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INTELLIGENT DRIVER FATIGUE DETECTION USING SENSOR NETWORK

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ABSTRACT

This paper presents a new approach towards automobile safety and security. In the field of an automotive research, a method to monitor and to detect a fatigue/drowsy or a drunken driver has been studied for many years. Previous research uses sensors such as an infrared camera for pupil detection or voice to detect fatigue, or image processing to detect driver expression. Even these approaches are able to detect driver's fatigue; however, these methods are not driver adaptable nor interactive with a outside driving situation. We propose driver's fatigue approach for real-time detection of driver fatigue. The system consists of a sensors directly pointed towards the driver's face. The input to the system is a continuous stream of signals from the sensors. The system monitors the driver's eyes to detect micro-sleeps (short periods of sleep lasting 3 to 4 seconds), monitors the driver's jaw to detect jaw movement and monitors to detect driver pulse from finger using LED & LDR assembling. The system can analyze the eyes lid movement, jaw movement, variation in pulse rate from the driver compute it as well as compare signal. Accordingly, we can be obtained the driver's fatigue level based on the response signals and alert driver.

Keywords- *Fatigue, Driver fatigue, Fatigue detection, Driver monitoring system architecture.*

I. INTRODUCTION

Driver fatigue resulting from sleep deprivation or sleep disorders is an important factor in the creasing number of accidents on today's roads. Therefore, a system that can detect oncoming driver fatigue and issue timely warning could help to prevent many accidents, and consequently save money and reduce personal suffering. These technologies monitor usually on line and in real time bio behavioral aspects of the operator; for example, eye gaze, eye closure, pupil occlusion, head position and movement, and heart rate.

The propose system based on eyes closer count of the driver. By monitoring the eyes and mouth, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. The eye blink frequency increases beyond the normal rate in the fatigued state. In addition, micro sleeps that are the short periods of sleep lasting 3 to 4 seconds are the good indicator of the fatigued state, but it is difficult to predict the driver fatigue accurately or reliably based only on a single driver behavior. In order to detect

Fatigue probability the facial expression parameters must be extracted first. There are many researches to detect driver fatigue. A method using an infrared camera to monitor pupil of the eye is the most popular method. Other research uses EEG to monitor driver fatigue. It is expensive to be commercialized and needs complex noise processing. In short, these all cannot reflect outer situation of a driver and cannot adapt to each user. The objective of this paper is to review and discuss some of the activities currently underway to develop unobtrusive, in vehicle, real drowsy driver detection and fatigue monitoring /alerting systems and to present a format by which these technologies may be evaluated for use in transportation operations. Data sets are collected from subjects showing spontaneous facial expressions during the state of fatigue i.e. using blinking of eye lid and movement of jaw. We analyze the degree to which individual facial action units can predict the difference between alert and drowsy or moderately drowsy and acutely drowsy. How to extract the relevant feature set of filters for a person independent drowsiness detector is studied. The propose system uses sensor network for detecting the Driver's Fatigue.

II. AN OVERVIEW OF EXISTING SYSTEM

Technological approaches for detecting and monitoring fatigue levels of driver fatigue continue to emerge and many are now in the development, validation testing or early implementation stages. Previous studies have reviewed available fatigue detection and prediction technologies and methodologies. A method using an infrared camera to monitor pupil of the eye is the most popular method. Other research uses EEG to monitor driver fatigue. It is expensive to be commercialized and needs complex noise processing. In short, these all cannot reflect outer situation

of a driver and cannot adapt to each user. These builds on previous work by providing updated information on state of the art emerging fatigue detection and alertness monitoring technologies, Significant advances in video camera and computer processing technologies coupled with robust, noninvasive eye detection and tracking systems have made it possible to characterize and monitor a driver's state of alertness in real time under all types of driving conditions.
Some currently available fatigue driver monitoring devices, as well as technologies that will be available in the near future for commercial transport applications, are identified and described.

