A Driver Nodding Detection and Prevention System to Avoid Accidents

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Abstract— Driving with drowsiness is one of the major cause or a reason behind the road and traffic accidents. Driver fatigue is a significant factor in a large number of vehicle accidents. So there is a need to develop such a techniques which helps to prevents the growth rate of such accidental things.for development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems.Drowsy driver detection system is one of the potential applications of intelligent vehicle systems.Due to the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects.This paper aims to describes a real-time non-intrusive method for detecting drowsiness of driver by using yawning measurement.Our proposed system involves several steps including the real time detection and tracking of driver's face, detection and tracking of the mouth contour and the detection of yawning based on measuring both the rate and the amount of changes in the mouth contour area. It uses webcam to acquire video images of the driver. Visual features like mouth & eyes which are typically characterizing the drowsiness of the driver are extracted with the help of image processing techniques to detect drowsiness. Here we are applying the bluring algorithm on images ,those are capture from webcam to remove the noise. Then converting the RGB image to HSV image.Where HSV converts the RGB image into black and white image and the blob detection will detect the blob from the images. Final test results demonstrate that the proposed system can efficiently measure the aforementioned parameters and detect the yawning state as a sign of driver's drowsiness.

Key words: Active contour model, Drowsiness Detection , Integrate Protection, Wavelet Transformation, Yawn Detection

I. INTRODUCTION

An improvement of public safety and the reduction of accidents is one of the important goals of the intelligent transportation systems (ITS). One of the most important factors for causes an accidents, especially on rural roads, is the driver fatigue and monotony. Fatigue reduces driver perception and decision-making capability to control the car. Research shows that usually after 2-3 hours of continuous driving, driver is fatigued and steering performance degrade. In the early afternoon hours, after eating lunch and at midnight, driver drowsiness is much more than other times. Driver drowsiness and distraction are major causal factors behind road accidents.To reduce the number of road accidents, it is necessary to monitor driver and driving behavior and alert the driver when he or she is drowsy or in distraction state.In addition, if it were possible to predict unsafe driving behaviors in advance, this would contribute to safe driving.According to one report ,the amount of car crashes would be reduced by 10-20%by monitoring and predicting driver and driving behaviors. A reliable and robust driver drowsiness and distraction detection system would send an alert to the driver and thus reduce the number of hazardous situations on the road. If it were possible to predict unsafe driving behavior in advance, this would also be helpful in preventing road accidents. Thus, it is desirable to design a framework consisting of two phases, that is, both Monitoring and predicting driver and driving behavior. Recently, the total number of serious car crashes is still increasing regardless of improvements in road and vehicle design for driver safety. The U.S. National Highway Traffic Safety Administration (NHTSA) data indicate that more than 40,000 Americans suffer serious injuries from 56,000sleep related road crashes annually .According to a study by the Sleep Research Center (UK), driver drowsiness at the wheel causes up to 20% of accidents on monotonous roads.Several studies have produced various estimates of the level of sleep deprivation as it relates to road accidents. In addition, driver distraction or inattention is another critical problem for safe driving. Yawning measurement is also good indicator of a driver's drowsiness. As non-visual features, heartrate variability (HRV), galvanic skin response (GSR) and conductivity, steering-wheel grip pressure, and body temperature are possible candidates for estimating the driver's fatigue level indirectly .Electroencephalogram (EEG) and Electro-oculogram (EoG) give additional psycho physiological information about drowsiness or emotional reactions. Driving behaviour information such as steering wheel movement, lane keeping, acceleration pedal movement and braking, etc., should also be considered to detect driver drowsiness. This record shows that car accidents caused by fatigue drivers is four- to six-times higher than near crash/crash risk relative to alert drivers as fatigue drivers fail to take correct actions prior to a collision. Ontario Ministry of Transportation's Driver's Handbook also mentions that "Drowsiness has been identified as a causal factor in a growing number of collisions resulting in injury and fatality. This is mainly due to the fact that driver fatigue impacts the alertness and response time of the driver thus increases the chances of getting involved in car accidents. Drowsy drivers may fall asleep at the wheel or tend to make serious - sometimes fatal - driving errors.

II. LITERATURE SURVEY

There are various approaches which are in development for detecting driver fatigue and drowsiness levels. Some of them are implemented and some are in implementation stage. Advantages and disadvantages for each technology or algorithm is analysed in this section.

Ye Sun et al.describes an innovative application for assisting driver while driving. This paper include non-intrusive measurement approach for detection of driver fatigue and monitoring driver"s health. Driver assistance system remotely detects the bio-potential signals without any physical contact with human skin. This does not cause

any problem to the user compared to conventional ways like using electrodes which need to be in contact with human body. Using delicate sensor and ECG, EEG eye blinking can be measured. The system is able to detect the electrical signals through cloth or hair without any contact with human.

Horng and Chen used an HSV colour space which converts RGB colour image frames into HSV colour space. This helps to remove brightness effect from image which improves skin colour detection and make it easy to track driver eyes to detect fatigue conditions. Fast search algorithms are applied for increasing searching efficiency in eye tracking.

Xianping Fu et al. uses driver"s drowsiness gaze tracking method used to prevent accidents.This approach focus on the head orientation of the driver in each direction and analyse eye movements like blinking of eyes, closed eye or open eye to detect the level of sleepiness of driver. Automotive learning and particle filtering algorithm is used in this approach.This algorithms helps to track head and face movement accurately by camera. Single camera is used to capture eye movements. It provides accurate head pose and gaze zone estimation and robust estimation of eye zone without full coordination of driver while capturing video.

