PES UNIVERSITY

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Report on

DESIGN AND IMPLEMENTATION OF DRIVER DROWSINESS DETECTION AND SAFETY ALERTS SYSTEM

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under the guidance of

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING,

PROGRAM B.TECH

Declaration

We, *Jay Shah, Matta Saloni, K Srinivasulu and Rahul Vinay*, hereby declare that the report entitled "Design and Implementation of Driver Drowsiness Detection and Safety Alerts System" is an original work done under the guidance of Prof. Nishita Danthi , Asst/Assoc Professor in the Dept of ECE and is being submitted as a partial requirement for completion of Phase-1 of Project Work of the B.Tech ECE Program of study during Jan-May 2021.

Place :

Date :

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Introduction

In recent years, the casualties of traffic accidents caused by driving cars have been gradually increasing. In particular, there are more serious injuries and deaths than minor injuries, and the damage due to major accidents is increasing.

Research shows, in India, 40% of highway crashes or near crashes occur due to drowsy driving whereas more than 50% of all deadly highway crashes which involve more than two cars are alcohol related. According to World Health Organization, road traffic injuries resulted in approximately 1.25 million deaths worldwide in the previous years, that is, approximately every 25 seconds an individual will experience a fatal crash.

A sleepy driver is arguably much more dangerous on the road than the one who is speeding as he is a victim of microsleeps. Driver drowsiness and drunk driving reduces the driver decision making capability and perception level. These two situations affect the ability to control the vehicle.

If drivers could be warned before they became too drowsy to drive safely, some drowsiness-related crashes could be prevented.
The presentation of timely warnings, however, depends on reliable detection. To date, the effectiveness of drowsiness detection methods has been limited. Some kind of systems like driver fatigue monitor, real time vision based on driver state monitoring system, seeing driver assisting system, user centre drowsiness driver detection have become a need of the hour.

Our work proposes the Design and Implementation of Driver Drowsiness and Safety Alerts Systems , reducing the risk of road accidents and improving transport safety.

Literature Survey

Design Hybrid Approach

Singh Binita Sumant, Ravi Krishna Pandey, Dept. of Computer Science Engineering, Gujarat Technological University, International Research Journal of Engineering and Technology, April 2017

The proposed system identifies drowsiness and fatigue in the driver's face using image processing and monitors the same using camera with Matlab algorithm on a real time environment.

Real-time pictures of the driver are captured using camera which will be then converted to frames of video.

Eyes are detected using Viola Jones algorithm and feature points extracted using PCA.

If the eyes are closed , alarm will be generated in the car using buzzer and SMS alerts will be sent to the owner of the car with the help of GSM. If the eyes are open, the image processing continues.

Data has been collected from 10 different drivers and an accuracy of 93% with 8% false alarm is observed.

Future scope of this work includes adding more features of detecting drowsiness other than image processing and using Raspberry Pi as hardware interface.

Real Time Driver's Hypovigilance Detection Using Facial Landmarks

Aliae Squalli Houssaini, Hassan Qjidaa, Sabri Abdellah Aarab, Dept. of Computer Science, Sidi Mohamed Ben Abdellah University Fez-Morocco, 2019, IEEE

A real time non intrusive driver hypovigilance detection system is proposed which makes it possible the identification of microsleep through the analysis of eye closure and fatigue through the analysis of mouth movements to detect yawning.

The first step of the technique presented is facial landmarks detection for each frame. Dlib library is used.

Pre-trained detector was trained on iBUG 300-W dataset to find 68 points that includes points from eyes, nose, eyebrows, mouth and jawline from any face.

Secondly, drowsiness is detected using eye landmarks and fatigue using mouth coordinates. Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) is calculated.

SVM is then trained using EAR and MAR features to classify the states of the driver. 3 classes can be detected - awake, yawning and closed-eyes.

To avoid eye blinking to be detected as microsleep, eye closure duration is computed.

If yawning or microsleep is predicted, then an alarm will be activated to alert the driver and notification will show in the screen.

The future work of this proposed system aim to use blinking frequency and blinking duration as new features for better prediction of driver's hypovigilance

Driver Drowsiness Detection System Based on Visual Features

Fouzia, Roopa Lakshmi R, Jayant kumar, Ashwitha S Shetty, Supriya K, IEEE 2018, 2nd International Conference on Inventive Communication and Computational Technologies

This paper introduces a drowsiness detection based on shape predictor algorithm.

The proposed system is to detect closed eyes to observe drivers' fatigue and alert the driver with a buzzer and vibration on positive detection.

If a drowsy driver is detected, a buzzer sound and the vibration is raised, until the driver is alert.

The eye detector is loaded with the Harr detectors which can detect eyes describing the contrast , taking measurement of the distance between the eye area.

High blinking rate indicated drowsiness level of the driver. The blink rate for normal people is 2-10 seconds. Based on these factors, when the eye is closed for too long, drowsiness is detected.

The Eye Aspect Ratio (EAR) between the height and width of the eye is computed.

The EAR is mostly constant when the eyes are open and it gets closer to zero while closing the eyes.

