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Accident Avoiding and Monitoring Using Open CV

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Abstract
These days, one of the main factors contributing to the majority of accidents worldwide is driver fatigue. Identifying driver eye fatigue is the most straightforward method of gauging driver sleepiness. The methods now in use in the literature are yielding findings that are somewhat less accurate because of low image and video clarity, which might be caused by differences in camera placements. This research proposes a driver drowsiness detection system that uses eye blink counts to identify tiredness as a solution to this problem. The motorist is alerted with a vibrator signal when their eyes are identified to be closed for an extended period of time. The suggested system performs well in terms of accurate sleepiness detection findings and thereby lowers the number of traffic accidents, as demonstrated by the testing results. The system is deployed on an Open CV environment with a single camera view.

Keywords: *Open CV, Eye Blink Count, Driver Drowsiness.*

1. Introduction
Over the past ten years, emerging nations have seen a progressive growth in the number of motor vehicles. According to officialaccident investigation records, a significant number of traffic accidents are caused by unsafe driving practices, such as drivingwhile intoxicated or sleepy. To elaborate, a lot of sleep- related car accidents happen between the hours of 2:00–6:00. A.M. and14:001–6:00 P.M. It's commonly known that drivers who work nights are more vulnerable [1]. Every year, traffic accidents worldwide result in 50 million impairments and 1.3 million fatalities. A significant risk and cause for concern, driver fatigue is found to be a direct or contributory factor in the majority of traffic accidents. Due to the fact that fatigue can significantly reduce reaction time and drivers' discernment and alertness. Road accidents can be avoided, perhaps saving lives, by developing a driver monitoring system that can alert the driver when it notices symptoms of fatigue. From a different angle, image processing became more and more common in computer science and engineering, having a multifaceted impact on some professions. By using image processing techniques, such as counting eye blinks, to detect driver tiredness, road accidents can be reduced concurrently. This is known as the promise scheme [2].

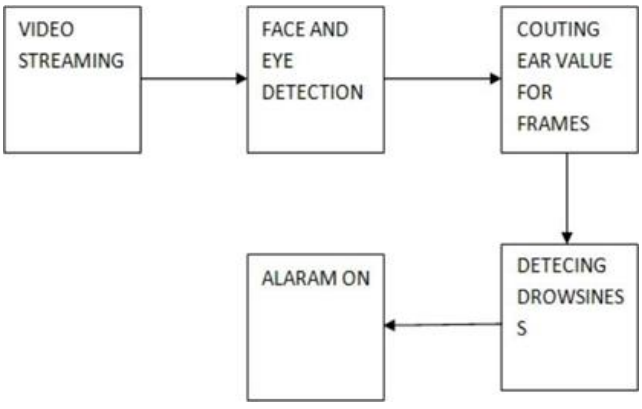
2. Implementation


Figure 1 Block Diagram

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By using streaming technology, millions of customers may access music and video content via the Internet via their PCs, PDAs, mobile phones, or other streaming devices [3]. The emergence of video streaming technologies can be attributed to

- The deployment of broadband networks;
- Improved efficiency in video and audio compression techniques;
- Growth in the number and quality of audio and video services available online

Video and audio data may be sent via the Internet in two main ways: in download mode. After downloading the content file entirely, it is played. This technique needs a lot of hard drive space and takes a long time to download the entire content file. 29 In streaming mode. There are segments of the material that play without needing to download the entire file [4].

2.1 Pre-Processing

The term "pre-processing" refers to procedures that work with pictures at the most basic level of abstraction, where the input and output are intensity images. Pre-processing aims to improve the picture data by reducing undesired distortions and enhancing certain key aspects that are necessary for later processing [5].

2.1.1 Blob Detection

Blob detection techniques in computer vision are used to identify areas inside a digital picture that have different qualities from the surrounding areas, such as brightness or colour. Informally speaking, a blob is an area of a picture where certain characteristics are constant, or roughly constant; every point within a blob may be thought of as somewhat comparable to every other point. Convolution is the most often used technique for blob detection. One method of distributing video over the Internet is using video streaming technology. By using streaming technology, millions of customers may access music and video content via the Internet via their PCs, PDAs, mobile phones, or other streaming devices. The following factors are driving the rise of video streaming technology:

- There is a deployment of broadband networks.
- Compression methods for audio and video are more effective.
- The range and calibre of online audio and video services are growing.

