DRIVER DROWSINESS DETECTION USING RASPBERRY PI

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ABSTRACT

The proposed system aims to lessen the number of accidents that occur due to drivers' drowsiness and fatigue, which will in turn increase transportation safety. This is becoming a common reason for accidents in recent times. In this, the driver is continuously monitored through webcam. This model uses image processing techniques which mainly focuses on face and eyes of the driver. Raspberry-pi processor is used for image processing. Image processing techniques such as Haar3-cascade frontal face and Face landmark shake predictor are used for acquiring details of given eye object and further processing. This proposed system is used for Driver Road safety system. In this system webcam capture driver face image. Then, face detection is employed to locate the regions of the driver' s eyes, which are used as the templates for eye tracking in subsequent frames. The tracked eye' s images are used for drowsiness detection in order to generate warning alarms. The proposed approach has three phases: Face, Eye detection and drowsiness detection. The role of image processing is to recognize the face of the driver and then extracts the image of the eyes of the driver for detection of drowsiness.

KEYWORDS: Fatigue Detection, Yawn Detection System, Driver failure due to drowsy state

INTRODUCTION

Drowsiness of the drivers is one of the key issues for majority of road accidents. Drowsiness threatens the road safety and causes severe injuries sometimes, resulting in fatality of the victim and economical losses. Drowsiness implies feeling lethargic, lack of concentration, tired eyes of the drivers while driving vehicles. Most of the accidents happen in India due to the lack of concentration of the driver. Performance of the driver gradually deteriorates owing to drowsiness. To avoid this anomaly, we developed a system that is able to detect the drowsiness nature of the driver and alert him immediately. This system captures images as a video stream through a camera,

detects the face and localizes the eyes. The eyes are then analyzed for drowsiness detection using Haar-cascade frontal face and Face
Landmark shake predictor algorithm. Based on the result, the driver is alerted for drowsiness through an alarm system.

LITERATURE REVIEW

In computer science, image processing is the use of computer algorithms to perform image processing on images. As a subcategory or field of digital signal processing, image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the buildup of noise and signal distortion during processing. Since images are defined over two dimensions digital image processing may be modelled in the form of multidimensional system.

PROBLEM STATEMENT

In most areas of clinical diagnosis, prevention is better than cure. Our study deals with automated brain tumor detection and classification. Normally the anatomy of the brain is analyzed by MRI scans or CT scans. The aim of the paper is tumor identification in brain MR images. The main reason for detection of brain tumors is to provide aid to clinical diagnosis. The aim is to provide an algorithm that guarantees the presence of a tumor by combining several procedures to provide a foolproof method of tumor detection in MR brain images. The methods utilized are filtering, erosion, dilation, threshold, and outlining of the tumor such as edge detection. The focus of this project is MR brain images tumor extraction and its representation in simpler form such that it is understandable by everyone. The objective of this work is to bring some useful information in simpler form in front of the users, especially for the medical staff treating the patient. The aim of this work is to define an algorithm that will result in extracted image of the tumor from the MR brain image. The resultant image will be able to provide information like size, dimension and position of the tumor, and its boundary provides us with information related to the tumor that can prove useful for various cases, which will provide a better base for the staff to decide the curing procedure. Finally, we detect whether the given MR brain image has tumor or not using Convolution Neural Network.

OBJECTIVES

The main objectives include designing a system that detects drowsiness of drivers by monitoring the eyes of the driver regularly, especially the retina. The system should give an alert to the driver when the driver yawns frequently or when the driver's eyes remain closed for a few seconds. The system works even when a driver is wearing spectacles. The system is not affected by bad lighting conditions.
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APPROACH

The proposed approach has three phases: Face, Eye detection and drowsiness detection. The role of image processing is to recognize the face of the driver and then extracts the image of the eyes of the driver for detection of drowsiness. The Haar-Cascade face detection algorithm takes captured frames of image as input and then the detected face as output. It can be concluded this approach is a low cost and effective solution to reduce the number of accidents due to driver's Drowsiness to increase the transportation safety. We are developed drowsiness detection systems that recognize signs of possible drowsiness, alerting the driver to their condition. ii Though there are several methods for measuring the drowsiness but this approach is completely non-intrusive which does not affect the driver in any way, hence giving the exact condition of the driver. For detection of drowsiness the per closure value of eye is considered. So, when the closure of eye exceeds a certain amount then the driver is identified to be sleepy. For implementing this system several Open Cv libraries are used including Haar-Cascade. The entire system is implemented using Raspberry-Pi.

PROPOSED SYSTEM/ METHODOLOGY

Our proposed system consists of open source web camera for capturing real time images of car driver. For further processing on that image, we need to send the image to Raspberry-pi system board. The Raspberry-pi system is loaded with Raspbian OS and Python packages for Open CV (Computer Vision). Haar-Cascade features are used to calculate required part of the eye (pupil and iris). Further, Hough transform is used for edge detection of pupil and iris. Pupil and Iris area is calculated and then it compares with threshold value. If it exceeds the threshold value then driver drowsiness condition is detected and alarm indicated by buzzer.

