Road Accidents Prevention system using Driver's Drowsiness Detection

Garima Turan, Sheifali Gupta

Abstract— **Driver Fatigue is one of the most common reasons for fatal road accidents around the world. This shows that in the transportation industry especially, where a driver of a heavy vehicle is often exposed to hours of monotonous driving which causes fatigue without frequent rest period. Due to the frequent incidence of driver fatigue this has become an area of great socio economic concern. Consequently, a road accidents prevention system by detecting driver's drowsiness, which measure the level of driver inattention and provide a warning when a potential hazard exists, have received a great deal of attention as a measure to prevent accidents caused by driver inattention. In this paper an efficient driver's drowsiness detection system is designed using yawn detection by taking eye detection and mouth detection into consideration simultaneously so that road accidents can be avoided successfully.**

*Index Terms —***Drowsiness, face detection, mouth detection, eyes detection, yawn detection, alert.**

I. INTRODUCTION

National Highway Traffic Safety Administration (NHTSA) analysis data indicates that drowsiness while driving is a contributing factor for road accidents and it results in 4-6 times higher crash risk relative to alert drivers [1]. Most of the fatal road accidents occur at speeds greater than 70 Kmph. The World Health Organization (WHO) has reported that India has the worst road conditions in the world resulting approximately two and a half lakh deaths in 2010 and 2011 [2].

Research shows that driver fatigue and drowsiness is one of the major reasons for the increasing accidents [3]. Driver fatigue not only impacts the alertness and response time of the driver but it also enhances the chances of being involved in car accidents. The sleepy drivers fail to take right actions prior to a collision. An important irony in driver's fatigue is that the driver may be too drained to comprehend his own level of drowsiness. This significant problem is often ignored by the driver. Consequently, the use of supporting systems that examine a driver's level of vigilance is necessary to avoid road accidents. These systems should then alert the driver in the case of sleepiness or inattention. Some warning signs that can be measured as indications of driver fatigue are: daydreaming while on the road, driving over the centre line, yawning, feeling impatient, feeling stiff, heavy eyes and reacting slowly.

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There have been intensive researches to detect drowsiness of drivers, based on the above mentioned gestures of body (i.e. eye motion detection and yawning detection). Here an efficient driver's drowsiness detection system is designed using yawn detection by taking eye detection and mouth detection into consideration simultaneously so that road accidents can be avoided successfully.

II. LITERATURE REVIEW

Driver Fatigue is among the most common reason for fatal road accidents around the world. This shows that in the transportation industry especially, where a driver of a heavy vehicle is often exposed to hours of monotonous driving which causes fatigue without frequent rest period. Due to the frequent occurrence of driver fatigue this has become an area of great socio economic concern. Detecting driver's drowsiness has been a research topic for many years, with many approaches being studied thus so far. The work presented in [4] takes advantage of some mouth geometrical features to detect yawning. The work in [5] proposes the detection of the face region using the difference image between two images. Driver's yawn is then detected based on the distance between the midpoint of nostrils and the chin. [6] Uses Gravity-center template to detect the face. It then uses grey projection and Gabor wavelets to detect the mouth corners. Finally LDA is applied to classify feature vectors to detect yawning. [7] It presents a system where the face is located through Viola-Jones face detection method in a video frame. Then, a mouth window is extracted from the face region, in which lips are searched through spatial fuzzy c means (s-FCM) clustering. In [8] there is an advantage of two cameras: a low resolution camera for the face and a high resolution one for the mouth. It then uses haar-like features to detect driver's mouth and yawning is detected by the ratio of mouth height and width. In [9] a method is adopted for yawning detection based on the changes in mouth geometric features. The work in [10] driver's drowsiness is determined using vehicle based measures, behavioral measures and psychological measures which makes this a hybrid drowsiness detection system. [11] Shows detection of drowsiness based on head movement and geometrical features of mouth is proposed. Experiment was conducted on sample size of 50 video clips and observed that head movement contributes about 8% and yawning contributes about 49%.

