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Driver Drowsiness Detection System

Ambekar Shivam Nivrutti, Korde Mohan Rajaram, Patil Sagar Rajendra, Puranik Shubham Dipak, Prof. Pushpendu Biswas, Prof. Bajirao Subhash Shirole
Computer Department, Sanghavi College of Engineering, Nashik, Maharashtra, India

ABSTRACT

A Drowsy Driver Detection System has been developed, using a non-intrusive machine vision based concepts. The system uses a small monochrome security camera that points directly towards the driver's face and monitors the driver's eyes in order to detect fatigue. In such a case when fatigue is detected, a warning signal is issued to alert the driver. This report describes how to find the eyes, and also how to determine if the eyes are open or closed. The algorithm developed is unique to any currently published papers, which was a primary objective of the project. The system deals with using information obtained for the binary version of the image to find the edges of the face, which narrows the area of where the eyes may exist. Once the face area is found, the eyes are found by computing the horizontal averages in the area. Taking into account the knowledge that eye regions in the face present great intensity changes, the eyes are located by finding the significant intensity changes in the face. Once the eyes are located, measuring the distances between the intensity changes in the eye area determine whether the eyes are open or closed. A large distance corresponds to eye closure. If the eyes are found closed for 5 consecutive frames, the system draws the conclusion that the driver is falling asleep and issues a warning signal. The system is also able to detect when the eyes cannot be found, and works under reasonable lighting conditions.

Keywords: Raspberry pi, Image processing, Frames, Pi Cam, Alert.

I. INTRODUCTION

The primary purpose of the Drowsy Driver Detector is to develop a system that can reduce the number of accidents from sleep driving of vehicle. With our two monitoring steps, we can provide a more accurate detection. For the detecting stage, the eye blink sensor always monitor the eye blink moment. It continuously monitor eye blink. If the monitoring is over, the collected data will be transmitted to a microcontroller, and the microcontroller digitizes the analog data. If the warning feedback system is triggered, the microcontroller makes a decision which alert needs to be activated. The second application of this paper is to detect the alcohol content or any leakage of gas from the vehicle, once it deduct such sensation the LED light glows indicating emergency and this project also deals with temperature sensors, in case of any fire inside the vehicle the sensor senses and stops the engine. For the alert systems, we have a beeper device. The project code is developed in C language and then converted to hex code which is readable to the microcontroller.

There are 4 main factors due to which driver gets fatigue. These are sleep, work, time of day and physical condition. According to our body clock, we can do maximum work during day time and take rest (sleep) during night. Suppose the car driver works during day and travels a car during night without taking rest then, human body clock affects on him. Next is the work. The type of work (light/heavy) also affects on car driver during night. Because of heavy work, he becomes fatigue and wants rest. If he does not take proper rest and travels car then car driver becomes drowsy. And the last one is the physical condition of the car driver. If the person is weak or ill and he takes medicines then, medicines affect on his body and car driver becomes drowsy.

II. LITERATURE SURVEY

Methods for Detecting Drowsy Drivers There are various techniques that can be used to detect the drowsiness of drivers. These techniques 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. 2.2 Monitoring Physiological Characteristics Among these methods, the techniques that are best, based on accuracy are the ones based on Human physiological phenomena [5]. This technique is implemented in two ways: Measuring changes in physiological signals, such as brain waves 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 [5]. The first method, the most accurate, is not realistic, since sensing electrodes would have to be attached directly onto the driver's body, and hence be annoying and distracting the driver. In addition, long time driving would result in perspiration on the sensors, diminishing their ability to monitor accurately. The second technique is well suited for real world driving conditions since it can be non-intrusive by using optical sensors of video cameras to detect changes. 2.3 Other Methods Fixing the sensor in front of driver seat so that the sensor monitor the eye movement of the driver periodically. If the eye lid of driver is not showing any change for a period of time, the caution will be given to the driver. This sensor should be fixed in such a way that it shall sense the eye movement when the driver bends or sets erect.

III. PROPOSED SYSTEM

RASPBERRY PI BOARD Raspberry Pi (represented in Figure.2) is a credit card sized single-board computer. Generation 2 Model B also has 4 USB ports, 1 GB RAM, USB camera interface and 1HDMI interface and 40 GPIO allows us to control and interact with real world. Fig.2. Raspberry pi2 model B. We implemented system using raspberry pi2 Model B. IT has a Broadcom BCM2836 system on chip which includes an ARM1176JZF-S 900 MHz processor, Video Core IV GPU, and an SD card. The GPU is capable of Blu-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core accessed using the supplied Open GL ES2.0 and Open VG libraries. The chip specifically provides HDMI and there is no VGA support. The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl.

Eye Blink Sensor The blinking of eye is necessary in this project, since it is used to drive the device and to operate events. Eye blink detection has to be done, for which we can avail readily available blink detectors (FIG 2 & FIG 3) (Catalog No. 9008 of Enable devices) or we can incorporate it with a special instruction written in image processing that, if there is no eye lid movement found for the certain period of predetermined i.e. time greater than the human eye blinking time then consider an event called "blink", for which the set of operations will be followed. Here, in this project we need to set time as 5 second or above it, as "blink event" is different from "common eye blinking".(4) We need to conduct testing for only blink event, and not to find common blinking of human eye.

