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Proactive Integrated Detection of Eye Blinking & Yawning to identify Sleepy Driver and Alert based Auto-Braking System for Speed Control

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ABSTRACT

Automotive vehicles are increasingly being equipped with accident avoidance and warning systems for avoiding the external collision with an object, such as a vehicle or a human. Upon detecting a main factor, the system will start an action to avoid the collision and/or provide a warning to the vehicle operator. In this paper a complete accident avoidance system is proposed by determining the driver's behavior. The main cause of vehicle accident is related to a main human factor, which is drowsiness. The aim of the proposed system is to help in analyzing the factors associated with driver's behavior for the development of accident avoidance systems. The main causes of the vehicle accidents, coined in the tracking of the driver fatigue with the help of our system, will help the driver to avoid risky situations. In this project we are implementing two image processing tool to get the facial geometry based eye region detection for eye blinking calculation, combined tracking of mouth for yawning detection. Inside an ego vehicle, frequencies of eye blinking and eye closure and yawning frequencies are used as the indication of sleepy driver and warning sign is then generated for recommendation; Outside an ego vehicle, Ultrasonic sensor is used to measure distance in front of cars and auto-braking system is applied during unsuccessful drowsiness alert and also during brake failure situations.

Keywords: computer vision, eye and mouth region detection, yawning and eye blinking detection, auto-brake.

I. INTRODUCTION

Driver fatigue is one of the major causes of accidents in the world. Twenty percent of the vehicle accidents are due to the drowsiness of the driver. Detecting the drowsiness of the driver is one of the surest ways of measuring driver fatigue. This project uses a non-intrusive technique for judging driver's alertness in driving. Driver's alertness is detected based on the state of the eyes and mouth of the driver. This paper describes how to track the eyes and mouth and determine the condition of it. There are various traditional techniques developed to alert the drivers namely, Placing sensors in various standard vehicle components, measuring the psychological factors of the drivers, Detect and recognize the facial motion and appearance changes occurring during drowsiness using computer vision systems.

II. METHODS AND MATERIAL

A. Related Work

There are some previous studies about drowsiness detection and fatigue monitoring. Various algorithms proposed till date which includes biological indicators, vehicle behavior and face analysis. Some of them are intrusive and some are non-intrusive. The intrusive methods include ECG, EOG and Head Motion. In some of this type of methods drivers had to wearing a head gear while driving. Whereas in other methods the system uses pulse detectors that were placed in the steering wheel and in back of the seat. This type of methods also was not dependable most of the time and this is the reason why those techniques were not much used by the common people. Methods to detect sleepiness on the basis of behavior of the vehicle such as steering positions, speed of the vehicle and lateral position were also developed but they were too slow in alerting the driver before he falls asleep. These methods alerts driver only after they fell asleep not before they were in the

episode of the drowsy state. The face analyses done nowadays are mostly non-intrusive and uses camera to detect the facial expressions. Some methods used the change in intensities in binary images to detect the drowsiness state while others used the facial expressions such as yawning to detect it.

B. Proposed Work

The proposed system consists of a microcontroller, ultrasonic sensor, PC, LCD and a buzzer. In MATLAB image processing tool algorithm is developed to detect the driver's drowsiness and to alert the driver and also to intimate to hardware to stop the car. Frequencies of eye blinking, eye closure and yawning frequencies are used as the indication of sleepy driver and warning sign is then generated for recommendation and if the driver is not getting alerted, auto-braking system will be implemented to slow down the vehicle. Outside an ego vehicle, road traffic is also analyzed. Ultrasonic sensor is employed to detect the distance between the front and the rear vehicles. If the distance seems to be very less, then an alert will be given to the driver to slow down the vehicle. If the speed is not reduced by the driver then an automatic braking will be activated to stop the vehicle. The auto-braking system is also applied during brake-failure situations.

The proposed system consists of 6 levels namely,

- Configuring webcam with computer vision toolbox
- Face tracking
- Feature extraction
- Vision output
- Working of Sensor
- Auto-Braking system

The modules descriptions are as follows:

a) Configuring webcam with computer vision toolbox

In this module, the webcam is configured with computer vision toolbox, which helps in the tracking of face region followed by detection of eye and mouth regions.

b) Face tracking

The face of human is detected using Viola Jones Haar extended features. The system uses trained haar features and haarcascade_frontface_alt.xml is used for the human face detection. This is an accurate method to detect real time human face.

The architectural block diagram of the proposed system is shown in the figure1.

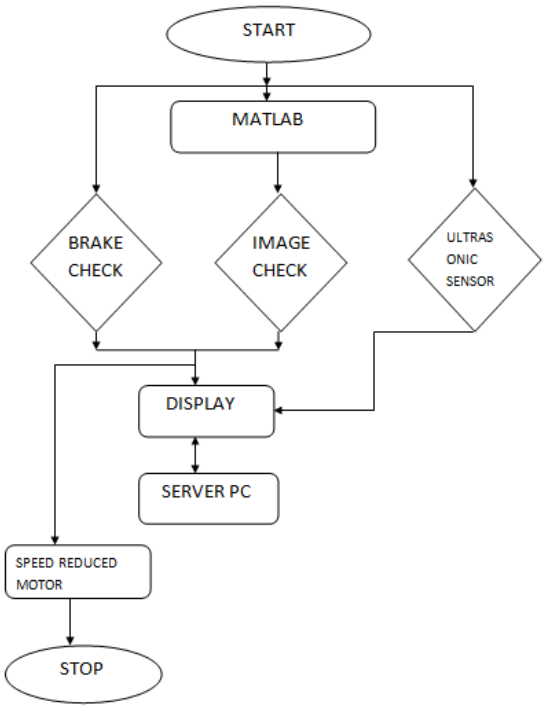


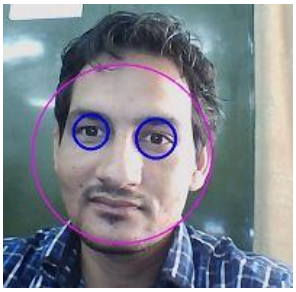
Figure 1. Architectural block diagram of Proposed System

