Driver Drowsiness Detection and Alarm System

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Abstract- In recent years driver fatigue is one of the major causes of vehicle accidents in the world. A direct way of measuring driver fatigue is measuring the state of the driver i.e. drowsiness. So it is very important to detect the drowsiness of the driver to save life and property. In fact, at least 15-20% of all vehicle accidents have been estimated to be sleepiness related. This project is aimed towards developing a prototype of drowsiness detection system. [2]This system is a real time system which captures image continuously and measures the state of the eye according to the specified algorithm and gives warning if required.

Though there are several methods for measuring the drowsiness, this approach is designed so that it does not affect the driver in any way, hence giving the exact condition of the driver.

Keywords- Drowsy driving warning, Eye movement detection, EMG, ECG, Grip Force, Multi-feature fusion, Comprehensive judgment.

I. INTRODUCTION

a. Background

Drowsiness is a phenomenon which states that there is a decrease in alerts and conscious levels of the driver. There is no direct measure to detect the drowsiness but several indirect methods can be used for this purpose.

Initially in many sections different types of methods for measuring the drowsiness of the driver are mentioned which includes Vehicle based measures, Physiological measures, Behavorial measures.[5] Using those methods a system can be developed which would alert the driver in case drowsy condition and prevent accidents. Depending on advantages and disadvantages the most suitable method is chosen and proposed. Then the approach for entire system development is explained using a flow chart which includes capturing the image in real time continuously, then dividing it into frames. Then each frames are analyzed to find face first. If a face is detected, then then next task is to locate the eyes. After the positive result of detecting eye the amount of closure of eye is determined and compared with the reference values for the drowsy state of eye[7]. If drowsy condition is found out, then driver is alarmed else repeatedly the loop of finding face and detecting drowsy condition is carried out.In latter sections object detection, face detection and eye detection and eye detection is explained in detailed manner. Because face is a type of object hence a few studies on object detection is done. In face detection and eye detection different approaches for both are proposed and explained in further sections which includes Principal Component Analysis (PCA) and Eigen face approach. We know that the structure of face is complex and multidimensional. A face needs great calculating methods and techniques for recognizing it. In this my approach will treating a face as a two dimensional structure and accordingly it should be recognized. Principal Component Analysis (PCA) is used for face recognition for this context. This idea involves the projection of face images onto that particular face space. Then we encode the variation or difference among the desired known faces. Eigen face decides and defines the face space. We represent these faces as Eigen vectors.[10] These vector consists of all sets of faces. Cases of similarity with different features of our face appears like nose, Eyes, lips etc. The Eigen face approach uses the PCA for recognition of the images. The system performs by projecting pre extracted face image onto a set of face space that represents significant variations among known face images. Eigen face approach includes Eigen Values and Eigen Vectors, Face Image Representation, Mean and Mean Centered Images, Covariance Matrix, Eigen Face Space.. The hardware that is used for the entire system is Raspberry Pi.[7] [10] Hence a brief introduction on Raspberry Pi is given followed by theoretical approach in details on drowsiness detection system which includes Haar Cascade, forming Integral Image, Ada boost and Cascading. All those four above methods were used in finding the state of eyes and forming algorithm for that. Then proper code was written to implement the proposed algorithm. Raspberry Pi was set up properly for implementation. Several subjects were taken to record the response and working of the system. The opening of eyes was indicated by circular shapes. If drowsy state is detected, then circle does not appear indicating the closure of eye or drowsy state of a driver.

b. Motivation

Driver drowsiness is a significant factor in the increasing number of accidents. Many researchers have researched and came to conclusion that driver drowsiness and road accidents are connected at some point. Although it is hard to decide the exact number of accidents due to drowsiness, it cannot be unseen. The above problem statement shows the significance

of a research with the objective of reducing the dangers of accidents that occurs due to drowsiness.

c. Problem Definition

A few systems are available in the market however; they are expensive making them a reserve for a few who can afford the cost of the current vehicles fitted with search technologies. There is hence great need to provide drowsiness detection system that are affordable to the many who are low income earners and also public service vehicles to help address the many accidents associated with drowsiness. The main purpose of this project is to develop prototype Drowsiness System.

