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Anti-Driver Sleep Detection

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***Abstract*: Drowsiness of the drivers is the main cause of accidents in the world. Due to lack of sleep and tiredness, drowsiness can occur while driving. The best way to avoid accidents caused by drivers' drowsiness is to detect drowsiness of the driver and warn him before fall into sleep. To detect drowsiness many techniques like eye retina detection, facial feature recognition has been used. Here in this paper, we propose a method of detecting driver drowsiness using eye retina detection and pulse rate detection of the driver. In this report, we propose a more accurate drowsiness detection method which is a hybrid approach of eye retina detection and pulse pattern detection.**

***Keywords*: Drowsiness, Driver, Detection.**

1. Introduction

Driver exhaustion is a significant variable in an expansive number of vehicle accidents. Late insights, assess that yearly 1,200 deaths and 76,000 injuries can be credited to weariness related accidents. Road Accidents in Sri Lanka cause financial losses worth around Rs.9.34 billion every year. It can be seen there are around 2,400 road accidents consistently which is one death per every four hours. It has been figured around 20% of car crashes with driver fatalities are due to driver's drowsiness. It was uncovered that driving execution quickly drop with expanded tiredness which result in making more than 20% of all vehicle accidents. Less attention heads the driver to being distracted and the likelihood of street accident goes high. Drowsiness related accidents have all the earmarks of being more serious, because of the higher speeds involved distraction and the driver being not able to take any avoiding activity, or even brake, before the accident. The improvement of innovations for recognizing or preventing tiredness of the driver is a significant test in the field of accident preventing systems. Because of the danger that that drowsiness presents on the road, strategies need to be created for checking its influences. Loss of the awareness because of the tiredness causes a few changes in the human's body and activities. These side effects and parameters empower us to effectively measure the drowsiness level. Different strategies for drowsiness identification can be partitioned into two general classifications. The techniques in the first gathering recognize the level of the tiredness focused around the physiological changes in the body. Eye status, speech properties, time interval between two yawning, head position, sitting carriage, heart rate, and brain signals are simply a couple of illustrations of the strategies in the first classification. Drowsiness additionally brings about some changes in the driving style. Techniques in the second category estimate the driver's drowsiness level by following these progressions. Steering angle, distance from the following vehicle, lateral position of the vehicle, longitudinal speed, longitudinal speeding up, and lane departure are utilized as a part of the technique of the second classification.

2. Project Development

Prior to proposing a new hybrid method for the drowsiness detection, a thorough study is carried out on the existing methods of drowsiness driver detection mechanisms and they are listed at. A better hybrid version of drowsiness detection mechanism is expected to be proposed using the specifications, observations and calculations figured out in the theoretical study. Standard face detection techniques and heart rate variability analysis results were studied and they have been used to create a new fuzzy based hybrid drowsiness detection mechanism. In fulfilling this task EMGU CV (A cross platform .Net wrapper to the OpenCV image processing library), fuzzynet1.2.0 (Fuzzy Logic Library for Microsoft .Net), "Kubios HRV Analysis" software and MATLAB fuzzy tool box has been used.

The general flow of the research can be mainly divided into several parts. In here drowsiness detection model is proposed with the physiological and behavioural measurements of the subject. According to that the study varies mainly on these two sectors. Basic steps of the behavioural measurements are as follows, Study of behavioural techniques used to detect drowsiness. Video Acquisition. Extracting features to detect drowsiness. Monitoring features with time. Providing output based on the detected features.

Basic steps of the physiological measures are as follows, Study on physiological measures used to detect drowsiness. Selecting HRV analysis to detect drowsiness. Analyzing LF/HF ratio for test samples. Selecting a suitable range of LF/HF for the implementation. Using the two input variables finally a fuzzy model has been designed to predict the driver's drowsiness level. Eye Shut Duration as behavioural

Measurement for Drowsiness Detection.

After the thorough study of behavioural measurements to detect drowsiness, we selected eye shot duration of the driver as the behavioural measurement to detect drowsiness. To calculate the blink duration, the first thing we did was face detection. To do the face detection we use "harrcascade face detection mechanism". To detect eye in the face we use "harr eye tracking algorithm". To detect the eye shut duration we use the Hough circle detection mechanism. The proposed system is shown below.

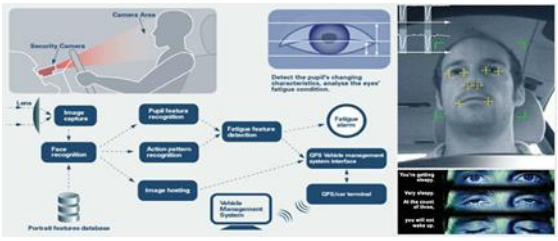

Fig. 1. Detection of drowsiness

3. System Design

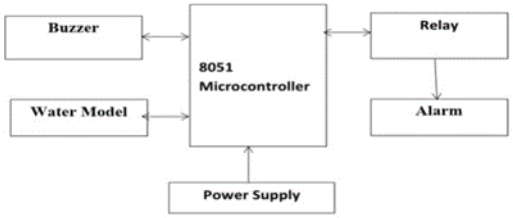

Fig. 2. Design of anti-driver sleep detection

Water model is used because once the alarm rings it sprinkles the water to the driver so that he or she can wake up. This system alerts the user if he/she falls asleep at the wheel thereby, avoiding accidents and saving lives, this system is useful especially for people who travel long distances and people who are driving late at night. If microcontroller is not reset, at that time, around one minute later the output of gate conducts, due to this the clock stops counting further and relay energizes to deactivate the load. This state changes only when reset switch is pressed, as a result of pressing the reset switch a next timer is set which will trigger the same events after half an hour.

Here the "haar face detection" and "haar eye tracking algorithm" were built in EmguCv library, and they were used to detect the face and the eye. To improve the eye searching mechanism, we give eye searching area the region of interest to search for the eyes as heuristics. This region of interest was selected by studying the normal human facial geometry.

Fuzzy model prepared for the drowsiness detection system has two input variables and an output. The details of the input and outputs are as follows, we proposed a fuzzy based model for the drowsiness detection system because mainly the inputs that we use for this system are from two different measurement mechanisms. Due to that the relationship between them is not exact. Also, when considering the output, which is drowsiness levels, it's also a fuzzy value, that is we can't either Seymour have a fine line between drowsiness and wakefulness. Due to these reasons we proposed fuzzy model to detect drowsiness

4. Conclusion

Considered the facts that mentioned in Discussion in IV Section it is concluded that the hybrid method that we proposed for drowsiness detection is more suitable than the detection techniques which consider only one category of measurements such as physiological, behavioural or vehicle based methods. Also the fuzzy based model proposed in this research assures high accuracy in detecting drowsiness and it provides exceptional results compared to the other models which is only taken crisp levels in predicting the drowsiness. As recommendation we can improve the system by providing a night time video acquisition camera. Also providing a real time input mechanism for HRV analysis data can make this proposed system a real time application.

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