A REVIEW PAPER ON HUMAN SLEEP DETECTION SYSTEM IN AUTOMOBILES

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ABSTRACT
Various investigation show that driver's drowsiness is one of the main cause of road accidents. The development of technology for preventing drowsiness at the time is a major challenge in the field of accidents avoidance. The advance in computing technology has provided the means for building intelligent vehicle system. The purpose of this study is to detect the drowsiness in driver to prevent accidents and to improve safety on the highway. The aim of this project is to design an Accident Prevention System which helps in preventing or avoiding accidents.
A real time face detection is implemented to locate driver's face region. A method of detecting drowsiness in drivers developed by using a camera that points directly towards the driver face and capture for the video. As a detection method, the system uses image processing technology using MATLAB to analysis images of the driver face taken with the help of video camera. The captured video is done, it is converted into numbers of frame of face and monitoring of the face region and eyes in order to detect drowsiness. The system is able to monitoring eyes and determine whether the eyes are in an open or closed. This detection system provides a non-contact technique for judging various level of alertness and facilitates early detection of a decline in alertness during driving.
KEYWORDS —*Image Processing, MATLAB, Microcontroller etc*

1. Introduction

National Highway Traffic Safety Administration (NHTSA) analysis data indicates that drowsiness while driving is a contributing factor for road accidents then it results in 4-6 times higher crash risk relative to alert drivers. Most of fatal road accidents occur at speed greater than 70kmph. The World Health Organization (WHO) has reported that India has the worst road conditions in the world resulting approx. Two and a half lakhs deaths in 2010 and 2011.
Research shows that driver fatigue and drowsiness is one of the major reasons for the increasing accidents. 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 action prior to a collision. An important irony in driver fatigue is that the driver may be too drain comprehend his own level of drowsiness. This significant problem is often ignored by the driver. Consequently, the use of supporting system that examine a driver level of vigilance is necessary to avoid road accidents. This system should alert the driver in the case of sleepiness or in attention. Some bonding sign that can be measure as indication of driver fatigue are: daydreaming, driving over the center line, yawning, feeling impatient, feeling stiff, heavy eyes and reacting slowly.
There have been intensive researches to detect drowsiness of drivers, based on the above mentioned gestures of drivers based on the above mentioned gestures of body. Here an efficient driver's drowsiness detection system is design using yawn detection by taking eye blinking and mouth detection into consideration simultaneously so that the road accidents can be avoided successfully.

2. Literature Survey

Antonie picot et.al., [1] had presented a drowsiness detection system using both brain and visual activity. The brain activity was monitored using a single electroencephalographic 16
(EEG) channel. An EEG-based drowsiness detector using diagnostic techniques and fuzzy logic were proposed. Visual activity was monitored through blinking detection and characterization. Blinking features were extracted from an electrooculographic (EOG) channel. Features were merged using fuzzy logic to create an EOG-based drowsiness detector. The features used by the EOG-based detector were voluntary restricted to the features that could be automatically extracted from a video analysis of the same accuracy. Both detection systems were then merged using cascading decision rules according to a medical scale of drowsiness evaluation. Merging brain and visual information made it possible to detect three levels of drowsiness: "awake,""drowsy," and "very drowsy."

Pia M. Forsman et. al., [2] had focused to develop a method for detecting driver drowsiness at more moderate levels of fatigue, well before accident risk was imminent. Eighty-seven different driver drowsiness detection metrics proposed in the literature were evaluated in two simulated shift work studies with high-fidelity simulator driving in a controlled laboratory environment. Twenty-nine participants were subjected to a night shift condition, which resulted in moderate levels of fatigue; 12 participants were in a day shift condition, which served as control. Ten simulated work days in the study design each included four 30-min driving sessions, during which participants drove a standardized scenario of rural highways. Ten straight and uneventful road segments in each driving session were designated to extract the 87 different driving metrics being evaluated. The dimensionality of the overall data set across all participants, all driving sessions and all road segments was reduced with principal component analysis, which revealed that there were two dominant dimensions: measures of steering wheel variability and measures of lateral lane position variability. The latter correlated most with an independent measure of fatigue, namely performance on a psychomotor vigilance test administered prior to each drive. It can be replicated findings across eight curved road segments used for validation in each driving session.

Prof.V.K.Banga et. al., [3] had developed a vehicle driver drowsiness warning system using image processing technique with neural network is proposed. The proposed system was based on facial images analysis for warning the driver of drowsiness or inattention to prevent traffic accidents. The facial images of driver were taken by a video camera which was installed on the dashboard in front of the driver. A Neural network based algorithm was proposed to determine the level of fatigue by measuring the eye opening and closing, and worn the driver 17accordingly. The results indicated that the proposed expert system was effective for increasing safety in driving. Information about the degree of eye closure was obtained through various self-developed image processing algorithms. During the monitoring, the system was able to decide if the eyes were opened, drowsy or closed. When the eyes were drowsy or closed, a warning signal was issued. Neural network provided a completely different, unorthodox way to approach a control problem, this technology was not difficult to apply and the results were usually quite surprising and pleasing. For future scope we suggested that that one could work on more features that could include the change was size and shape of iris when the person was drunk or when there was glossy appearance to eyes or must work on the concept of Horizontal Gaze Nystagmus for better accuracy using other machine algorithm like SVM.

