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# Design and Development of Drivers Behavior Monitoring and Alerting System

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**Abstract:** Distracted driving is one of the main causes of vehicle collisions in the United States. Passively monitoring a driver's activities constitutes the basis of an automobile safety system that can potentially reduce the number of accidents by estimating the driver's focus of attention. This paper proposes an inexpensive vision-based system to accurately detect Eyes Off the Road (EOR). The system has three main components: 1) robust facial feature tracking; 2) head pose and gaze estimation; and 3) 3-D geometric reasoning to detect EOR. From the video stream of a camera installed on the steering wheel column, our system tracks facial features from the driver's face. Using the tracked landmarks the system computes head pose and gaze direction. Automated estimation of the allocation of a driver's visual attention may be a critical component of future Advanced Driver Assistance Systems. In theory, vision-based tracking of the eye can provide a good estimate of gaze location. In practice, eye tracking from video is challenging because of sunglasses, eyeglass reflections, lighting conditions, occlusions, motion blur, and other factors. Estimation of head pose, on the other hand, is robust to many of these effects, but cannot provide as fine-grained of a resolution in localizing the gaze. However, for the purpose of keeping the driver safe, it is sufficient to partition gaze into regions.

**Keywords:** USB Camera, Raspberry Pi.

## I. INTRODUCTION

Driver distractions are the leading cause of most vehicle Crashes and near-crashes. According to a study Released by the national highway traffic safety administration and the Virginia tech transportation institute [6], 80% of crashes and 65% of near-crashes involve some form of driver distraction. In addition, distractions typically occurred within three seconds before the vehicle crash. Recent reports have shown that from 2011 to 2012, the number of people injured in vehicle crashes related to distract driving has increased 9% [1]. In 2012 alone, 3328 people were killed due to distracted driving crashes, which is a slight reduction from the 3360 in 2011. Distracted driving is defined as any activity that could divert A person's attention away from the primary task of driving. Distractions include texting, using a smart phone, eating and drinking, adjusting a CD player, operating a gps system or Talking to passengers. This is particularly challenging nowadays, where a wide Spectrum of technologies have been introduced into the car Environment. Consequently, the cognitive load caused by secondary Tasks that drivers have to manage has increased over the years, hence increasing distracted driving. According to A survey [10], performing a high cognitive load task while Driving affects driver visual behavior and driving performance. We propose a method for exploiting the correspondence between drivers' eye and head movement. These two variables have been shown to be correlated but in complex ways that vary by operational mode (parked vs moving), location of focus and other extrinsic and individual characteristics [5]. In terms of utilizing head pose data as part of a gross distraction detection system, [6] showed that the farther off-axis the focus point is (a conceptual overlap with reduced likelihood of adverse event detection), the more likely that a glance will be accompanied by a head movement. We show that even small shifts in facial configuration is sufficiently distinct for a classifier to accurately disambiguate head pose into one of six gaze regions.

## II. HARDWARE SYSTEM

We can overcome the disadvantage of the existing method by improving system prototype is built on the base of one embedded platform ARM which controls all the processes. Experimental results illuminate the validity of this car security system. In this proposed embedded car security system, IRS (Iris recognition System) i**s** used to detect the iris of the driver and compare it with the predefined iris. For example, in the night when the car's owner is sleeping and someone theft the car then IRS obtains images by one tiny web camera which can be hidden in the car. IRS compares the obtained image with the predefined images if the image doesn't match, then the information is sent to the owner through SMS. So now owner can obtain the alert of the thief in his mobile as well as. In the above proposed system is developed to monitor the driver condition and provide accident occurrence information to the owner/ guardian of the vehicle. In the system, the MEMS sensor gives the information about the head movement of the driver as shown in Fig.1. Whenever the driver feels drowsy he nodes his head continuously. This movement is observed by the MEMS sensor and given to the controller.

