PREVENTION OF ACCIDENTS DUE TO DROSINESS USING MEMS SENSORS

[1] R Venkateswarlu,
[1]Associate Professor,
[1]ECE Department,
[1]Narayana Engineering College, Nellore,AP, INDIA

[2]C. Leela Mohan,
[2]Associate Professor,
[1]ECE Department
[1]Narayana Engineering College, AP, Nellore, INDIA

Abstract: This system provides a unique method to cur drunken and drowsy people. This system has an alcohol sensor and eye blinking sensor embedded in the vehicles. Whenever the driver start vehicle, the sensors senses the eye blink and measures the content of alcohol his breathe and automatically sends the signal to buzzer, GSM and LCD. In this system the outputs of sensors are given to the microcontroller for comparison. If the value reaches to fixed limit then automatically GSM will send the sms, buzzer will produces sound and LCD will display the message.

IndexTerms **– ARM7 LPC2148, GSM, MQ-135 Gas Sensor**

I INTRODUCTION

This paper involves measure and controls the eye blink & alcohol content using IR sensor & alcohol detector. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position. Alcohol detector detects the content of alcohol in the breath and thus it attempts to clamp down alcoholics. This system used microcontroller, LCD display, alcohol detector, GSM and buzzer. The output of the sensor is directly proportional to the content of alcohol consumed. This output is given to logic circuit to indicate the alarm. This paper involves controlling accident due to unconscious through eye blink & alcohol detector. Here one Eye blink sensor and alcohol detector is fixed in vehicle where if anybody loses conscious and indicate through alarm, LCD and GSM. The circuit has an alcohol sensor. This sensor measures the content of alcohol from the breath of drunken people. Output of the sensor is directly proportional to the alcohol content. When the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide in the sensor, ethanol burns into acetic accident then more current is produced. So the more alcohol molecules more will be the current produced. Output of the sensor is then fed to the microcontroller for comparison. The output of the sensors is in the analog nature which should be converted into digital format. This is done by the analog to digital converter of the microcontroller unit. The microcontroller controls the entire circuit. The LCD displays the message, GSM sends message and buzzer produces alarm. The working conditions and various constraints were properly studied before carrying out further steps.

1.1 Introduction to Embedded systems

An embedded system is a system which is going to do a predefined specified task is the embedded system and is even defined as combination of both software and hardware. A general-purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. "Embedded" reflects the fact that they are an integral part of the system. At the other extreme a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious.

All embedded systems are including computers or microprocessors. Some of these computers are however very simple systems as compared with a personal computer.

