

DROWSINESS ALERT SYSTEM

Vedant Paithankar¹, Sourabh More², Niraj Pandav³

¹AISSMS IOIT, Pune University, Pune -01, vedantpaithankar@gmail.com

²AISSMS IOIT, Pune University, Pune -01, sourabhmore22@gmail.com

³AISSMS IOIT, Pune University, Pune -01, nrj.pandav@gmail.com

Abstract— *Drowsiness while driving is the most vital reason behind the horrific accidents happening over tedious routes such as highways. The motive of this paper is to design portable drowsiness alert system which can be mounted on the vehicle's cockpit (cars, trucks, etc). Based upon the images captured by the camera mounted along with the project setup, we aim to detect the drowsiness level of the driver. For the analysis, the magnitudes of head movement and the blink rate of the eyes are obtained. Based on the analysis the respective sensors are triggered using the microcontroller to alert the driver. The entire system is implemented using PIC Microcontroller.*

Keywords — *Drowsiness, Accidents, Camera, Sensors, PIC microcontroller*

INTRODUCTION

According to the reports, there are about 1.2 billion vehicles running on World's roads [1]. Therefore there are high chances of getting road accidents worldwide. There are about 1.25 Million People, who die each year due to road traffic crashes where drowsiness is a major factor in road accidents. Drowsiness is a state of sleepiness which cannot be avoided but can be detected and controlled. Thousands of drivers are driving their vehicles for long hours because of which there is a high possibility that they feel drowsy. The aim of this paper is to develop a system that will detect the driver drowsiness. In this paper the fatigue monitoring is based on behavioural measures where head movement, yawning, eye blinking rate are taken into consideration. The detection of eyes can be done by using various techniques like Image processing, EEG based technique, Artificial Neural Network Based Technique, vehicle-based measures [2]. This paper is focused on monitoring the real time vision of driver state through Image Processing Algorithm by using cameras and alerting a driver.

LITERATURE REVIEW

Ralph Oyini et al. give the detailed analysis of the head position and eye state of a driver is monitored. In this SVM classifies the series of video frames into awake and drowsy modes. From experimental results it shows that their system has high classification recovery with low errors and that results in the prevention of false alarms.

Aniban Dasgupta et al. proposed real time embedded stage which is used to detect the drowsiness during day and night. They used Haar like features for face detection. At a day time principle component analysis is used for eyes detection while local binary pattern features used for night time.

Antoine et al. focused on brain and visual activity of driver for drowsiness detection. EEG is used to check the brain activity and eye blinking is used for visual activity which is obtained by an EOG. From the result it proves the EEG and EOG detectors are good because signals from EEG are checked with signals of EOG, because of this fake alarms rate decreases upto 5%.

OBJECTIVES

- The main objective of this system is to authenticate the eye blinks of a driver using IP algorithm.
- Secondly, to detect the drowsiness and alert a driver by using buzzer and vibration sensor.
- To continuously monitor the Heart rate of a driver. If the heartbeat becomes slow i.e. below 40 beats per min, it indicates fatigue and displays a drowsiness alert message on LCD.
- To stop the driver from turning on the car by detecting drivers impaired by alcohol.

WORKING PRINCIPLE

In this system, the eye blinking rate, eye closure duration, head position and yawning rate these four facial parameters are measured to detect the drowsiness of the driver. The facial images of the driver are taken continuously with the help of camera mounted on the car's dashboard. This image is first captured from video bit streams of driver's face and sent for further processing. This system uses OpenCV which makes it possible to detect and recognize faces and follow eye movements. Open CV's algorithm uses Haar cascade features through which it is possible to detect facial features and ignore everything else. So as we get the detected faces, we create a Region of Interest (ROI) of face. Now after creation of rectangular ROI, when the face goes out of created rectangular frame i.e. tilted towards extreme right or left, it indicates the drowsiness condition. Also the eyes are located and using eyelid, the system detects the eye blinks of a driver through which the drowsiness condition is detected. The alcohol detector MQ-03 placed on the steering wheel sees whether the driver is drunk or not. This will again add the extra security for preventing the road accidents. The data collected from the Alcohol sensor is given to the microcontroller which compares the sensed value with the threshold value. The heartbeat sensor fixed at the back of the seat of driver calculates the heart beat rate of the driver. All these detected values are given to the PIC18 microcontroller. The microcontroller is programmed in such a way that:

- If Blinking of eyes is detected above the threshold value then the vibrating alert will be triggered.
- If frequently yawning is detected and exceeds above the threshold value of IR, then vibrating alert will be triggered.
- If alcohol is detected by the detector then buzzer makes buzzing sound.
- If nodding is captured and head movements are out of frame then the buzzer goes on.
- The heartbeat of a person is continuously monitored which is sent to the LCD.