III. JUSTIFICATION OF RESEARCH

This research is different from the related literature in two aspects. Firstly, in this research we are concatenating eye

detection and mouth detection by determining the moment when there are closed eyes and open mouth simultaneously so that a robust detection can be achieved. Secondly, in order to have a realistic implementation we use an actual camera for real time images to be processed. And thirdly, in this research the system will be designed using open CV library.

IV. OBJECTIVES

The main objective is to first design a system to detect driver's drowsiness based on yawning measurement by eye and mouth detection ensuring the robust detection of yawning expression in the presence of variable lighting conditions and facial occlusions so that road accidents can be avoided successfully. Secondly, to alert the driver on detection of drowsiness by using beep or buzzer and to ensure a simple and efficient design, that can be implemented using simulation and hardware as well without false detections.

V. PROPOSED APPROACH

The driver's face is continuously recorded using a video camera that is installed under the front mirror. In order to detect the yawn, the first step is to detect and track the face using the series of frame shots taken by the camera. Then the location of the eyes is detected and the mouth in the detected face. **The closed eye gesture is detected along with closed eyes for yawning detection.** This makes segmentation procedure more robust to false detections. The mouth and eye geometrical features are then used to detect the yawn. The system will alert the driver of his fatigue by use of beep or buzzer and the improper driving situation in case of yawning detection. This is to be done in various phases given following:

Phase 1: Face Detection
Phase 2: Eyes Detection
Phase 3: Mouth Detection
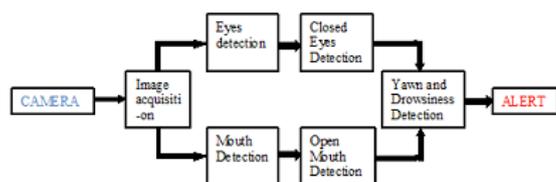Phase 4: Yawn Detection
Phase 5: Alert System

Fig. 1: Block Diagram

Fig. 2: Flowchart

Fig.3: Alert in case of Yawn Detection

VI. APPLICATIONS

✓ Transportation business where almost daily accidents occur due to driver fatigue.
✓ Security guard cabins.
✓ Operators at nuclear power plants where continuous monitoring is necessary.
✓ Military applications where high intensity monitoring of soldier is needed.
✓ In classrooms where students feel drowsy and inattentive during the class.
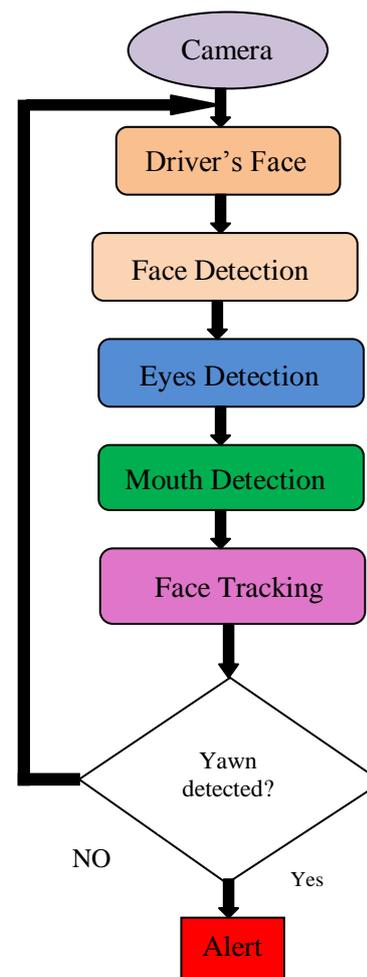✓ In Offices to detect lazy and sleepy employees.

VII. FUTURE SCOPE

a) Rather using alarm we can use Automatic Braking System which will reduce the speed of the vehicle.
b) The vehicle can be automatically parked by first using Automatic braking system, which will reduce the speed and concurrently will turn on the parking lights of the vehicle
c) Using Pressure sensor on the steering alarm or Automatic braking System can be set in case of drowsiness. By using wireless Technology if the driver gets drowsy an alert message can be sent to a selected person's mobile by using GSM module along with the alarm in vehicle.

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