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VEHICLE TRACKING SYSTEM INVOLVED DROWSINESS DETECTION SYSTEM USING BUZZER & VIBRATION SENSOR

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ABSTRACT:

Driver impairment due to drowsiness is known to be a major contributing factor in many motor vehicle crashes. More than 30% of the road accidents are caused by the fatigue of the driver. At present, there are various drowsiness detection systems available in the market. These systems are implemented using any one of the various implementation techniques such as detection of any behavioural pattern, changes in physiological conditions, or vehicular motion. Consequently, the accuracy of such systems has been found to be low..The paper is built around MCU. Here we are using eye blink sensor. By default the vehicle will be in running condition. During this time if the person closes the eyes automatically the vehicle will be in halt condition, the updated message will be displayed on the 16x2 LCD. The Position will be messaged using GPS and GSM respectively interfaced to the controller. A vibrator is also interfaced so that the driver will be alerted and can drive safely.

This paper uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

KEYWORDS: Driver monitoring system, eyes off the road detection, gaze estimation, GPS, GSM.

I. INTRODUCTION

Eye tracking as a tool is now more accessible than ever, and is growing in popularity amongst researchers from a whole host of different disciplines and have the potential to become an even more important component in future perceptual user interfaces. The technique is used in cognitive science, psychology, human-computer interaction, advertising, medical research, and other areas. Today, the human eye-gaze, blinking and eye movement can be recorded with relatively high reliability by unobtrusive techniques. Though, there are relatively few techniques proposed for the active scene where the head and the camera move independently and the eye moves freely in all directions independently of the face. Though, care must be taken, that eye-gaze tracking data is used in a sensible way, since the nature of human eye movements is a combination of several voluntary and involuntary cognitive processes.

Distracted driving is defined as any activity that could divert a person's attention away from the primary task of driving. Distractions include texting, using a smartphone, eating and drinking, adjusting a CD player, operating a GPS system or talking to passengers. This is particularly challenging nowadays, where a wide spectrum of technologies have been introduced into the car environment. Consequently, the cognitive load caused by secondary tasks that drivers have to manage has increased over the years, hence increasing distracted driving. According to a survey performing a high cognitive load task while driving affects driver visual behavior and driving performance. drivers under high cognitive loads showed a reduction in the time spent examining mirrors, instruments, traffic signals, and areas around intersections.

Especially concerning is the use of hand-held phones and other similar devices while driving. texting, browsing, and dialing cause the longest period of drivers taking their Eyes Off the Road (EOR) and increase the risk of crashing by three fold. these dangerous behaviors are wide-spread among drivers, 54% of motor vehicle drivers in the United States usually have a cell phone in their vehicles or carry cell phones when they drive.

II RELATED WORK

Driver monitoring has been a long standing research problem in computer vision. It is beyond the scope of the paper to review all existing systems, but we provide a description of the most relevant work in academia and industry.

Broadly speaking, there are two approaches to estimate gaze direction: Techniques that only use the head pose and those that use the driver's head pose and gaze. For systems that rely only on head pose estimation, an extensive report on the topic can be found in [34]. Lee *et al.* [30] proposed an algorithm for yaw and pitch estimation based on normalized histograms of horizontal and vertical edge projections combined with an ellipsoidal face model and a Support Vector Machine (SVM) classifier for gaze estimation.

Chutorian*et al.* [33] proposed a driver head pose estimation algorithm based on Localized Gradient Orientation (LGO) histograms in combination with Support Vector Regressors (SVR).

The algorithm was further developed in [35] by introducing a head tracking module built upon 3D motion estimation and a mesh model of the driver's head. Recently, Rezaei and Klette [37] introduced a new algorithm for distracted driving detection using an improved 3D head pose estimation and Fermat-point transform. All the described approaches reported to work in real time. Systems that use head pose and gaze estimation are grouped into hardware and software based approaches.

Ishikawa *et al.* [25] proposed a passive driver gaze tracking system using Active Appearance Models (AAMs) for facial feature tracking and head pose estimation. The driver's pupils were also tracked and a 3D eye-model was used for accurate gaze estimation from a monocular camera.