C. Feature extraction

In machine learning, pattern recognition and feature extraction starts from an initial set of predefined data and builds threshold values (features) intended to be more informative, less redundant, helps in the corresponding learning and simplification steps, in some situations it leads to accurate output calculations. Feature extraction is used in providing reduction in dimensionality. This module involves three main things namely,

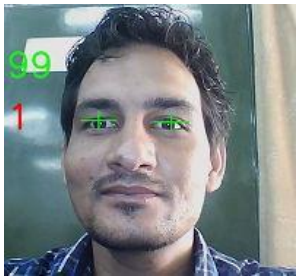
- Eye detection:

The eye of human is (Region of Interest) ROI detecting fatigue. If eye is blinking at normal rates, it means that human is alert to drive. Whenever the human feels drowsiness the eye blink rate is decreased (not blinked in 2to 3 seconds). The eye detection is also using Viola Jones haar features for eye detection and tracking.



- Eye blinking calculation:

The detection and tracking of real time blink of an eye is very much important in detection of human drowsiness. It involves face cascade, left eye cascade and right eye cascade.

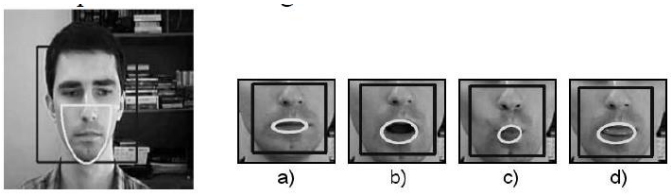


The above figure is the real time eye tracking using web camera. Whenever the blink (close eye) frames are greater than 40% to 50% of current frames, the driver is said to be in drowsy state.

The above figure is the state when human is sleeping, the proposed system will alert the human with message "Alert – Pull Over!!" to save from road accidents and miss happenings.

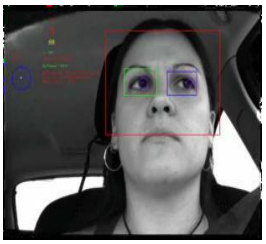
- Yawning detection:

In order to increase speed of the face detection and to make sure that the face is large enough to recognize mouth positions, the minimum size of the face was set to the half of the image frame width. Sample results of face detection and mouth region finding are pictured in the figure. The mouth region is localized arbitrarily in the lower part of the face region.



D. Vision output

In this module, the alert signal is generated as a result of detecting the driver's drowsiness by tracking the face region and detecting the eye and mouth region followed by calculating the eye blinking and yawning frequencies to indicate the sleepy driver.



E. Working of sensor

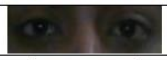
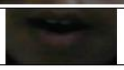
Ultrasonic sensors are based on measuring the properties of sound waves with frequencies above the audible range of human. They are mainly dependent on 3 physical principles namely, time of flight, the Doppler Effect, and the attenuation of sound waves. Ultrasonic sensors are always non-intrusive so that they do not require any physical contact with the target, and can also detect some clean and shining targets otherwise obscured to some vision-based sensors. In the proposed system, ultrasonic sensor has been used to measure distance with an accuracy of a few centimeters, over a range of a few meters, at a speed of milliseconds to several seconds per sample.

F. Auto-Braking system

In this module, the implementation of auto-braking system is shown as a result of driver's drowsiness, detection of less distance between front and rear vehicles and during the situation of brake failure.

III. RESULTS AND DISCUSSION

The experimentally detected result of the proposed system that detects the eye and mouth region of the driver is depicted in the following table:

REGION	NORMAL STATE	SLEEPY STATE
EYE		
MOUTH		

The above table shows the eye and mouth in the sleepy as well as normal state. This is stored in the database for the comparison and shows whether the driver is in sleepy state or normal state.

IV. CONCLUSION

The proposed system thus has been developed to detect driver's drowsiness using mat lab and in addition auto-braking system has been developed in this project to reduce the speed of the vehicle if the driver is dormant even after the alert message that has been given by the system through alarm. This project will be very much useful for today's world since most of the accidents are caused due to the fatigue condition of the driver.

V. REFERENCES

[1] Kartik Dwivedi1, Kumar Biswaranjan2,Amit Sethi3," Drowsy Driver Detection using RepresentationLearning" Department of Electronics and Electrical Engineering, Indian Institute of Technology, Guwahati, India{k.dwivedi, k.biswaranjan, amitsethi}@iitg.ernet.in

[2] Lunbo Xu, Shunyang Li, Kaigui Bian, Tong Zhao, Wei Yan, "Sober-Drive: A Smartphone-assisted Drowsy Driving Dettection System", Institute of Network Computing and Information Systems School of EECS, Peking University, Beijing, China 100871{alexander818, 00948318, bkg, zhaotong, w}@pku.edu.cn

[3] "Drowsy driver detection" project by Ronen Nissim andMarkGreenbergSupervised by Dori Peleg