Video and audio data may be sent via the Internet in two main ways: in download mode. After downloading the content file entirely, it is played. This technique needs a lot of hard drive space and takes a long time to download the entire content file. In streaming mode. The content file can play while portions of it are being received and decoded; it is not necessary to download it in its whole [6].

2.1.2 Face detection

Since face detection is a major field of study, several methods have been put forth. The majority of them are predicated on the same notion, seeing face detection as a work of binary classification. That is, the job is to determine if a certain portion of the image has a face or not. This is accomplished by first turning the provided region into features, and then determining whether or not these features resemble a human face using a classifier trained on sample photos. Since faces might appear in a variety of settings and sizes, a window-sliding approach is frequently used as well. The objective is to make the classifier identify as face or non-facial the areas of a picture at all sizes and locations [7].

- The procedure involves removing face areas with consistent size and normalised intensity from an input picture.
- The appearance characteristics, which characterise changes to the face such wrinkles and furrows (skin texture), are derived from the identified facial portion.
- In this system type, the face region is extracted using an executable file (.dll, or dynamic link library).
- The adaptive boosting approach and haar-like characteristics serve as the foundation for the face detection process.

2.2 Fatigue Detection

One auto safety feature that helps avoid accidents caused by tired drivers is driver drowsiness detection. According to some studies, weariness may be a factor in 20% of all traffic accidents, and on some routes, it may even account for 50% of them. Certain modern

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technologies are able to recognise trends in drivers and identify when a motorist is getting sleepy [8].

2.3 Eye Detection and Drowsiness Detection

The eyes are identified from the face for further processing to determine whether or not driver 35 is sleepy. Here, we are focusing on describing the eyes specifically on the face. This suggested method makes use of a real-time algorithm to identify eye blinks in a video sequence captured by a camera. Current landmark detectors are quite resilient to changes in lighting, face expressions, and head direction with regard to a camera. This project's landmark detection is accurate enough to calculate the eye opening's level. In order to characterise the eye opening in each frame, the suggested method evaluates the landmark positions and extracts a quantity known as the eye aspect ratio (EAR). Several markers are used in this approach to identify when an eye opens and closes. The majority of the distinguishing features on a picture of a human face are captured by this landmark detector. An eye blink is the quick shutting and opening of an eye of a person. Every single person blinks in a slightly distinct pattern. The pattern varies in the blink duration, the degree of ocular squeezing, and the speed at which the eyes close and open [9]. An eye blink lasts between 100 and 400 microseconds. We obtain the eye aspect ratio (EAR), which is utilised as an approximation of the eye opening state, from the landmarks identified in the picture. The eye landmarks are identified for each and every video frame. The eye's aspect ratio—which relates the eye's height and width—is calculated. P1, P2,... P6 are the markers on the eye from Figure 1. When an eye is open, the EAR remains relatively constant, but when it is closed, it approaches zero. Due to the fact that both eyes blink simultaneously, the EAR of each eye is measured and averaged.

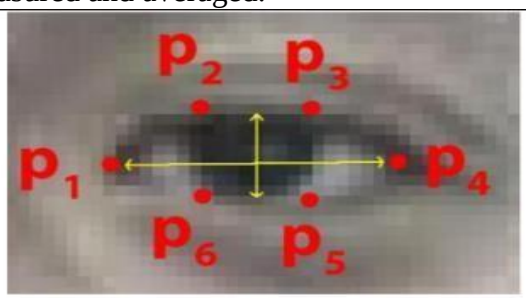

Figure 1 Landmarks On the Eye

The driver is considered sleepy if, after obtaining the EAR value, the value remains below the limit for two or three seconds. The system's buzzer takes action to rectify the driver's unusual behaviour.

2.4 Fatigue Detection

One piece of automotive safety technology that helps avoid accidents caused by tired drivers is driver drowsiness detection. According to some studies, weariness may be a factor in 20% of all traffic accidents, and on some routes, it may even account for 50% of them. Certain technologies in use today are able to recognise trends in drivers and identify when a motorist is getting sleepy. The algorithm for the sleepiness detector.

