

DESIGN AND IMPLEMENTATION OF DRIVER ALERT SYSTEM

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ABSTRACT

Driver's fatigue is one of the major causes of traffic accidents, particularly for drivers of large vehicles (such as cars and heavy trucks) due to prolonged driving periods and boredom in working conditions. In this work, we propose a vision-based fatigue detection system for car driver monitoring, which is easy and flexible for deployment in cars and large vehicles. The system consists of modules of face detection, eye detection, eye openness estimation, fusion, drowsiness measure percentage of eyelid closure (PERCLOS) estimation, and fatigue level classification. The core innovative techniques are as follows: 1) an approach to estimate the continuous level of eye openness based on spectral regression. 2) a fusion algorithm to estimate the eye state based on adaptive integration on the multimodal detections of both eyes. A robust measure of PERCLOS on the continuous level of eye openness is defined, and the driver states are classified on it. In experiments, systematic evaluations and analysis of proposed algorithms, as well as comparison with ground truth on PERCLOS measurements, are performed. The experimental results show the advantages of the system on accuracy and robustness for the challenging situations when a camera of an oblique viewing angle to the driver's face is used for driving state monitoring.

Keywords:Percentage of Eyelid Closure (PERCLOS) Estimation,Pulse width modulation(PWM),USB Video Class (UVC)

INTRODUCTION

Driver's fatigue is one of the major causes of traffic accidents, particularly for drivers of large vehicles (such as cars and heavy trucks) due to prolonged driving periods and boredom in working conditions. In this work, we propose a vision-based fatigue detection system for car driver monitoring, which is easy and flexible for deployment in cars and large vehicles. The system consists of modules of face detection, eye detection, eye openness estimation, fusion, drowsiness measure percentage of eyelid closure (PERCLOS) estimation, and fatigue level classification. The core innovative techniques are as follows:

- 1) An approach to estimate the continuous level of eye openness based on spectral regression
- 2) A fusion algorithm to estimate the eye state based on adaptive integration on the multimodal detections of both eyes.

A robust measure of PERCLOS on the continuous level of eye openness is defined, and the driver states are classified on it. In experiments, systematic evaluations and analysis of proposed algorithms, as well as comparison with ground truth on PERCLOS measurements, are performed. The experimental results show the advantages of the system on accuracy and robustness for the challenging situations when a camera of an oblique viewing angle to the driver's face is used for driving state monitoring[6-10].

PROPOSED SYSTEM

In the proposed system, we are going to implement this project as a driver sleep detection manner. The camera is placed in raspberry pi to capture if the driver is in sleep mode or not with the help of image processing technology. If the vehicle engine is ON but it is not accelerated, our device does not work. While acceleration is sensed device starts detecting if the driver is in sleeping condition. If sensed, the vibrator and buzzer goes ON and vehicle is slowed down by varying the duty cycle of the waveform using Pulse width modulation (PWM). The requirements specification is a technical specification of requirements for the software products. It is the first step in the requirements analysis process it lists the requirements of a particular software system including functional, performance and security requirements. The requirements also provide usage scenarios from a user, an operational and an administrative perspective. The purpose of software requirements specification is to provide a detailed overview of the software work, its parameters and goals. This describes the project target audience and its user interface, hardware and software requirements. It defines how the client, team and audience see the project and its functionality shown in fig 1.

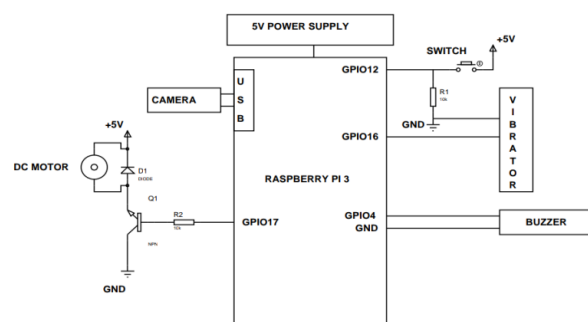


Figure 1 block diagram

USB CAMERA



Figure 2 USB Camera

An USB camera is a small digital video camera directly or indirectly connected to a computer or a computer network. Webcams come with software that needs to be installed on the computer to help users record video on or stream it from the Web. Webcams are capable of taking pictures as well as high-definition videos, although the video quality can be lower compared to other camera models. This documentation describes product specifications to ensure design to meet customer's requirements .AH5020B23-S1-2Z1 is an USB Video Class (UVC) compliant camera module with video feature, designed for portable notebook PC image applications. It is made up of the following components, CMOS sensor, lens, holder, backend, PCB, imageprocessing circuit and connector, to come out a digital video device. It shall be a reliable device which is embedded in notebook PC to transfer video data through USB interface to notebook PC.AH5020B23-S1-2Z1 not only offers up to UXGA resolution (1600X1200) for image applications to take still image, but also offers video stream for end user to preview/record motion image through USB 2.0 interface. It can support VGA (640x480) resolution up to 30 fps at YUY2 mode.AH5020B23-S1-2Z1 builds in AE, AWB and AGC for automatic image control supported by CMOS sensor. For image quality control, it also offers UVC standardized User Interface (UI) to let end user well tune image by property pageshown in fig 2.