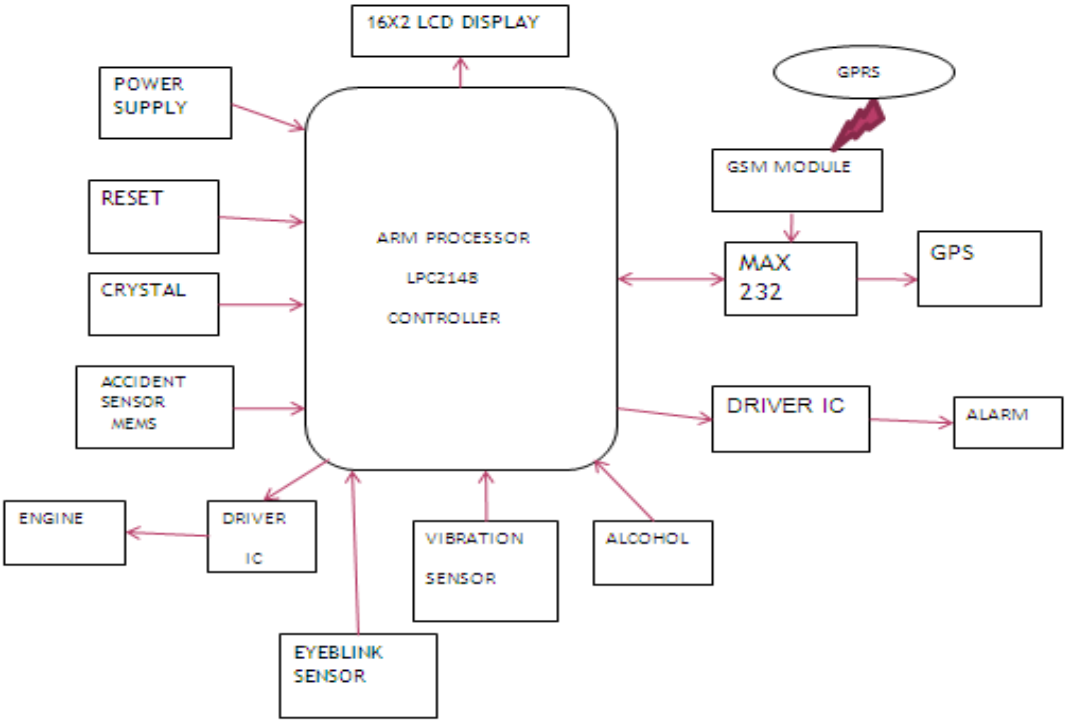

Figure1: Block diagram of Prevention Of Accidents Due To Drosiness Using Mems Sensors

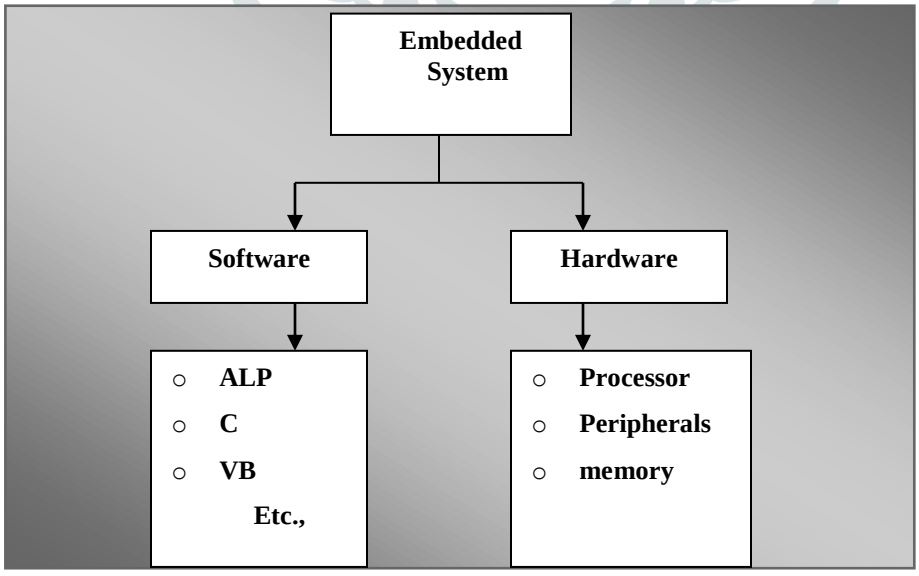

Figure 2: Block diagram of Embedded System

Memory: It is used to store data or address.

Peripherals: These are the external devices connected

Processor: It is an IC which is used to perform some task

Applications of embedded systems

- Manufacturing and process control
- Construction industry
- Transport
- Buildings and premises
- Domestic service
- Communications
- Office systems and mobile equipment
- Banking, finance and commercial
- Medical diagnostics, monitoring and life support
- Testing, monitoring and diagnostic systems

Processors are classified into four types like:

- Micro Processor (µp)
- Micro controller (µc)
- Digital Signal Processor (DSP)
- Application Specific Integrated Circuits (ASIC)

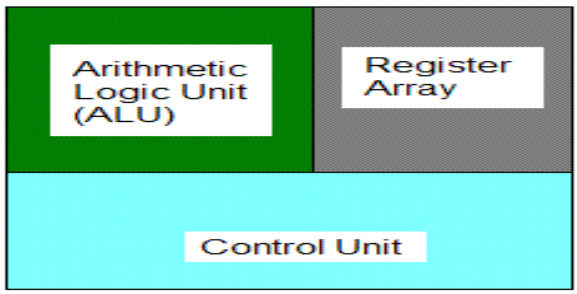

Figure 3: Three Basic Elements of a Microprocessor

1.2 ARM7 LPC2148

The **ARM7 LPC2148 development board 8051 board** is specifically designed to help students to master the required skills in the area of embedded systems. The kit is designed in such way that all the possible features of the microcontroller will be easily used by the students. The kit supports in system programming (ISP) which is done through serial port.

NXP's **ARM7 LPC2148 development board 8051 board** is proposed to smooth the progress of developing and debugging of various designs encompassing of High speed 32-bit **Microcontrollers**.