Visual Analysis of Eye State for Driver Alertness Monitoring

Mrs. Priyanka Hadsange, Prof. R.U Shekokar, Department of Electronics and Telecom Engineering, International Research Journal of Engineering and Technology, July 2018

The implemented system consists of the following components , in addition to these are three external hardware components typically a camera for video acquisition , raspberry pi and audio alarm.

Capturing: A camera mounted on an automotive dashboard captures images of driver's face

Processing and detecting : captured facial image is used to determine whether a driver's face is open or closed.

Current eye state can be determined using Haar classifiers.

Salient features of this model are :

- Focus on the driver , direct way to detect drowsiness.
- Real time system that detects face and iris.
- Completely non-intrusive system.
- Cost effective.

Methodology Finalized

The system comprises of 3 phases:

1)Capturing:

- The image of the driver is captured using a camera.
- This camera creates a video loop, concentrating on a single frame containing the driver's eye blink.
- The captured video is then divided into frames for analysing.

2)Detection:

This phase first involves the detection of the face of the driver.

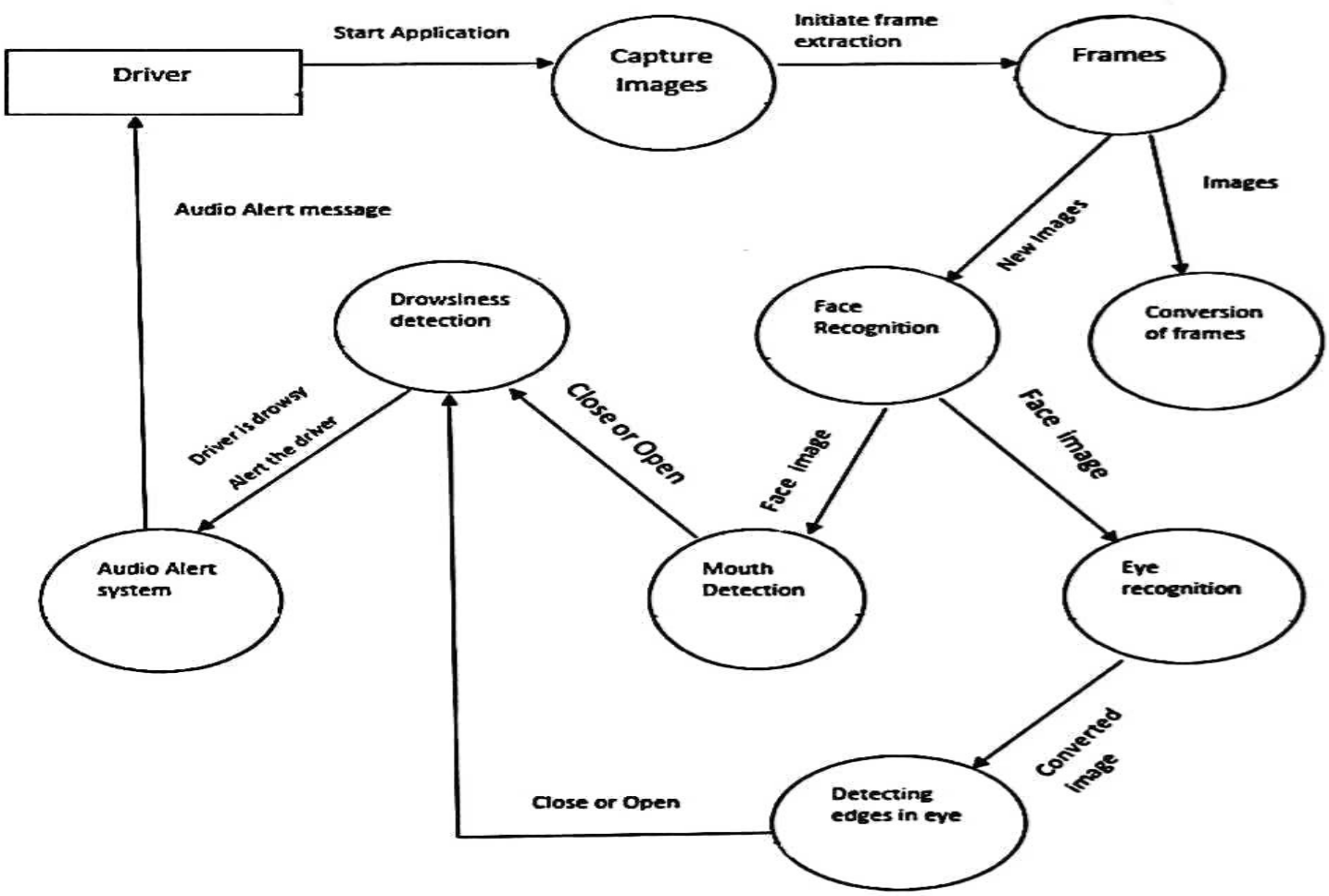
Face detection is done using a haar cascade classifier which results in locating the face in a frame.