RASPBERRY PI



Figure 3. Raspberry pi

The purpose of this datasheet is to provide documentation for these peripherals in sufficient detail to allow a developer to port an operating system to BCM2837. There are

number of peripherals which are intended to be controlled by the GPU. These are omitted from this datasheet. Accessing these peripherals from the ARM is not recommended shown in fig 3.

ARM virtual addresses (standard Linux kernel only)

As is standard practice, the standard BCM2837 Linux kernel provides a contiguous mapping over the whole of available RAM at the top of memory. The kernel is configured for a 1GB/3GB split between kernel and user-space memory. The split between ARM and GPU memory is selected by installing one of the supplied start*.elf files as start*.elf in the FAT32 boot partition of the SD card. The minimum amount of memory which can be given to the GPU is 32MB, but that will restrict the multimedia performance; for example, 32MB does not provide enough buffering for the GPU to do 1080p30 video decoding. Virtual addresses in kernel mode will range between 0xC0000000 and 0xEFFFFFFF. Virtual addresses in user mode (i.e. seen by processes running in ARM Linux) will range between 0x00000000 and 0xBFFFFFFF. Peripherals (at physical address 0x20000000 on) are mapped into the kernel virtual address space starting at address 0xF2000000. Thus a peripheral advertised here at bus address 0x7Ennnnnn is available in the ARM kernel at virtual address 0xF2nnnnnn.

Bus addresses

The peripheral addresses specified in this document are bus addresses. Software directly accessing peripherals must translate these addresses into physical or virtual addresses, as described above. Software accessing peripherals using the DMA engines must use bus addresses. 1 BCM2837 provides a 128KB system L2 cache, which is used primarily by the GPU. Accesses to memory are routed either via or around the L2 cache depending on senior two bits of the bus address. Software accessing RAM directly must use physical addresses (based at 0x00000000). Software accessing RAM using the DMA engines must use bus addresses (based at 0xC0000000) shown in fig 4.

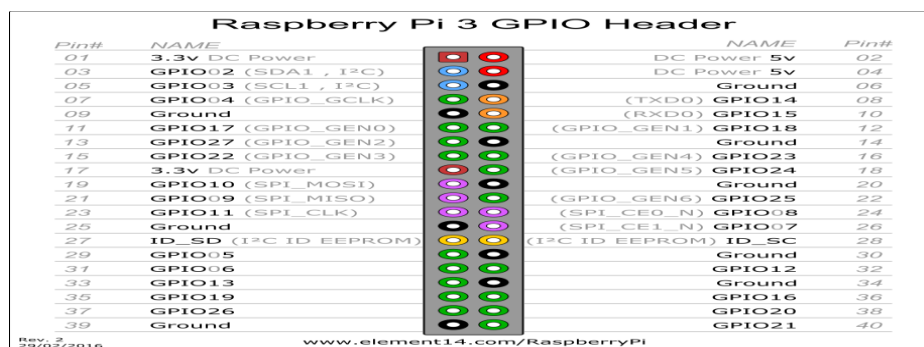


Figure 4. Raspberry Pi Pin Diagram

DC Motor

Geared DC motors can be defined as an extension of DC motor. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the

shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor shown in fig 5 .

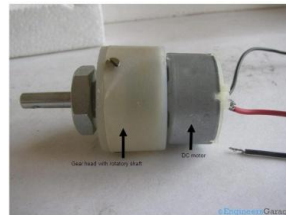


Figure 5 External structure of a DC geared motor

The lateral view of the motor shows the outer protrudes of the gear head. A nut is placed near the shaft which helps in mounting the motor to the other parts of the assembly shown in fig 6.

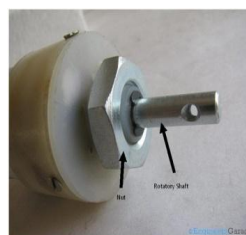


Figure 6. Lateral view of DC geared motor

Also, an internally threaded hole is there on the shaft to allow attachments or extensions such as wheel to be attached to the motor. The outer body of the gear head is made of high density plastic but it is quite easy to open as only screws are used to attach the outer and the inner structure. The major reason behind this could be to lubricate gear head from time to time. The plastic body has a threading through which nut can be easily mounted and vice versa from the gear head. The rear view of the geared motor is similar to the DC motor and it has two wires soldered to it shown in fig 7.