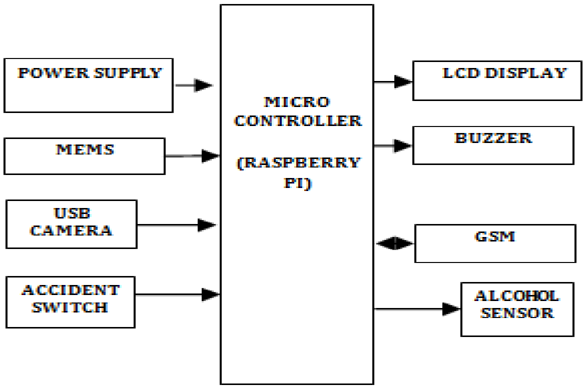


**Fig.1. Block diagram.**

The alcohol sensor senses the amount of alcohol consumed by the driver and displays on the LCD. If the driver over drinks and drives, the buzzer will be raised. The USB camera captures the images of the eyes and if the eye is closed it will raise buzzer indicating the driver is feeling sleepy. The accident present in the circuit will identify the accident occurrence and sends a message to the user about the accident occurrence. In this way the above system provides information about accident occurrence and driver conditions.

## III. METHODOLOGY

**Micro Controller:** This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

**Raspberry Pi:** Raspberry Pi is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

**Liquid-Crystal Display (LCD):** is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

### A. GSM

Global System for Mobile Communication (GSM) is a set of ETSI standards specifying the infrastructure for a digital cellular service as shown in Fig.2. The network is structured into a number of discrete sections:

- Base Station Subsystem – the base stations and their controllers explained
- Network and Switching Subsystem – the part of the network most similar to a fixed network, sometimes just called the "core network"
- GPRS Core Network – the optional part which allows packet-based Internet connections
- Operations support system(OSS)–network maintenance

SM was intended to be a secure wireless system. It has considered the user authentication using a pre-shared key and challenge-response, and over-the-air encryption. However, GSM is vulnerable to different class of attacks, each of them aiming a different part of the network.

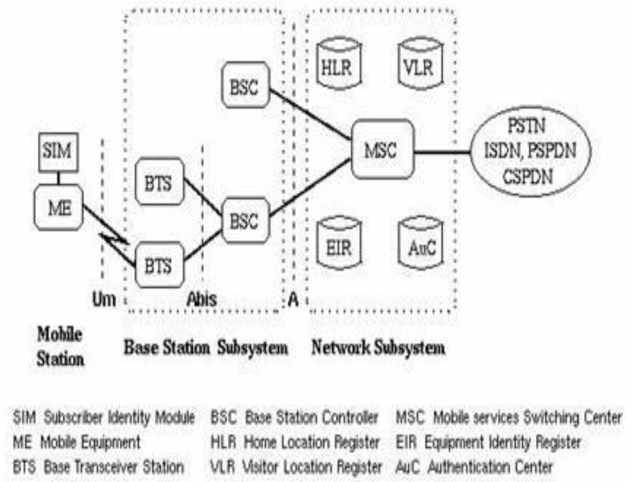


**Fig.2. GSM architecture.**

### B. MEMS

Micro- Electro- Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible "micromachining" processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices. MEMS promises to revolutionize nearly every product category by bringing together silicon-based microelectronics with micromachining technology, making possible the realization of complete systems-on-a-chip. MEMS is an enabling technology allowing the development of smart products, augmenting the computational ability of microelectronics with the perception and control capabilities of micro sensors and micro actuators and expanding the space of possible designs and applications. Microelectronic integrated circuits can be thought of as the "brains" of a system and MEMS augments this decision-making capability with "eyes" and "arms", to allow micro systems to sense and control the environment. Sensors gather information from the environment through measuring mechanical, thermal, biological, chemical, optical, and magnetic phenomena. The electronics then process the information derived from the sensors and through some decision making capability direct the actuators to respond by moving, positioning, regulating, pumping, and filtering, thereby controlling the environment for some desired outcome or purpose. Because MEMS devices are manufactured using batch fabrication techniques similar to those used for integrated circuits, unprecedented levels of functionality, reliability, and sophistication can be placed on a small silicon chip at a relatively low cost as shown in Fig.3.


**Fig.3.MEMS IC.**

**C. Buzzer**

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave ovens, & game shows. The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep as shown in Fig.4. The "Piezoelectric sound components" introduced herein operate on an innovative principle utilizing natural oscillation of piezoelectric ceramics. These buzzers are offered in lightweight compact sizes from the smallest diameter of 12mm to large Piezo electric sounders. Today, piezoelectric sound components are used in many ways such as home appliances, OA equipment, audio equipment telephones, etc. And they are applied widely, for example, in alarms, speakers, telephone ringers, receivers, transmitters, beep sounds, etc.