- To start, we'll set up a camera to search for faces in a stream.
- •If a face is detected, the eye regions are extracted using facial landmark detection.
- We will be using "haarcascade_frontalface_default" classifier and "dlib's shape_predictor_68_face_landmarks".Under standing dlib's facial landmark detector
- The dlib library's pre-trained facial landmark detector is used to locate 68 (x, y)-coordinates that correspond to facial features on the face.

2.4.1 Face Shape Co-Ordinates

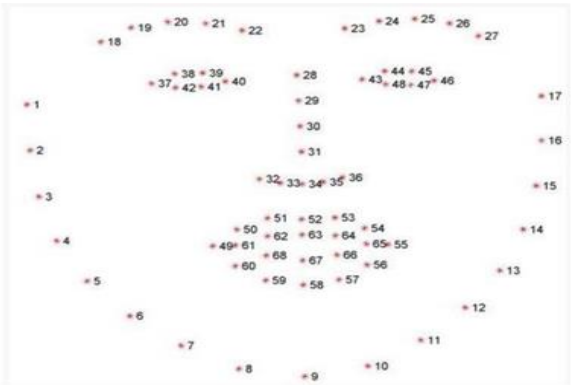

Figure 2 Detecting Facial Landmarks with dlib, Open-CV, and Python

Six (x, y) coordinates are used to represent each eye. These coordinates are entered from the left corner of the eye (as if you were staring at the person) and are then used to move clockwise around the remaining area.

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- Based on a modification to the conventional Histogram of Oriented Gradients + Linear SVM approach for object detection, it initialises dlib's pre-trained face detector.
- The eyes are the only two face components in which we are concerned when it comes to blink detection (Figure 2).

2.4.2 Eye Aspect Ratio

This graphic should help us to remember one important thing. The width and height of these coordinates are related to one another.

$$\text{EAR} = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

The eye aspect ratio (EAR), which is an equation reflecting this relationship, may then be derived (for sleepiness detection) To enhance our blink detector:

- A 13-dimensional feature vector is created by concatenating the eye aspect ratios for the N-th, N-6, and N +-6 frames, as well as by computing the eye aspect ratio for the N-th frame.
- A HaarCaascade is then trained using these feature vectors.

2.5 Software Requirements

- DLIB
- OpenCV-python

3. Hardware Equipment's

3.1 Raspberry Pi

Figure 3 Raspberry Pi

The Raspberry Pi Foundation created the tiny single-board computer, known as the Raspberry Pi, in the United Kingdom to support computer science education in schools and in impoverished nations. Outside of its intended market, the original model outsold the projected sealing in terms of popularity, particularly for robotic applications.

3.2 Features

A Broadcom System on Chip (SOC), including an ARM-compatible CPU, an on-chip graphics processing unit, and a Vedio core IV, is at the core of the Raspberry Pi. The primary characteristic shared by the first and third generations is as follows:

- The frequency range of CPUs is 700 MHz to 1.2 GHz.
- The amount of RAM on board is between 256 MB and 1 GB.
- A USB slot is not the same as another USB slot.
- 3.5mm phone jack, composite video output, and HDMI.
- GPIO pins, which allow standard protocols like I2C (inter-integrated circuit), give low level output.
- Contact for Ethernet 8 Position 8 (8P8C)

3.3 Raspberry Pi Power Supply

Model B+ Power Supply: The power supply has been entirely overhauled to increase the B+'s dependability and really lower its current demand. The 1A fuse has been replaced with a 2A fuse, and the microUSB jack is still located on the left. Additionally, a DMG2305UX P-Channel MOSFET is available (http://adafru.it/dGU). Compared to a diode, this has a far lower "drop-out" rate and functions as a polarity

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protection switch. With only 52mW of resistance, the voltage loss at 2A is only 0.1V. It would be at least 0.5V for most diodes. Check out this fantastic video explaining the method here: A projection TVS diode (D5 component #SMBJ5) that guards against overvoltages is located on the right. Thus, not much has changed in this case (except than adding 21 to a protection FET). Around the polarity FET, there is a PNP-matched-pair action occurring, but it's 3AM, and I'm not really sure why, so I'll wait to analyse it till I get some sleep. Now let's examine the 1.8V and 3.3V supply.