While working on this system, the threshold values were stored based upon the practical analysis of a person (driver).

BLOCK DIAGRAM

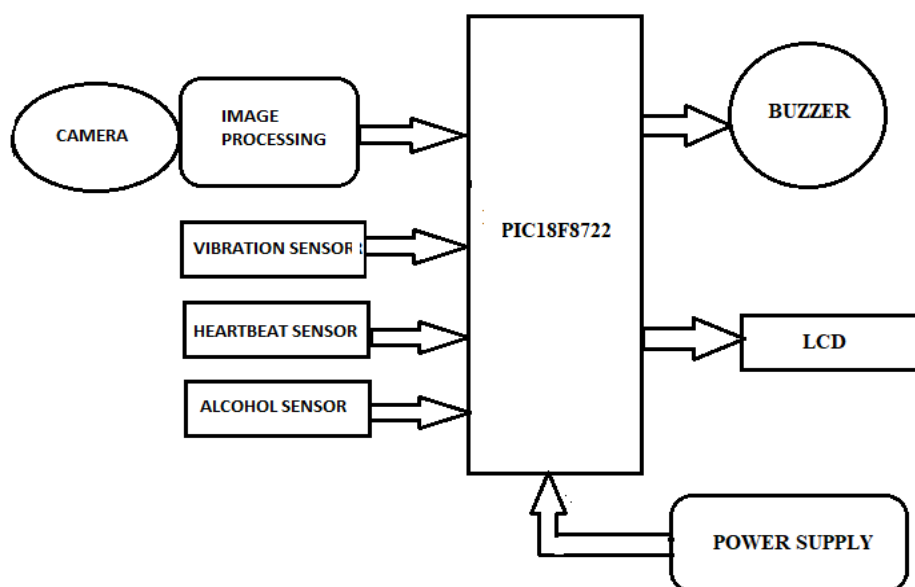


Fig 1.0 Drowsiness Alert System

HARDWARE SELECTION:

Some of the hardware components used in our system is as follows:

- 1) PIC Microcontroller
- 2) Alcohol Sensor
- 3) Heartbeat Sensor
- 4) LCD
- 5) Buzzer

PIC Microcontroller

PIC stands for Peripheral Interface Controller which works on nanoWatt technology. This technology provides wide operating range and consumes less power. Its new circuit design techniques include brown-out and low Voltage detector which allows operation in harsh environments. PIC18 has two USART modules which makes it possible to transmit and receive more data simultaneously. Additionally, PIC18 has 128 Kb Flash Memory for storing the application code.



PIC18f8722

Alcohol Sensor:

A sensor is a device which detects physical quantities and converts it into human readable form on display or processes it further. MQ-3 is an alcohol sensor which is used to detect alcohol gases in air. Its temperature ranges from -10 to 50°C and the output of sensor is in analog form. MQ-3 has high sensitivity to alcohol and responds quickly as soon as it detects.



Alcohol Sensor MQ3

Heartbeat Sensor:

Heartbeat Sensor is used to detect the heartbeat of a person. As you press your finger on the sensor, it starts to detect the Beats per minute rate. After removing your finger you will observe that there is no heartbeat anymore and it resets after few seconds. This sensor will be placed at the steering wheel of car which will continuously monitor the heartbeat rate.



Heartbeat Sensor MAX30100

LCD

LCD is used to display array of characters on the screen. The 16*2 LCD can display 32 characters in two rows (16 characters in a row). It will display the values measured by the sensors and will continuously monitor the driver's health. LCD has row of 8 pins from D0 to D7 at its port. These pins are used to pass the data into LCD.



