method, physical alterations such as sagging posture, the driver's head position, and eye open/close conditions are assessed in addition to physiological indications such as changes in heart rate, brain waves, and eye flickering. Although this method is the most accurate, it is impracticable since the driver would be uncomfortable and distracted if detecting electrodes were placed directly on their body.

Long drives also make the sensors sweat, which impairs their ability to screen properly. As a result, as it provides the most conclusive information about drowsiness, the quantity of eye closure, also known as the percentage of closure, will be significantly weighted in this approach. Additionally, because it is non-intrusive, the driver is entirely at comfortable using this device and it has no impact on their condition. This method is unaffected by other factors, such as the state of the roads. In accordance with the selected threshold value, microsleep is also recognised. The creation of this system includes face tracking and recognition, human eye detection, location, and monitoring, eye condition detection, and driver tiredness evaluation. The main elements of the detection technique integrate driver fatigue testing with human eye location and detection. The ratio of open to closed eyes multiplied by the total number of frames for a given period was the better method for evaluating the driver's PERCLOS estimation [7].

**DESIGN**

The proposed technology will be able to detect fatigue in a suitable real-time driving environment. The calibre of the camera being used will dictate performance. The recommended solution is suitable for usage by both daytime and nighttime drivers due to its well-designed and straightforward interface. Users can utilise the interface in steps to reach their objectives. The suggested system must be usable whenever necessary if the user's system complies with the specified requirements. If the programme fails unexpectedly, the recommended system must be able to recover from failure and resume operation after recovery. Along with the necessary peripheral hardware, the drowsiness detection system will be created on the Raspberry Pi board, and its software will be built in Python 3. We outline the standards for determining driver fatigue using a basic sensor set up to explain our problem.

1. The device should measure what it is intended to, operationally that is eye blink.
2. The real time behavior of the driver should be monitored by the device.
3. The device should be consistent while measuring over the time and it should measure the same event for all drivers.
4. The device should be able to operate accurately and reliably in both day and night time conditions.
5. The device should be able to operate accurately and reliably over the expected range of truck cab temperature, humidity and vibration conditions.
6. The device should be designed to maximize sensitivity and specificity

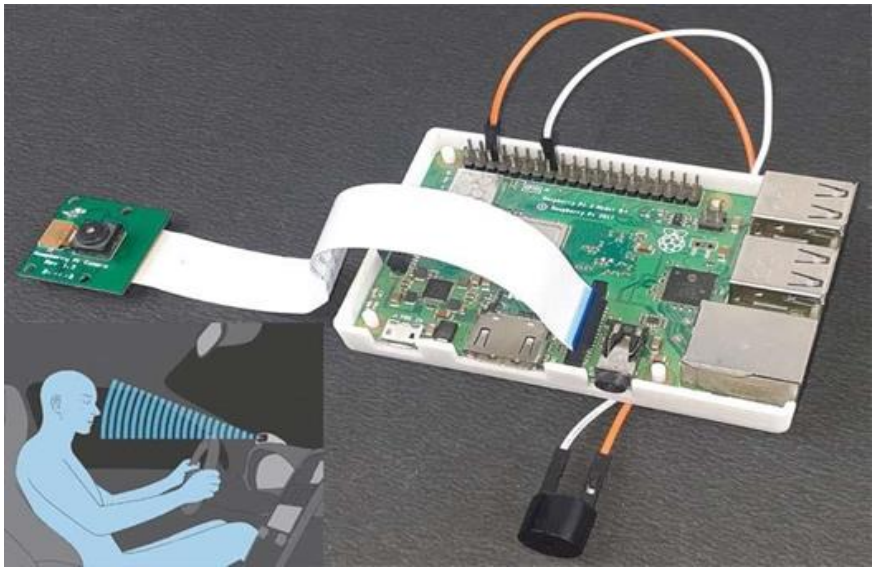

***Fig 1: Proposed Fatigue detection system***

## SYSTEM ARCHITECTURE

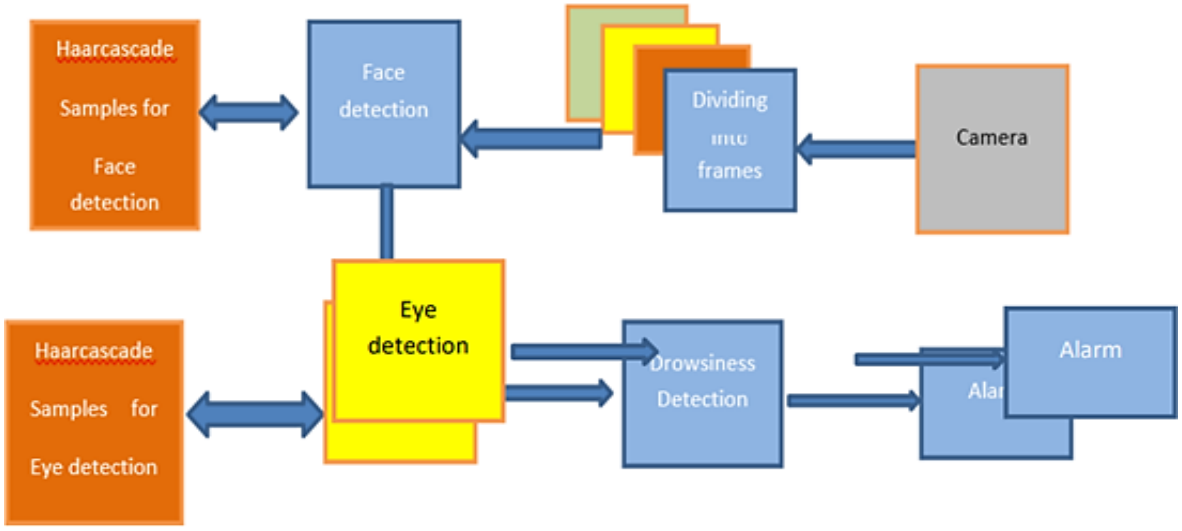


*Fig 2: System architecture of Fatigue detection system*

A camera records the driver's face while they are driving and turns it into a video feed. The programme then examines the footage to determine the amount of tiredness, fatigue, and sleepiness. The driver's face movement, level of fatigue, and the regions of the face that are significant depending on eye closure are the most crucial things to watch at this stage. Finally, a verbal alert is given if fatigue is detected.

### Comparison with Existing System

This recognition method surpasses physiological, vehicle-based, and fingerprint tests despite some of its inherent flaws. Some people might be reluctant to put their fingers in the same location that many others have touched countless times. Some persons have suffered finger injuries. The surface conditions of the fingertip have a significant influence on the capacity to identify a fingerprint, which might change depending on environmental or individual circumstances.

For vehicle-based tactics to be effective, the present driver's driving style must be studied and mimicked. Micro sleep, which is most common on straight roadways, cannot be detected. The physiological procedures are not feasible since detecting electrodes would have to be placed directly on the driver's body, which would be uncomfortable and distracting to the driver. In addition, prolonged driving causes sweating on the sensors, limiting their ability to screen correctly.

## CONCLUSION

By observing the eyes, this equipment may identify signs of fatigue. Shape prediction algorithms are used to find faces and then eyes. Face landmarks collected via facial landmark detection serve as the inputs for these algorithms. The EAR function, which calculates the ratio of distances between horizontal and vertical eye landmarks, is the subject of this module. Additionally, a speaker module is fitted, and it is used to deliver appropriate speech alarms when the driver nods off. Through the study presented in this paper, a novel approach to lowering accident rates and advancing technology to prevent fatal vehicle accidents is developed.

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