III. ACTION UNIT PRDICTIVENESS

In order to understand the action unit predictiveness in drowsiness MLR was trained on frame wise outputs of each facial action individually. Examination of the A' for each action unit reveals the degree to which each facial movement is associated with drowsiness in this study. The A's for the drowsy and alert states are shown in Table (1). Performance was evaluated in terms of area under the. For all of the novel subject analysis, the output for each feature was summed over a temporal window of seconds before computing. Cross validation was performed with trained on subjects and tested on subject at a time. The average of the five facial actions that were the most predictive of drowsiness by increasing in drowsy states were, (outer brow raise), (frown), (chin raise), and (nose wrinkle). The five actions that were the most predictive of drowsiness by decreasing in drowsy states were (smile), (lid tighten), (nostril compress), (brow lower), and (jaw drop). The high predictive ability of the blink/eye closure measure was expected. However the predictability of the outer brow raise was previously unknown.
The developing an active safety system for reducing the number of automobiles accidents due to reduced vigilance. Drowsiness in drivers can be generally divided into the following categories: sensing of physiological characteristics, sensing of driver operation, sensing of vehicle response, monitoring the response of driver. Among these methods, the techniques based on human physiological phenomena are the most accurate. This technique is implemented in two ways: measuring changes in physiological signals, such as brain waves, heart rate, and eye blinking; and measuring physical changes such as sagging posture, leaning of the driver's head and the open/closed states of the eyes. The first technique, while most accurate, is not realistic, since sensing electrodes would have to be attached directly on to the driver's body, and hence be annoying and distracting to the driver.

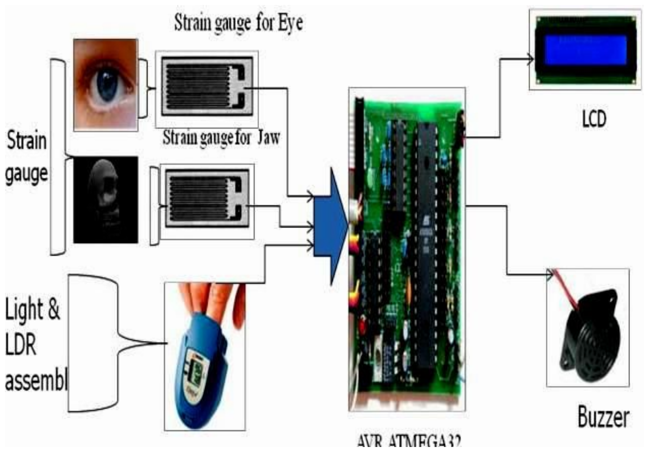
Table I: Set of action units used for predicting Fatigue

Blink/Eye closure
Outer brow raise
Lip Corner
Depressor chin
Raiser
Nose Wrinkle
Jaw
Sideway lip
Stretch Inner brow
Raise Upper Lip Raise Mouth Stretch
Lip Pucker Lip presser Tongue show

IV. DESIGN

"The proposed embedded system will used to improve the accuracy of fatigue detection as compare to existing fatigue detection system." To clarify our problem, we define requirements to detect driver's fatigue with a minimum sensor system.
1. The device should measure what it is intended to, operationally E.g. eye blinks, heart rate, jaw movement and conceptually e.g., alertness.
2. The device should monitor driver behavior in real time
3. The device should be consistent in its measurement over time, and it should measure the same event for all drivers.

4. The device should be able to operate accurately and reliably in both day time and night time illuminations conditions.
5. For devices that produce audible warnings, it should be possible to hear the auditory output under all driving conditions at a level that is not startling to the user.
6. The volume of auditory output should be adjustable over a reasonable range, approximately 50dB to 90dB.
7. The device should be able to operate accurately and reliably over the expected range of truck cab temperature, humidity and vibration conditions.
8. The device should be designed to maximize sensitivity and specificity. In other words it should minimize missed events by accurately and reliably.