Buzzer

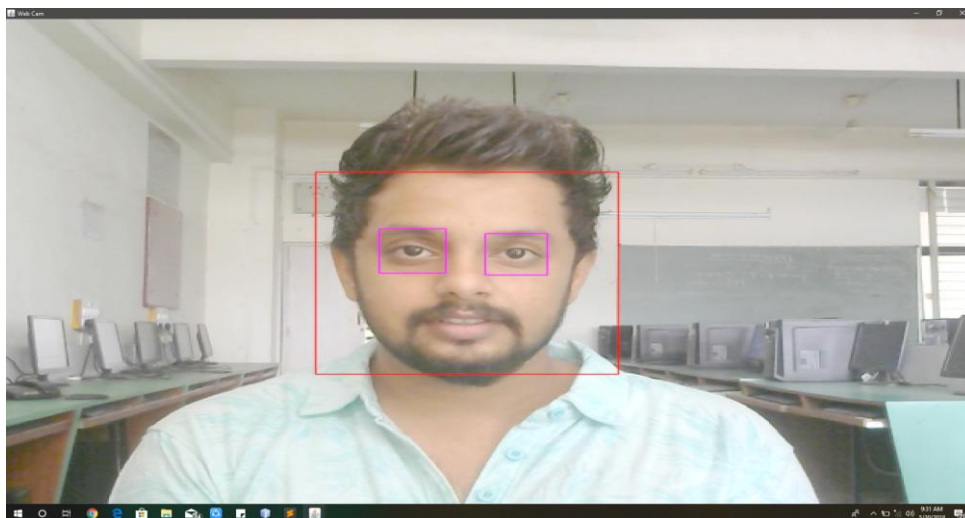
Buzzer is an output device which makes buzzing sound to attract someone's attention. These devices are mostly used to produce some kind of sound to alert or to give notification. This device will make sound after detecting drowsiness of a driver.



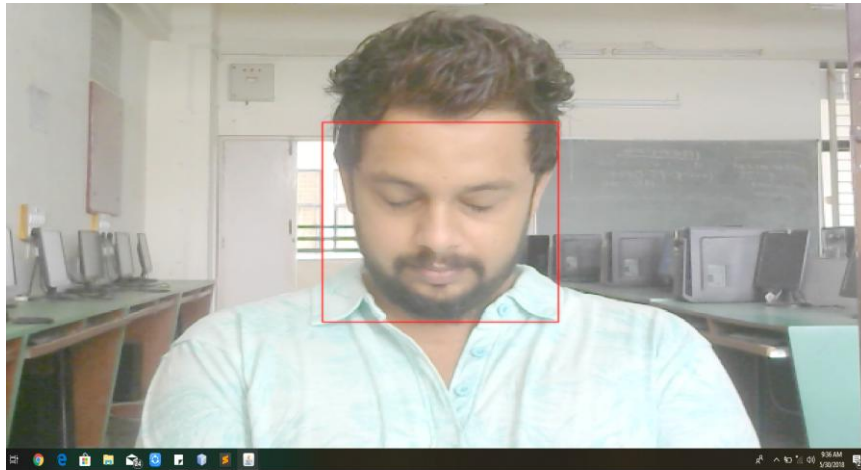
Buzzer

EXPECTED RESULTS

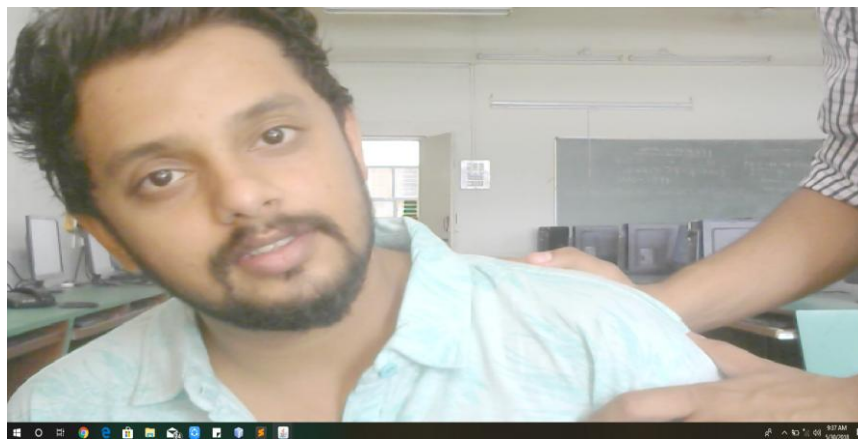
Drowsiness Alert system was designed by using PIC18 Microcontroller as hardware and was coded in Java. This system was tested under different conditions like straight and tilted head, open and close eyes as shown below