II. LITERATURE SURVEY

Ovidiu Stan et.al. Says in the paper [1] "Eye-Gaze Tracking Method Driven by Raspberry PI Applicable in Automotive Traffic Safety" that This paper comes as a response to the fact that, lately, more and more accidents are caused by people who fall asleep at the wheel. Eye tracking is one of the most important aspects in driver assistance systems since human eyes hold much in-formation regarding the driver's state, like attention level, gaze and fatigue level. The number of times the subject blinks will be taken into account for identification of the subject's drowsiness. [9]Also the direction of where the user is looking will be estimated according to the location of the user's eye gaze. The developed algorithm was implemented on a Raspberry Pi board in order to create a portable system. The main determination of this project is to conceive an active eye tracking based system, which focuses on the drowsiness detection amongst fatigue related deficiencies in driving.Kulkarni S. S. et.al. Says in the paper [2] "Application of raspberry pi based embedded system for real time protection against road accidents due to driver's drowsiness and/or drunk and drive cases" that Present work deals with the application of raspberry pi CPU based sensing system to the detection of driver's lethargy and alcoholism in order to avoid the road accidents. The embedded system consists of 5-megapixel digital camera, alcohol detection sensor and the buzzer interfaced to the microcontroller. The embedded system is controlled by Raspbian operating system. The system detects real time situation of the driver's vigilance and control over the vehicle. If alcoholic and / or drowsiness tests are positive.

III. EXISTING SYSTEM APPROACH

The existing system consists of various approaches like image processing, EEG, vehicular, vocal measures etc. Any of these approaches doesn't give 100% results [3]. The maximum result is achieved using EEG based approaches but these are intrusive in nature. Other techniques also have some limitations which don't allow them to give perfect result. Thus on the basis of our study we conclude that if we try with a combination of two or more approaches such that one can reduce the limitations of other approach and thus helps us in providing best result. This can lead us in making a harmless, less interfering and most efficient driver drowsiness detection system.[8] We can combine some image processing approaches with some vehicular measures and physiological measures. Heart rate and respiration rates can be a good example of physiological measures which are clear indicators of drowsiness. To remove the intrusive nature of physiological measures we can use wireless sensors which can be effectively fitted in seat belts, seat covers etc..

IV. PROPOSED SYSTEM APPROACH

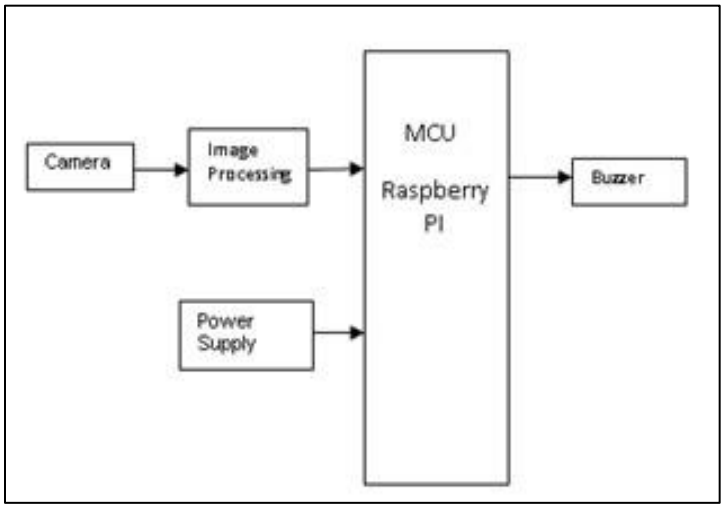

Fig.1: System Architecture Diagram of Proposed System

The most precise technique depends on human physiological measures [1]. This procedure is executed in two ways: measuring changes in physiological signs, for example, brain waves, heart rate, and eye flickering; and measuring physical changes, for example, sagging posture, inclining of the driver's head and the open/shut conditions of the eyes [1]. In spite of the fact that this procedure is most precise, it is not reasonable, since detecting electrodes would need to be put straightforward onto the driver's body, and thus be irritating and diverting to the driver. Also, long time driving would bring about sweat on the sensors, reducing their capacity to screen precisely.This approach will be mostly focusing on amount of eye closure also called (PERCLOS) percentage of closure as it provides the most accurate information on drowsiness.[6] It is also non-intrusive in nature, hence does not affect the state of the driver and also the driver feels totally comfortable with this system. Environmental factors like road condition does not affect this system.[4]The case of micro nap is also detected according the given threshold value. The development of this system includes face identification and tracking, detection and location of the human eye, human eye tracking, eye state detection, and driver fatigue testing. The

key parts of the detection framework fused the detection and location of human eyes and driver fatigue testing. The improved technique for measuring the PERCLOS estimation of the driver was to compute the proportion of the eyes being open and shut with the aggregate number of frames for a given period.

V. CONCLUSION

The main objective of this project is to allow the user to view the state of drowsiness and alarm the user about the same

VI. ACKNOWLEDGMENT

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