Jaeik Jo et. al., [4] had focused on accurate classification of eye state. This research had proposed a new method for eye state classification that combines three innovations: (i) extraction and fusion of features from both eyes, (ii) initialization of driver-specific thresholds to account for differences in eye shape and texture, and (iii) modelling of driver-specific blinking patterns for normal (non-drowsy) driving. The results show that the proposed method achieves significant improvements in detection accuracy.

Ivan G. Daza et. al., [5] had presented a non intrusive approach for monitoring driver drowsiness using the fusion of several optimized indicators based on driver physical and driving performance measures, obtained from Advanced Driver Assistant Systems in simulated conditions. This paper was focused on real-time drowsiness detection technology rather than on long term sleep or awake regulation prediction technology. The system was developed in order to obtain robust and optimized driver indicators able to be used in simulators and future real environments. These indicators were principally based on driver physical and driving performance skills. The fusion of several indicators,

proposed in the literature, was evaluated 20 using a neural network and a stochastic optimization method to obtain the best combination. This paper proposed a new method for ground-truth generation based on a supervised Karolina Sleepiness Scale. An extensive evaluation of indicators, derived from trials over a third generation simulator with several test subjects during different driving sessions, was performed.

Priyanka Devane et. al., [6] ITS (intelligent transportation system) is having goal of reducing the accidents and improving the public safety. Driver fatigue or distraction is main reason in many accident cases on rural roads. Drowsiness or fatigue breaks the driver concentration while driving which resulted into loss of decision making functionality for controlling car. From general research and polls, it is assumed that for continues driving case, driver is fatigued after 2-3 hours and hence the performance of steering is deteriorated. The driver drowsiness is more in midnight, after lunch, afternoon hours as compared to other times in day. Also the factors like alcohol; drugs etc. are responsible for loss of driver concentration. The best tool for measuring fatigue and drowsiness is brain activity monitoring, but in this approach, brain signals must be received from the electrodes that connected to the driver head which make it as an intrusive approach. After monitoring of brain activity, the most significant symptom of fatigue is appeared in eye. According to the researches, the latency between the visual stimulus and its response is one of the main measures to determine the consciousness.

Roshani Tabrizi et al., **[7]** proposed an eye detection algorithm that detects eye in the HSV color space. They also proposed another method is based on the method proposed for the precise eye detection. In this method, a linear transform was applied on image in YCbCr color space, and then the transformed image was converted to binary image. This method has a very good accuracy for eye detection in colour images, but it fails when illumination of environment is low.

M. J. Flores et al., [8] proposed two different methods for eye detection in day and night. The proposed method for eye detection in day is based on searching an elliptical gray-level model in the top half of face region. In night mode, an IR lighting and imaging system was used which can detect pupil directly. It seems that the combination of these two methods make the system robust and efficient.

J. Jimenez-Pinto et al., [9] uses the salient points of face are detected after face detection. In these researches, the salient points are tracked over time. Thus, according to the relative position of salient points, hypo-vigilance symptoms are extracted.

Prof. P. H. Kulkarni etal [10] The authors of this respective paper aims at designing an embedded system for implementing an efficient alcohol detection system that will be useful to avoid accidents. There are many different types of accidents which occur in daily life. Accidents may be caused due to many reasons. It may be due to some failure in the mechanism of the vehicle such as a brake fail, or due to the recklessness of the driver in most of the cases. In many of the accident cases, the driver is found drunk which contributes to a large proportion of road accidents. Though there are laws to punish drunken drivers but they cannot be implemented absolutely. For instance the traffic police cannot be everywhere to keep a check on whether the driver is sober or not. This can be a major reason for accidents. So there is a need for an effective system to keep a check on the soberness of the drivers.

Therefore in order to avoid these accidents the authors have implemented a prototype project. In that project, it is checked whether the person is drunk or sober by using the MQ3 GAS sensor. In this system, sensor circuit is used to detect whether the alcohol was consumed by driver or not. To that very end, a system is designed which regulates the ignition of a car on the basis of the soberness of its driver. What the system does is that when some alcohol concentration is detected in the breath of the driver, the car will be stopped and the related information will go to a nearby location through GSM. The project is based on EMBEDDED C programming using AVR ATmega16 microcontroller.

The alcohol detector (MQ3) as stated in the paper is suitable for detecting alcohol concentration just like your common breath analyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration which is given to inbuilt ADC of microcontroller.

3. Conclusion

The sleep detection system proposed has a specific set of advantages over the existing method and proves to be more efficient and economical in comparison. Although there is a constraint on the quality of the camera required for processing the live video feed, this method offers a non-invasive system for sleep detection. An improvement over the existing method, this system is indeed a feasible and easily implementable alternative. In this we proposed new framework for efficient and accurate detection of driver's drowsiness using face component extraction, feature extraction and template matching hybrid technique. We address the limitations of existing methods for driver fatigue detection in this paper. For future work, practical implementation, and its evaluation against existing method is recommended.

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