1. Face Detection

This module takes input from the camera and tries to detect a face in the video input. The detection of the face is achieved through the Haar-Cascade classifiers mainly, the Frontal face cascade classifier. The face is detected in a rectangle format and converted to grayscale image and stored in the memory which can be used for training the model.

2. Eye Detection

Since the model works on building a detection system for drowsiness we need to focus on the eyes to detect drowsiness. The eyes are detected through the video input by implementing a Haar-Cascade classifier namely Haar-cascade Eye Classifier. The eyes are detected in rectangular formats.

3. Drowsiness detection

In the previous module the frequency is calculated and if it remains 0 for a longer period then the driver is alerted for the drowsiness through an alert from the system.

4. UV Detection

Ultraviolet can be detected by suitable photodiodes and photocathodes, tailored to be sensitive to different parts of the UV spectrum. Sensitive UV photomultipliers are available. Spectrometers which can be and radiometers are made for measurement of UV radiation. Silicon detectors are used across the spectrum

5. Alcohol Detection

A sensor is used to detect whether the driver is drunken or not. There should be proper distance between the sensor and the driver for accuracy. The alarm generated can be in the form of audio in order to inspire the driver to reach his/her destination safely.

HARDWARE AND SOFTWARE REQUIREMENT

- **Hardware**

1. Processor – i3 and Above
2. Hard Disk – 60 GB
3. Memory – 1GB RAM
4. Raspberry Pi - HC-SR04
5. Alcohol Sensor
6. Pi camera
7. Buzzer
8. Ultrasonic Sensor

- **Software:**

1. Operating System:
   Windows 7 and above

2. Front End:
   HTML, CSS

3. Programming Language:
   Python (Python 3.9 and Onward)

4. Algorithm:
   Haar-cascade Frontal Face, Face landmark shake predictor

SYSTEM DESIGN

First of all the system captures images through the webcam and after capturing it detects the face through Haar-cascade algorithm. It uses Haar-Cascade features which can detect the face. If the system founds it as face the it will proceed for next phase i.e eye detection. The eye is also detected using Haar-cascade features and it is used for blink frequency.Camera is used to monitor the status of the driver. We are using the raspberry pi processor this is the heart of the drowsiness detection system. Alarm is beeped when system sends the signal.

MATHEMATICAL MODEL

System Description:

S= I, O, F, DD, NDD, Failure, Success

Where,

• S = System

• I = Input

• O = Output

• F = Failure

• S = Success

I is Input of system Input

I = set of Inputs

Where,

• I = Image's

F is Function of system

F = set of Function

Where,

• F1 = Capture Image

• F2 = Detect Face

• F3 = Apply Haar-cascade Feature

• F4 = Detect Haar-cascade Feature

• F5 = Detect Driver Drowsiness

• F6 = Monitor Driver Status

• F7 = Notification Alert

• F8 = Buzzer Buzz

O is Output of system

• Output O1 = Drowsiness Detection

- **Success Conditions:** Product working smoothly. drowsy state detected successfully.
- **Failure Conditions:** if internet connection Unavailable.

System Testing:

The following table represents four test cases that were conducted while doing this project for drowsiness and yawn detection of the driver.

Test ID	Test Condition	System Behavior	Test Result
TC1	Drowsiness Detected	Drowsy	Pass
TC2	Drowsiness Detected	Non-Drowsy	Fail
TC3	Yawn Detected	Fatigue	Pass
TC4	Yawn Detected	Fresh	Fail

Table: - Drowsiness testing

EXPERIMENTAL RESULTS:

Fig 1. Drowsiness Detected

Fig 2. Yawn Detected

Advantages &disadvantages:

- **Advantages:**

a) Fast response
b) Wide detection range
c) Efficient and low cost design.
d) Low power consumption.
e) Easily operable

- **Disadvantages:**

a) This system supports only inside the vehicle.
b) Wi-Fi / Internet connection should be always Available

- **Application:**

a) Security
b) This system can be implemented in vehicles in real time to avoid accident

- **Limitations:**

The accuracy of the model degrades if the eye frames are not captured clearly due to any kind of obstacles such as goggles or spectacles having reflection). Camera operations such as auto adjustments with respect to zoom and rotation are not considered in conducting experiments. Once the eyes are localized, zooming in automatically will help increase the accuracy. The accuracy of detection of eyes and mouth reduces when the driver is not facing the camera.

CONCLUSION

In this Paper, interface Raspberry-Pi camera with the processor. Raspberry-Pi camera is properly initializing, images are captured. Image is further used for HaarCascade feature extractions. Haar-cascade Face region, Eye region and Open eye region is calculated.Drowsy driving can be as deadly as drunk driving. Drivers drowsiness not only putting themselves in danger, but they are a risk to everyone else on the road. Drivers who are tired and sleepy have delayed reactions and make bad decisions.In this project, we presented the conception and implementation of a system for detecting driver drowsiness based on vision that aims to warn the driver if he is in drowsy state.

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