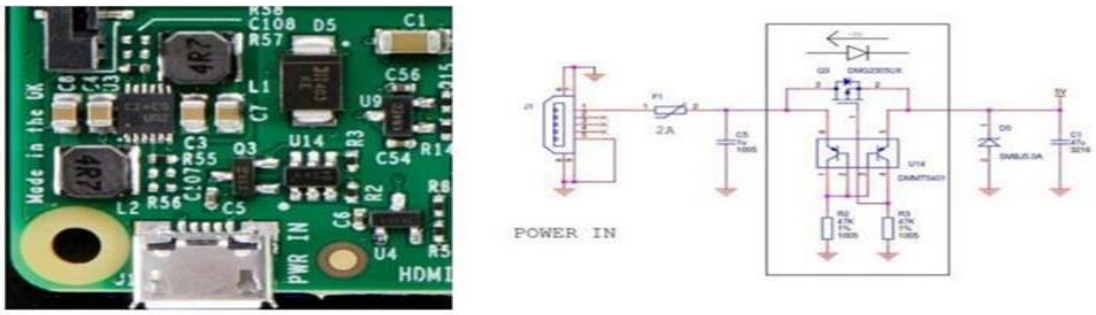

Figure 4 Power Input

3.1 Raspberry Pi Configuration

Configuring the Raspberry Pi: As previously mentioned, the Raspberry Pi is shipped without any accessories. Unpacking RasPi and covering it with an enclosure should be done first (Figure 3). Without the need for any tools, Raspberry Pi may be put into the protective case. The Raspberry Pi is held in place by plastic clips in the container. Once the Raspberry Pi has been mounted in an enclosure and is secure, it may be equipped with all the required accessories. Similar to any other computer, the Raspberry Pi requires a few standard equipment, including an HDMI cable for the display, a mouse, a keyboard, and an internet connection cable. Make sure the MicroSD card is flashed and ready with an operating system before connecting in the power cord. Additionally, it is advised to make a backup folder on the Micro SD card in case something goes wrong. 23 A card reader may be used to verify the MicroSD card. The majority of desktop and laptop computers include card readers. Make sure there is something stored on the MicroSD card by inserting it into the card reader. Once everything appears to be in order, insert the MicroSD card into the Raspberry Pi. It is now possible to attach the power cord. Since the Raspberry Pi lacks a power switch of any type, it will turn on as soon as the power cord is plugged in. A setup menu opens immediately after the start-up text on the monitor begins to flow. Raspi-config is the name of the configuration menu (Figures 4 & 5). You may modify a few of the Raspberry's settings with Raspi-config.

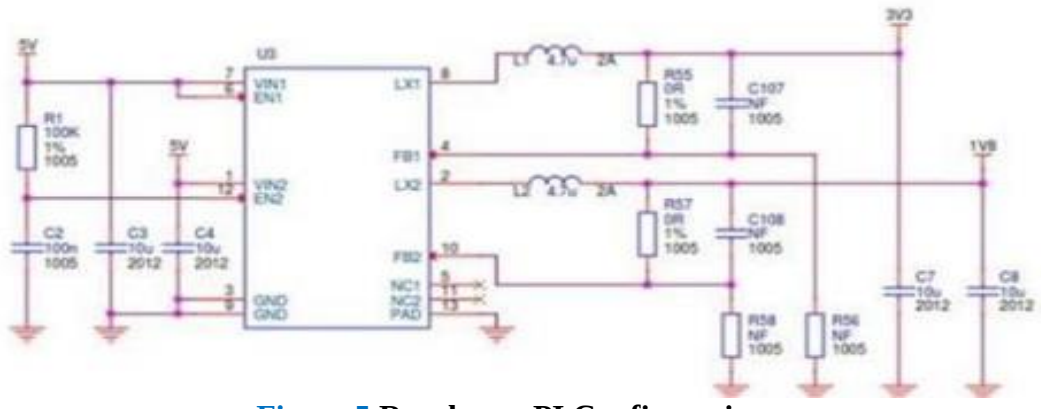

Figure 5 Raspberry PI Configuration

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3.2 Taking Advantage of Raspberry Pi's Camera Module

This chapter describes how to install the Pi NoIR camera module on the Raspberry Pi and use the built-in functionalities that are specifically designed for it. A Python script to take resized photos is built at the conclusion of this chapter. Images are stored to their own directory and given names that include the current timestamp.