- Only facial related structures or features are detected and all other types of objects like buildings, trees, bodies are ignored.
- In our method eyes and mouth are the decision parameters for finding the state of the driver.
- We have used the Haar Feature Cascade technique for identifying faces.
- We have also used a facial landmark algorithm which is used to specify a particular area of interest based on landmarks (points).
- Eye Aspect Ratio(EAR) is the ratio of the number of eye blinks to the width of the eye.

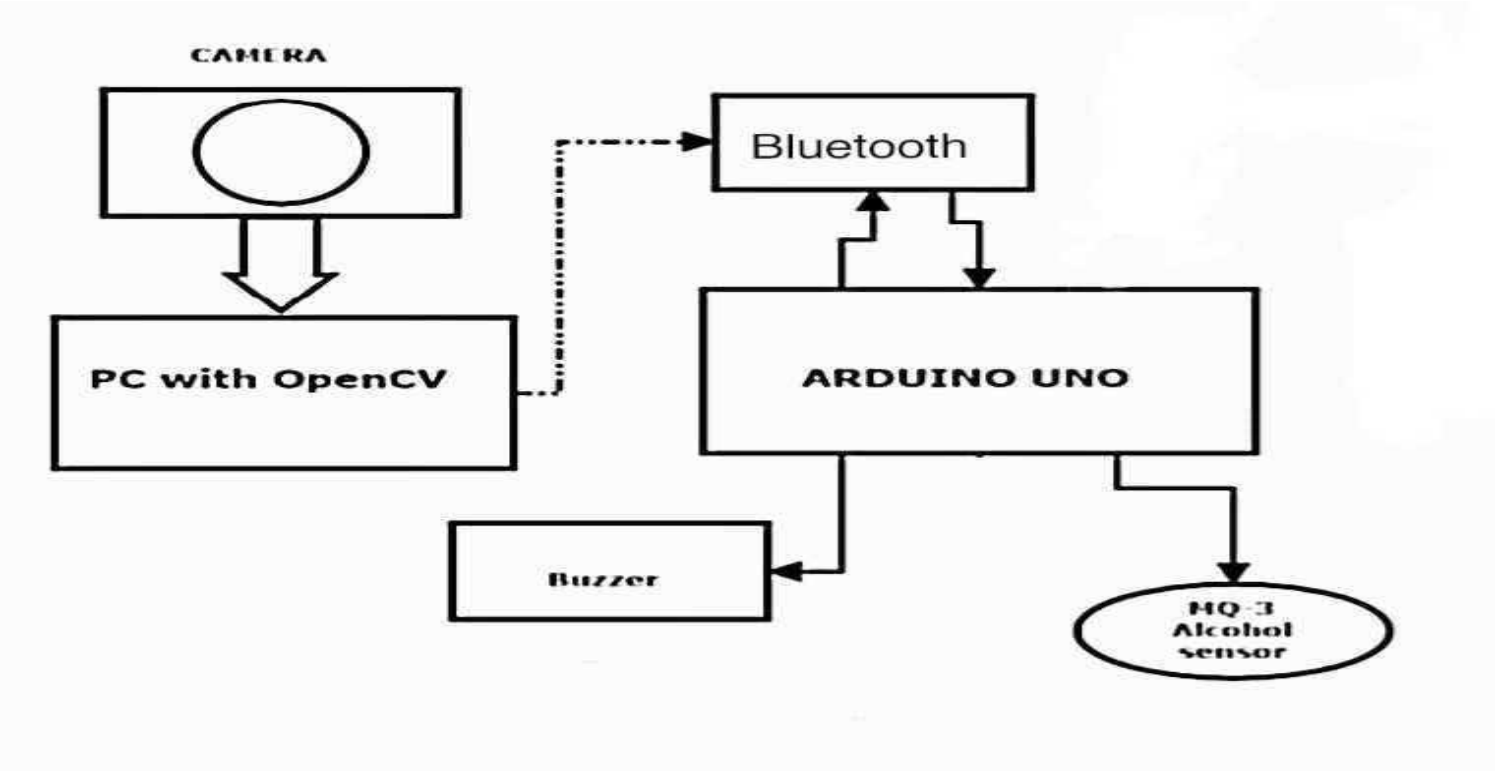
3.Correction:

- The actual state of the eye is found, if it is closed or open or semi closed or semi open.
- A warning message is channelized if obtained eyes are in close or semi close state to a particular threshold value.
- If the system detects that the eyes are open then it is repeated again and again until closed eyes are found.

Block Diagram



Hardware Design



List of Hardware/Software needed

Hardware Requirements

- Camera (laptop)
- Arduino

MQ 3 Sensor

Buzzer

Power supply

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Software Requirements

- Operating System : Windows 7+ and above
- Software : OpenCV library
- Language : Python 3.6.0
- Packages : twilio and python dlib.

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- ‘Design Hybrid Approach’ by Singh Binita Sumant, Ravi Krishna Pandey, Dept. of Computer Science Engineering, Gujarat Technological University, International Research Journal of Engineering and Technology, April 2017.
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- “Visual Analysis of Eye State for Driver Alertness Monitoring” by Mrs. Priyanka Hadsange, Prof. R.U Shekokar, Dept. of Electronics and Telecom Engineering, International Research Journal of Engineering and Technology, July 2018.