H. Ma et al.Haar algorithm to track the face and for detecting eyes.This paper uses Histogram-based automatic threshold algorithm which helps to extract the eye contour. It used to detect is driver in sleepy conditions or not.

III. 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.

IV. PROPOSED SYSTEM

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:

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

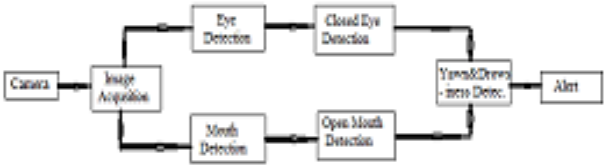

Fig. 1: Block Diagram

A. Images Processing Based Techniques In image processing based techniques, drivers face images are used for processing so that one can find its states.From the face image one can see that driver is awake or sleeping.Using same images,they can define drowsiness of driver because in face image if driver is sleeping or dozing then his/her eyes are closed in image.And other symptoms of drowsiness can also detected from the face image. We can classify these techniques in three sub-categories.

A. Face Detection and Tracking:

The face location is the region where the similarity degree is at its maximum.The details of each step will be further explained in the following subsections.The first steps towards yawning detection is the detection and tracking of the driver's face. Given a single image, the goal of face detection is to identify all image regions that contain a face regardless of its position, orientation, and lighting conditions. Such a problem is challenging because faces are nonrigid and have a high degree of variability in size, shape, color, and texture.The orientation of the face can also be a challenge in the detection process. However, we have assumed that the monitoring camera is installed inside the vehicle under the front mirror facing the driver at a fixed angle. Therefore the problem of relative camera-face pose is less challenging in our application while head position might still vary from driver to driver. There is also a great deal of variability among faces including shape, color, and size. Presence of facial features such as beards, mustaches, and glasses can also make a great deal.

1) Skin Segmentation:

As mentioned before,the first step towards face detection is segmenting the possible areas where the face is locate based on the properties of human skin in RGB and YCbCr color spaces.Because the detection scheme should be invariant to skin type and change in lighting conditions,we have taken advantage of a set of bounding rules for different color space (RGB, YCbCr and HSV) in order to improve the detection efficiency

B. Template Matching Technique:

In this technique, one can use the states of eye i.e. if driver closes eye/s for some particular time then system will generate the alarm.Becasue in this techniques system has both close and open eyes template of driver. This system can also be trained to get open and closed eye templates of driver.This method is simple and easy to implement because templates of both open and closed eye states are available to system. Researchers have used this technique.

1) Wavelet Transform:

The continuous wavelet transform constructs a time-frequency representation of a signal.Therefore, when applied to an image that is a 2D signal,this transformprovidesvavspace-frequency representation of the

image, demonstrating the frequency of changes in all localities of the image.

Fig. 2: Open and Closed Eyes Template

2) Eye Blinking based Technique:

In this eye blinking rate and eye closure duration is measured to detect driver's drowsiness. Because when driver felt sleepy at that time his/her eye blinking and gaze between eyelids are different from normal situations so they easily detect drowsiness. In this system the position of irises and eye states are monitored through time to estimate eye blinking frequency and eye clouse duration. And in this type of syetem uses a remotly plced camrea to aquire video and computer vision methodes are then applied to sequentially localize face, eyes and eyelids positions to measure ratio of closure.Using these eyes clouser and blinking ration one can detect drowsiness of driver.

3) Yawning Based Technique:

Yawn is one of the symptoms of fatigue.The yawn is assumed to be modeled with a large vertical mouth opening. Mouth is wide open is larger in yawning compared to speaking.Using face tracking and then mouth tracking one can detect yawn, detect yawning based on opening rate of mouth and the amount changes in mouth.

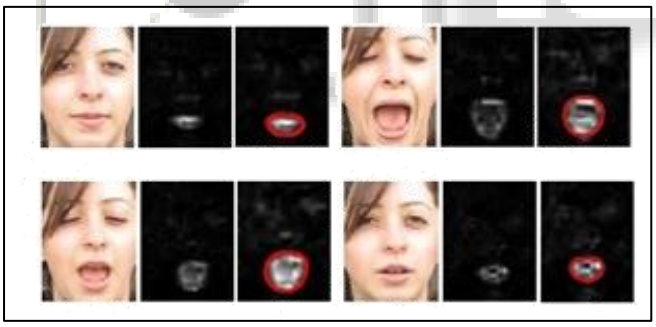

Fig. 3: Mouth.Yawn Image

V. Application

1) Transportation Business where almost daily accident occurs due to driver fatigue.
2) Security guards cabin.
3) Operators at nuclear power plants where continuous monitoring is necessary.
4) Military applications where high intensity monitoring of soldier is needed.
5) In class room where students feels drowsy and inattentive during the class.
6) In offices to detect lazy and sleepy employs

VI. Conclusion

The proposed system detecting drowsiness of driver by continuously monitoring mouth area & eyes.This non-intrusive approach to detecting drowsiness of driver without interference in both daytime & night time as webcam ,with brightness controller.The yawning state is determined based on measuring the rate and amount of changes in the mouth contour area. The proposed face detection and tracking approach is based on both properties of human skin as well as face projection profiles in terms of location of eyebrows, eyes, nose and mouth. Image Processing techniques are one of the favorite ones for researchers. These techniques are much simple and user friendly.So there is a lot of scope in drowsiness detection using Image Processing.

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