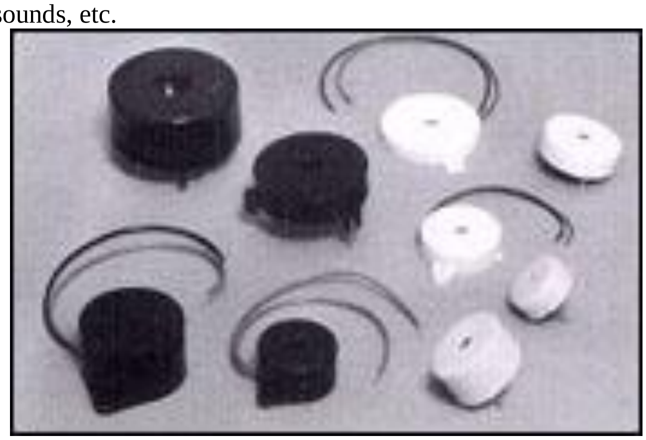

**Fig.4. Types of Buzzers**.

**D. WEBCAM**

"Webcam" refers to the technology generally; the first part of the term ("web-") is often replaced with a word describing what can be viewed with the camera, such as a netcam or streetcam. Webcams are video capturing devices connected to computers or computer networks, often using USB or, if they connect to networks, Ethernet or Wi-Fi. They are well-known for low manufacturing costs and flexible applications. Video capture is the process of converting an analog video signal—such as that produced by a video camera or DVD player—to digital form. The resulting digital data are referred to as a digital video stream, or more often, simply video stream. This is in contrast with screen casting, in which previously digitized video is captured while displayed on a digital monitor as shown in Fig.5. Webcams typically include a lens, an image sensor, and some support electronics. Various lenses are available, the most common being a plastic lens that can be screwed in and out to set the camera's focus. Fixed focus lenses, which have no provision for adjustment, are also available. Image sensors can be CMOS or CCD, the former being dominant for low-cost cameras, but CCD cameras do not necessarily outperform CMOS-based cameras in the low cost price range. Consumer webcams are usually VGA resolution with a frame rate of 30 frames per second. Higher resolutions, in mega pixels, are available and higher frame rates are starting to appear.


**Fig.5. Webcam.**

The video capture process involves several processing steps. First the analog video signal is digitized by an analog-to-digital converter to produce a raw, digital data stream. In the case of composite video, the luminance and chrominance are then separated. Next, the chrominance is demodulated to produce color difference video data. At this point, the data may be modified so as to adjust brightness, contrast, saturation and hue. Finally, the data is transformed by a color space converter to generate data in conformance with any of several color space standards, such as RGB and YCbCr. Together, these steps constituted video decoding, because they "decode" an analog video format such as NTSC or PAL. Support electronics are present to read the image from the sensor and transmit it to the host computer. The camera pictured to the right, for example, uses a Sonix SN9C101 to transmit its image over USB. Some cameras - such as mobile phone cameras use a CMOS sensor with supporting electronics.

**Features:**

- Smallest wireless video & audio camera
- Wireless transmission and reception
- High sensitivity
- Easy installation & operation
- Easy to conceat
- Light weight
- Low power consumption
- Small size

**Specifications:**

- Output frequency: 900MHZ 1200MHZ
- Output power: 50mW 200mW
- Power supply: DC +6~12v
- Distance covered: 10m

### E. Alcohol Sensor

Sensitive material of MQ-3 gas sensor is SnO2, which with lower conductivity in clean air. When the target alcohol gas exist, the sensor's conductivity is higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapor as shown in Fig.6. The sensor could be used to detect alcohol with different concentration; it is with low cost and suitable for different application.

**Fig.6. Alcohol sensor.**

## IV. CONCLUSION

Secured and safety environment system to reduce the complexity and improve security, also much cheaper and 'smarter' than traditional once. Three are the main novelties of the proposed system. Robust face landmark tracker based on the supervised descent Method.

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