3.2.1 Installing the Pi NoIR Camera Module

The NoIR camera module board for the Raspberry Pi is packaged in an anti-static plastic bag. It installs quickly and simply. There is a designated slot on the cover of the protective case where the camera module may be installed.

Figure 6 Raspberry Pi's Camera Module

(Figure 6) The ribbon cable is attached to the Raspberry Pi's camera connection port by means of two tiny screws. The HDMI socket and the 3.5mm audio jack are where you'll find the connecting port. The ribbon cable of the camera module must be plugged in once the clip on the connection port has been drawn up. To let the modifications, take effect, the Raspberry Pi must be restarted after attaching the camera module and enabling it using the Raspi-config setup tool.

3.2.2 Taking the First Pictures and Videos with the Pi NoIR Camera

The camera module has built-in functionality in the Raspberry Pi A. You may make films and capture images using these built-in features to test the camera module's functionality. "Raspistill" is one of these built-in commands or functions. -v -o first_image.jpg raspistill A preview window opens after entering the aforementioned command into the terminal. After five seconds of the preview window being open, Raspberry snaps the photo and stores it in the first_image.jpg file. The -o argument allows you to choose the filename for the output file, while the -v parameter provides verbose information during the execution. (Figures 7 and 8).

Results

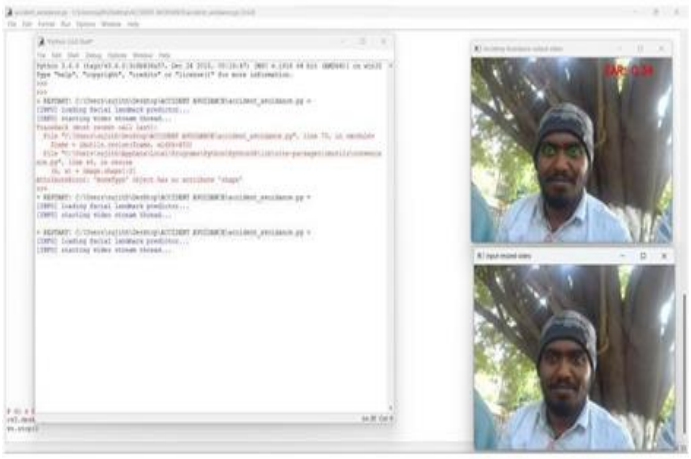

Figure 7 Output – 1 (For The Required Ear Value)

When the eye aspect ratios for the frame, N–6, and N + 6 frames are calculated and concatenated, a dimensional feature vector is created that can identify when a person is sleepy and provide an alarm.

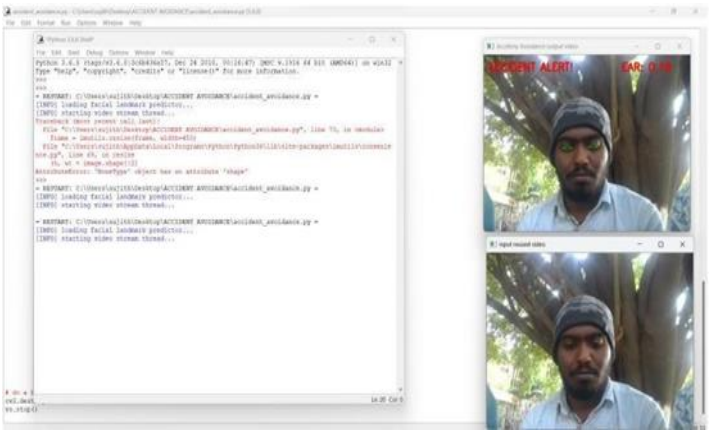

Figure 8 Output – 2 (For The Accident Alert)

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