Smith *et al.* [39] relied on motion and color statistics to robustly track driver head and facial features. Using the assumption that the distance from the driver's head to the camera is fixed, the system recovered the three dimensional gaze of the eyes using a simplified head model without any calibration process.

III System Development

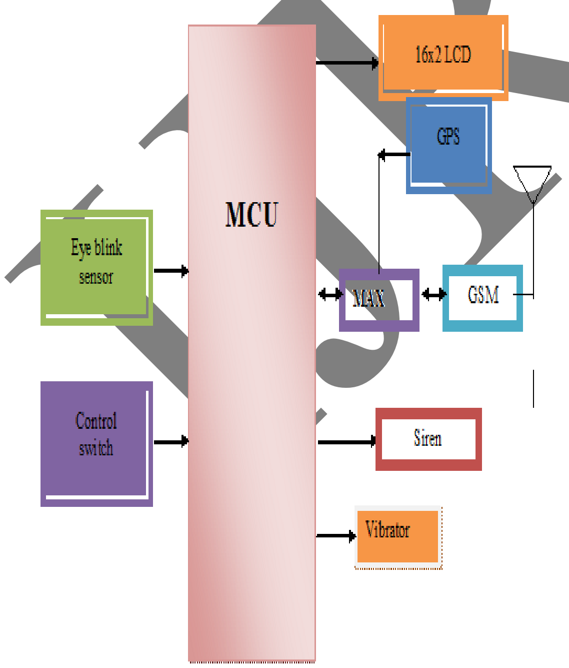

Figure 3.1: Proposed System Overview

The project is built around MCU. Here we are using eye blink sensor. By default the vehicle will be in running condition. During this time if the person closes the eyes automatically the vehicle will be in halt condition, the updated message will be displayed on the 16x2 LCD. The Position will be messaged using GPS and GSM respectively interfaced to the controller. A vibrator is also interfaced so that the driver will be alerted and can drive safely. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

II. PERFORMANCE ANALYSIS

IMAGE ACQUISITION:

The image acquisition module uses a low-cost web camera. USB webcam is used based on CCD mechanism. Camera is interfaced to MCU using USB port. Camera is placed on car dashboard above the steering wheel approximately 35-40 cm away pointing straight to the driver. Placing camera in this way makes capturing driver's face very easy. Operation of the camera at night time is achieved using an IR illumination source to provide a clear image of the driver's face without distracting driver. 36 LED IR illuminator is used which is fitted with LDR for automatic on off.

EYE GAZE TRACKING AND ESTIMATION:

Driver eye gaze is constantly changing during driving depending on surrounding conditions. Thus detecting eyes is not sufficient. Eyes need to be tracked in real time. Continuously Adaptive Mean Shift (CAMSHIFT) algorithm is used for real time eye tracking. Pupils of the eyes are tracked

EYES OFF THE ROAD DETECTION AND FATIGUE DETECTION:

Zones are defined in point of view of a driver with left hand drive system. 11 different gaze zones representing the dashboard, the centre console, the rear-view mirror, two side mirrors and six zones on the windshield. These defined zones cover most of the possible gaze directions involved in real-world driving.

Comparison

Human Driver	Automated Driver
Competent to drive in 100% of road conditions	Competent to drive in 98% of highway conditions
Distractible, inattentive	Vigilant
Susceptible to fatigue	Tireless
Subject to boredom, tedium	Consistent, multitasking, servile
Highly adaptable	Limited programmed behaviour change
High ambiguity and uncertainty tolerance	Limited programmed uncertainty tolerance
Highly evolved yet fixed sensory perception system	Limited yet extendable sensory system, not confined to range of human senses (e.g. millimeter-wave radar)
Limited reaction time	Near instantaneous reaction time

III. CONCLUSION

The system achieved accuracy above 90 % for all of the scenarios evaluated, including night time operation. In addition, the false alarm rate in the on-the-road area is below 5 %. Our experiments showed that our head pose estimation algorithm is robust to extreme facial deformations. While our system provided encouraging results, we expect that improving the facial feature detection in challenging situations (e.g., profile faces, faces with glasses with thick frames) will boost the performance of our system. Currently, we are also working on improving the pupil detection using Hough transform-based techniques to further improve the gaze estimation.

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