V. SYSTEM ARCHITECTURE

Systems Architecture will be Consist of three essential components as shown in Figure (2), which is shown below.
1) INPUT UNIT:
Sensor can sense the behavior of user.
2) CONTROL UNIT:
For calculating, decision making and evaluation.
3) DISPLAY UNIT / OUTPUT UNIT: It is used to display the result. Buzzer is use to alert

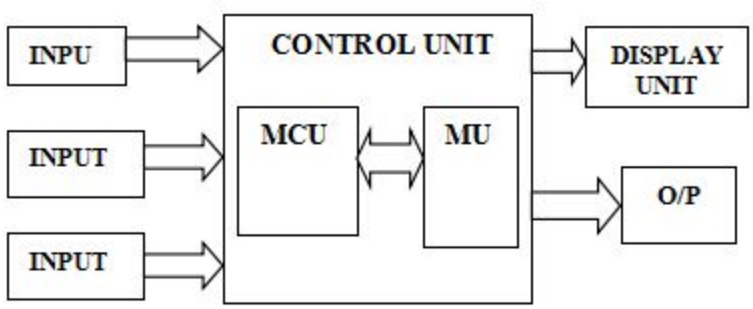


Fig 2: System architecture for proposed embedded system

In the proposed system the following pre-processing are used.
1) Signal acquisition module.
2) Pre-processing
3) Detection of fatigue

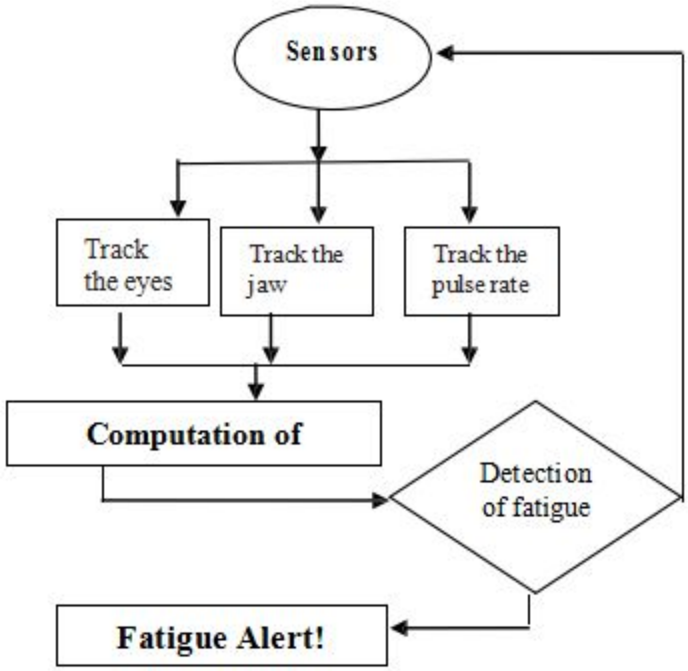


Figure 3: Flowchart for process of fatigue detection system

VI. EXISTING SYSTEM AND ITS DRAWBACK

The guidelines and criteria used to assess the potential efficacy of the Driver alertness monitoring technologies and devices relate to the functional characteristics and operational properties of the device or technology .In most cases, this list lacks the technical details necessary to be considered a functional requirements specification, Nevertheless, addressing these general user acceptance and scientific criteria is vital to ensure that any proposed device or technology is qualified for its intended purpose of monitoring, unobtrusively and in real time, driver alertness and thereby, in theory , helping to mitigate motor vehicle crashes related to driver fatigueless.

VII. COMPARISION WITH EXISTING METHOD

There is recognition technique is better than the fingerprint and face recognition techniques because of some of the inherent disadvantages of them. Some people may feel offended about placing their fingers on the same place where many other people have continuously touched. Some people have damaged or eliminated fingerprints. Fingerprint recognition performance is significantly influenced by fingertip surface condition, which may vary depending on environmental or personal causes [13]. In face recognition technique the main disadvantage is the variation of face with the age. Existing techniques for face detection in color images are plagued by poor performance in the presence of scale variation, variation in skin colors, complex backgrounds etc.

VIII. CONCLUSION

It is due to the driver's fatigue, traffic accidents keep with a yearly increasing of a high rate. This paper shows the new fatigue detection technique using strain gauge sensor. In this technique the fatigue will be detected immediately and regular alert the driver.
Through research presented in this paper, we propose a new advanced safety model that detects the driver fatigue.

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