

# Driver fatigue detection system using Android application

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## ABSTRACT

Road traffic is increasing rapidly because of availability of various public and private means of transportation. Flow of traffic rarely stops at any hour of the day because of extensive work schedules and travelling needs. This ultimately leads to long driving hours by not only people who are driving continuously to face the adverse effect of fatigue i.e. drowsiness and sleep deprivation. Driver Fatigue Detection using Android Application system uses android based smartphone which helps to detect driver under fatigue and system alerts driver under sleepy conditions. It is real time driver fatigue detection system which uses OpenCV (Open Source Computer Vision) for tracking driver's facial expression for preventing accident. Proposed algorithm tracks eyes, mouth to detect dozing and yawning respectively. It also detects stress from driver's facial expressions like forehead lines and give warning to passengers. It also provide stress recognition through driver's speech like driver asking for help and takes respective action. Warning system uses different levels of warning includes messages, voice messages, beep, vibrations to alert driver. This system HaarCascade filter libraries for facial tracking and other face region tracking.

**Keywords—** OpenCV, HaarCascade, Fatigue, Eye Detection, Jaw detection, Forehead Stress detection.

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## I. INTRODUCTION

The advance of computing technology has provided the means for building intelligent vehicle systems. Drowsy driver detection system is one of the potential applications of intelligent vehicle systems. Excessive sleepiness results in an increased risk of motor vehicle crashes primarily because the driver either falls asleep while driving or experiences reduced attention to road events and the driving task due to fatigue. Statistics show that 20% of all the traffic accidents are due to drivers with a diminished vigilance level [2]. Furthermore, accidents related to driver hypovigilance are more serious than other types of accidents, since sleepy drivers often do not take correct action prior to a collision. For this reason, developing systems for monitoring driver's level of vigilance and alerting the

driver, when he is drowsy and not paying adequate attention to the road, is essential to prevent accidents. The prevention of such accidents is a major focus of effort in the field of active safety research.

People in fatigue show some visual behaviors easily observable from changes in their facial features like eyes, head, mouth and face. Computer vision can be a natural and non-intrusive technique to monitor driver's vigilance. Faces are the important part to be considered while giving any judgment regarding drowsiness which has been a research target in computer vision for a long time. Automatic recognition of facial expression consists of three levels of tasks: face detection, facial expression information extraction, and expression classification. It involves detection, identification and tracking facial feature points

under different illuminations, face orientations and facial expressions.

The critical issue that a fatigue detection system must address is the question of how to accurately and early detect fatigue at the initial stage. Possible non-intrusive techniques for detecting fatigue in drivers using computer vision are, based on eye and eyelid movements, based on head movement, methods based on mouth opening. In proposed method, the driver's face is taken as an input from camera. We can then detect the location of the eyes, mouth and forehead lines in the detected face. The mouth geometrical features are then used to detect the yawn. Then system will generate the alert sound to the driver about his drowsiness and the improper driving state in case of yawning, closing of eyes and forehead lines are detected

## II. METHODS

1. Blob Algorithm
2. HSV Algorithm

### **Blob algorithm:**

First this algorithm determines X,Y,Z co-ordinates. By using co-ordinate values, it will obtain the center of face. According to the center it obtain the position of eyes, Mouth and Forehead. Then it sets the keypoints for each feature. Runtime captured images are compared with normal image of driver which is already stored in database of system. fatigue situation of driver stress lines are occurred on forehead, the size of eyes becomes small and while yawning the position of mouth changes. For detecting these behaviors, blob algorithms has extra features(Size, Shape).

### **HSV Algorithm:**

HSV is Hue Saturation Value. Basically it is used for color conversion. When driver is in fatigue situation, so because of forehead lines the color of forehead becomes darker than compare to original forehead color. By using this algorithm fatigue can be detected.

## III. RESULTS & DISCUSSION

Driver's Fatigue is one of the important accident causing factor. Fatigue detection system is still under the development. Most of people worked on the fatigue detection of driver by using various technologies. E.g. By Eye detection using infrared rays, by calculating Steering pressure, With the help of sensors, Heart-beat variations, Eye detection using camera, by using machine vision. These all are used for detecting the driver's fatigue and preventing the accidents.

### **A. Infrared illuminators with Camera detects Fatigue.**

Infrared illuminators will focus on driver's face without using any external light device. As infrared rays are there, It can work in any environment(Day or Night). Two cameras are used in this system. Camera1(wide angle camera) is placed on upper side of dashboard. It detects the facial expressions, Head movements. Camera2(Narrow angle camera) is placed on lower side of dashboard. It detects Eyelid movements, Gaze movements.

This system gives the bright pupil effect. It minimizes interference with driver's driving. SVM(Support Vector

Machine) identifies eye regions as marked and removes spurious ones accurately. This SVM is for Eye Detection. For Eye tracking, there are two algorithms.

1. Mean shift Eye tracker.

2. Kalman algorithm

Mean shift eye tracker tracks eyes based on appearance of eyes. And kalman algorithm tracks moving eyes of driver.