Eye in open state and head position straight



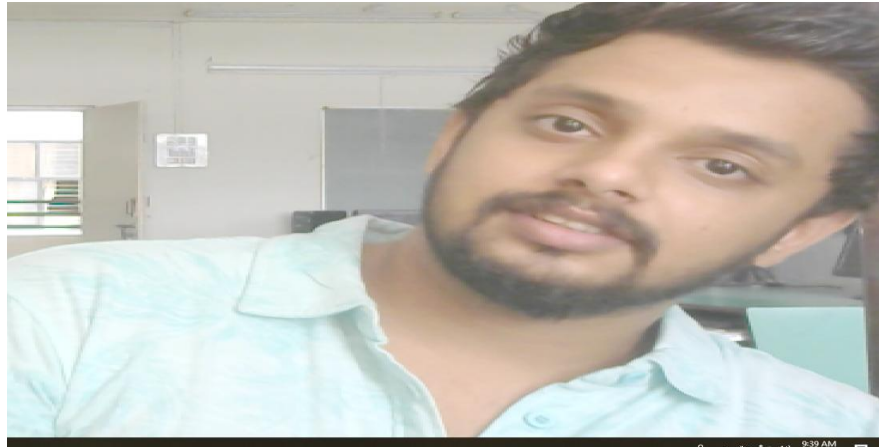
Eye in closed state with head position straight



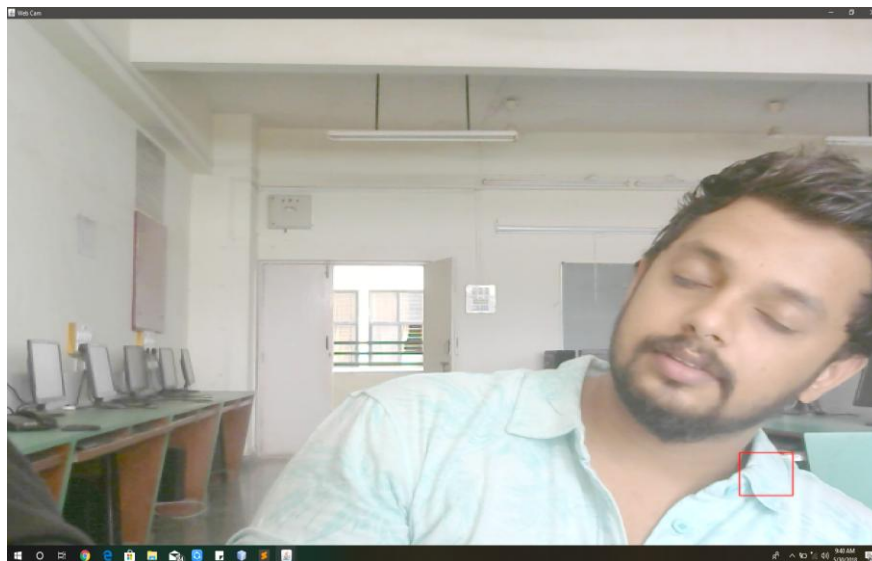
Eye in open state with head position tilted (left).



Eye in closed state with head position tilted (left).



Eye in open state with head position tilted (Right).



Eye in closed state with head position Tilted (Right)

CONCLUSION

Previous studies have proposed that the drowsiness detection can be done using several techniques. In this paper, we conclude that the maximum output is achieved by using Image Processing due to its high accuracy and reliability. Also the output signal of fatal detection was very fast for behavioural measures of the driver. In addition, heartbeat sensor used can be an example of physiological measures which is a good indicator of stress and drowsiness. Moreover, system has alcohol sensor which detects the alcohol gases in air if driver is impaired by alcohol and stops the vehicle. Hence combining these techniques would give a driver more safety and prevent road accidents.

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