IR Sensor Infrared transmitter - a device that emits infrared rays. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed parallel to each other. The signal is given to IR transmitter whenever the signal is high, the IR sensor is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator. The comparator is connected with operational amplifier. In the comparator circuit the reference voltage is given to inverting input terminal of the circuit .The Non inverting input terminal is connected to IR receiver. When there is an interruption in the IR rays between the IR transmitter and receiver, the IR receiver becomes not conducting. So the comparator non inverting input terminal voltage is higher than inverting input. The comparator output is at the range of +5V. This voltage is given to microcontroller. When IR transmitter passes the rays to receiver, the IR receiver becomes conducting due to noninverting input voltage is lower than inverting input. Now the comparator output is GND. So the output is given to microcontroller. This circuit is mainly used to for counting eye lid movement.

IV. Methodology and Implement

Implementing an automated system to vehicles that provides high security to driver and the passengers, by designing an eye blink sensor which continuously monitor number of times the eye blinks, once when the eye blinks count decreases (that means the driver is sleepy), buzzer indication will be given and that wakes

driver from sleep. This paper involves measuring the eye blinks using IR sensor. There are two sections in IR sensor .The IR transmitter is used to transmit the infrared rays to our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed then the output of IR receiver is high otherwise the IR receiver output is low. This is to know whether the eye is at close or open position at that condition. In the transmitter section, eye blink sensor is placed near the eye to sense the blink count and this information is transmitted in the form of pulses and is given to the ARM7 Microcontroller. The ARM7 processor use this information to compare with the normal eye blink programmed in and if any abnormal situation arises, the buzzer indication is given to the driver to alert him, this operation is enabled by means of the circuit connected to the buzzer and the signal is transmitted via RF-transmitter at the frequency of 433.92 MHz's. The transmitted signal is received and the signal is decoded and given to the Microcontroller, which use this information for displaying the alert message in the LCD as programmed along with buzzer alert. When there is any leakage of gas in the vehicle the sensor sense such condition and give the signal by glowing the Emergency light. And in case of any fire inside the vehicle the temperature sensor sense the condition and stops the engine. And in case of any gas leakage the smoke sensor deducts the condition and gives the emergency light.

Algorithm The algorithm is as follows
Step1: Start process
Step2: Real-Time Images collected from Pi camera
Step3: Initial frame has been set
Step4: Frame Comparison
Step5: If face not found
Step6: Buzzer on
Step7: Else if close eye found
Step 8: Buzzer on
Step9: Normal mode
Step10: No buzzer
Step11: Else if sleeping mode
Step12: Buzzer on
Step13: Stop the process

OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel's research center in Nizhny Novgorod (Russia), it was later supported by Willow Garage and is now maintained by Its eez. The library is cross-platform and free for use under the open-source BSD license.

OpenCV is released under a BSD license and hence it's free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. Written in optimized C/C++, the library can take advantage of multi-core processing. Enabled with OpenCL, it can take advantage of the hardware acceleration of the underlying heterogeneous compute platform. Adopted all around the world, OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 9 million. Usage ranges from interactive art, to mines inspection, stitching maps on the web or through advanced robotics.

V. EXPERIMENTAL RESULTS

Figure 1: Initial Frame Detection

Figure 2: Close Eye & Face Detection

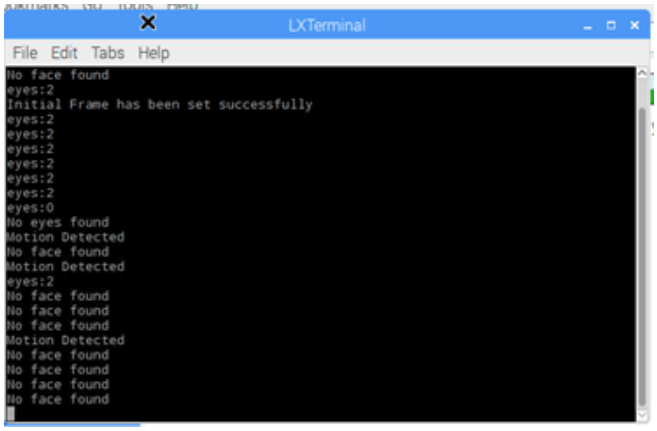

Figure 3: Operational Results

VI. CONCLUSION

Advance Vehicle Control and Safety System Using Face Detection will reduce the number of accidents and ensure driver safety. Also keyless authentication will provide car safety and reduce the number of car thefts. Using Android mobile the different vehicle functions are easily operated. Such a kind of a system for driver safety and car security is present only in the luxurious costly cars. Using Advance Vehicle Control and Safety System Using Face Detection driver security and driver safety system can be implemented in normal cars also.

VII. REFERENCES

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