### **B. FACELAB, MINDS and PERCLOS detects Driver's Fatigue.**

1. FACELAB – FACELAB detects the visual behavior of driver. It also detects inattention of driver. FACELAB detects the eye closure, gaze movements, iris center of driver. FACELAB uses video camera which generates the 3D image of each feature.

2. MINDS – MINDS is micro-nod detection system. It determines the X,Y,Z technique for head movements of driver. Using calculated co-ordinates it obtains the head movements of driver. It also detects the micro sleep events.

3. PERCLOS – PERCLOS is Percent Eye Closure. This is based on video. It measures the eye closure. This methodology can make difference between eye closure and eye blinks.

### **C. HRV, Temperature detects driver fatigue.**

HRV is Heart Rate Variability. Heart rate is measured by ECG(Electrocardiography). As driver suffers from fatigue, there is variations in driver's heart rate. So diver fatigue is detected.

As driver suffers from fatigue, the pressure of hands on steering becomes less. So by calculating that pressure fatigue can be calculated.

The temperature of inside the vehicle and outside the vehicle is calculated by sensor. The calculated difference is helpful to find out the drowsiness of driver.

### **D. Driver fatigue detection using machine vision**

Eye and Eyebrows are mainly used for finding fatigueless of driver. MATLAB platform is used for the implementation of this project.

Machine vision – The images which are captured by camera has good quality. The captured image is converted into binary form. Then only upper part of head is kept and other part is discarded. It saves the memory. After that only red position from original image is taken to get best result. Noise is removed from image(using maximum three filters). Then black pixel bunches used to find eyes open or closed. This is done repeatedly and result is given based on each image processing and alert given to user.

According to analysis this system work best on 5 people out of 6. This is fast processing and simple equipment

## IV. PROPOSED WORK

### **Diver fatigue detection system using Android Application.**

Fatigue of driver are amongst the most significant cause of road accidents. The project is to find out the methods to detect driver drowsiness and alerting them hence increasing the transportation safety.

This project is an Android Application based. The camera of Android phone detects the eye movements, jaw movements and forehead lines. The normal image of driver(without

stress) is stored in database of system. Runtime images are compared with Normal image stored in database.

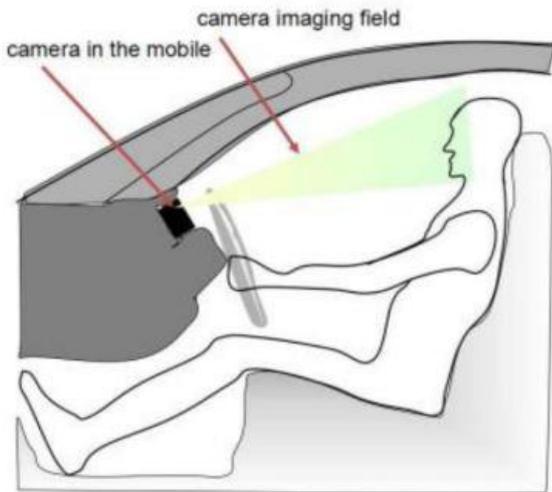


Figure 1 : Position of android phone

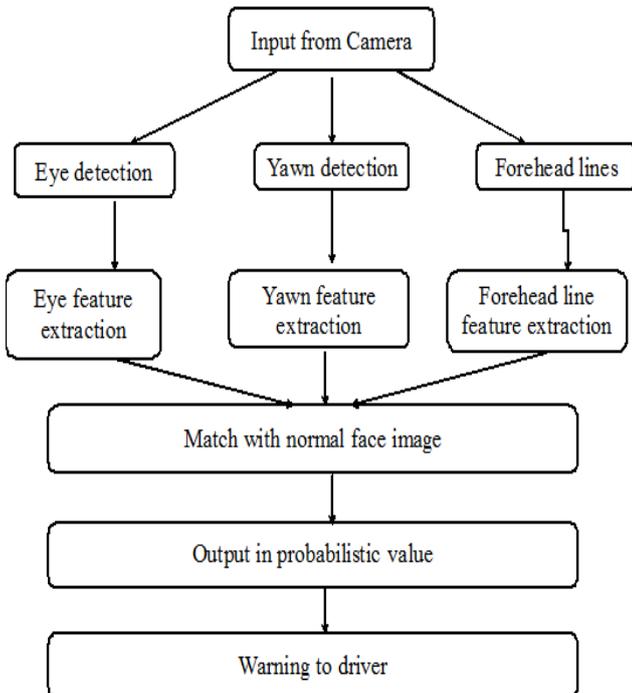


Figure 2: Working flow.

Android application developed for driver fatigue detection have many advantages, all the system is in Android phone, so number of devices are decreased. It is cost effective, reliable and easy to access.

### V. CONCLUSION

The Android application proposed has all the features. It is detecting the eye movements, Jaw movements and also forehead lines parallel

. So the accuracy of result is high. Proposed application will help to avoid the accidents. This application is easy to access as everyone has Android phones.

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