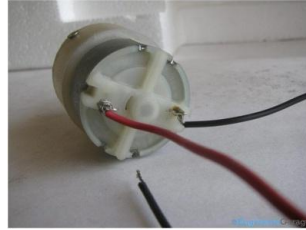


Figure 7. Rear view



Figure 8. Figure head

In a geared DC motor, the gear connecting the motor and the gear head is quite small, hence it transfers more speed to the larger teeth part of the gear head and makes it rotate. The larger part of the gear further turns the smaller duplex part. The small duplex part receives the torque but not the speed from its predecessor which it transfers to larger part of other gear and so on. The third gear's duplex part has more teeth than others and hence it transfers more torque to the gear that is connected to the shaft shown in fig 8 & 9 .

Flow chart

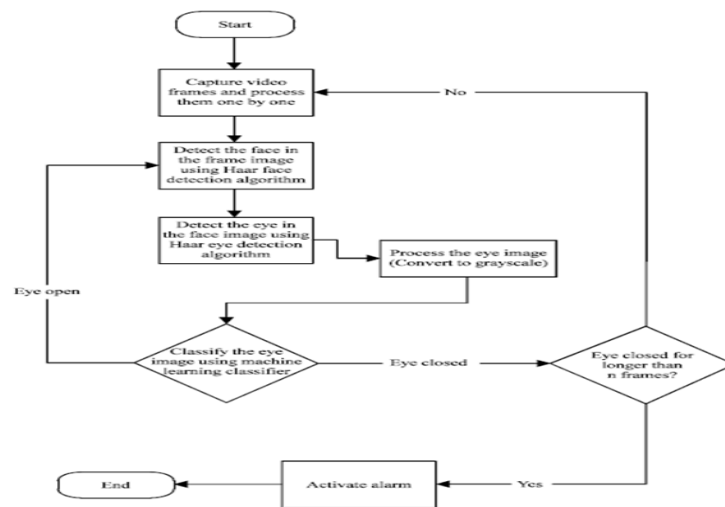


Figure 9. Flow chart

EXPERIMENTAL RESULTS

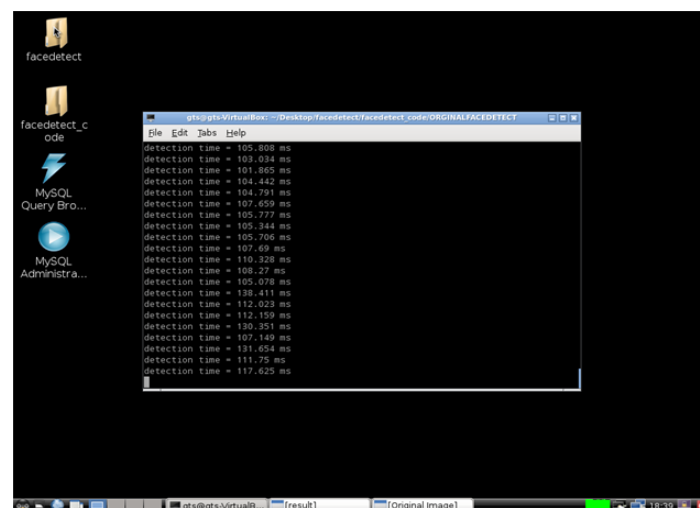


Figure 10 Result 1

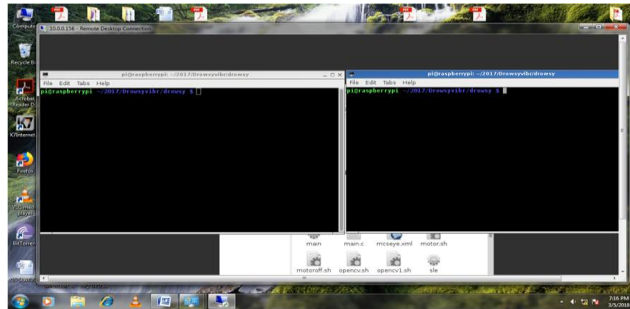


Figure 11 Result 2

A wearable vibrator can be implemented for alerting the driver. An alert message can be given to the cab managers (e.g. OLA, UBER) along with the pulse rate of the driver to enable the person in charge be aware of the condition of the driver thereby enhancing the safety of the rider shown in fig 10&11

Conclusion

The analysis and design of driver drowsiness detection and alert system is presented. The proposed system is used to avoid various road accidents caused by drowsy driving. And also this system used for security purpose of a driver to caution the driver if any fire accident or any gas leakage. This work involves avoiding accident due to unconsciousness through Eye blink.

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