FEATURES OF LPC2148:

- MCU:LPC2148 16/32 bit ARM7TDMI-S ™ with 512K Bytes program Flash, RAM,USB 2.0,RTC,10 bit ADC 2.44 uS,2x I2C, SPI, 2x 32 bit TIMERS,6x PWM, 8x, CCR, 1x DAC, WDT, 5V tolerance I/o, up to

60MHz operation standard JTAG connector with ARM 2x10 pin layout for programming/debugging with ARM-JTAG

- USB connector.
- Two channel RS232 interface and drivers.
- Two buttons Reset and ISP.
- Two status LEDs.
- On board Voltage regulator 3.3v with up to 800mA current.
- Single power supply:12v AC or DC required.
- Power supply LED.
- Power supply filtering capacitor.
- RESET circuit with exterman control of Philips ISP utility via RS232
- RESET button
- DBG,BSL slide switch
- 12 Mhz crystal on socket.
- 32768 Hz crystal and RTC backup battery connector.
- Extension headers for all UC ports.

INPUT/OUTPUT PORTS (GPIO of LPC2148)

Understanding what is IO Ports and how to use them is very important. It's because when we see micro chip, we'll find a black box i.e. IC with some pins. LPC2148 has two IO ports each of 32-bit wide, provided by 64 IO pins. Ports are named as P0 and P1. Pins of each port labeled as **Px.y** where "**x**" stands for port number, 0 or 1. Where "**y**" stands for pin number usually between 0 to 31. Each pin can perform multiple functions. For example: Pin no.1 which is P0.21 serves as GPIO as well as PWM5, AD1.6 (A/D converter1, input 6), CAP1.3 (Capture input for Timer1, Channel 3).

CONFIGURE GPIO in LPC2148:

The first thing to learn while programming LPC2148 is how to conFigure GPIO Pins? Let's start with the associated concepts and registers.

PORT PINS	TYPE	DESCRIPTION
P0.0-P0.31 P1.16-P1.31	Input/output	General purpose input/output. The number of GPIOs actually available depends on the use of alternate functions.

II L293D H-BRIDGE:

Common DC gear head motors need current above 250mA. There are many integrated circuits like ATmega16 Microcontroller, 555 timers IC. But, IC 74 series cannot supply this amount of current. When the motor is directly connected to the o/p of the above ICs then, they might damage. To overcome this problem, a motor control circuit is required, which can act as a bridge between the above motors and ICs (integrated circuits). There are various ways of making H-bridge motor control circuit such as using transistor, relays and using L293D/L298.

L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction. It means, by using a L293D IC we can control two DC motors. As well, this IC can drive small and quiet big motors.

This L293D IC works on the basic principle of H-bridge, this motor control circuit allows the voltage to be flowing in any direction. As we know that the voltage must be change the direction of being able to rotate the DC motor in both the directions. Hence, H-bridge circuit using L293D ICs are perfect for driving a motor. Single L293D IC consists of two H-bridge circuits inside which can rotate two DC motors separately. Generally, these circuits are used in robotics due to its size for controlling DC motors.

Figure 4:L293d IC

2.1 H-Bridge Circuit

A H bridge is an electronic circuit that allows a voltage to be applied across a load in any direction. H-bridge circuits are frequently used in robotics and many other applications to allow DC motors to run forward and backward. These motor control circuits are mostly used in different converters like DC-DC, DC-AC, AC-AC converters and many other types of power electronic converters. In specific, a bipolar stepper motor is always driven by a motor controller having two H-bridges.

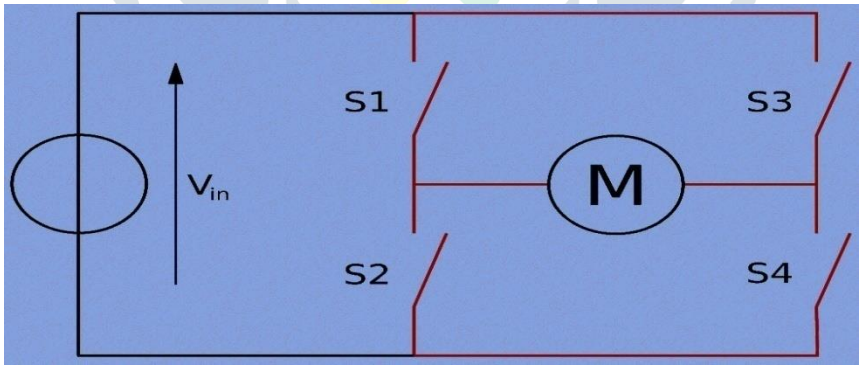

Figure 5: H-Bridge Circuit

A H-bridge is fabricated with four switches like S1, S2, S3 and S4. When the S1 and S4 switches are closed, then a +ve voltage will be applied across the motor. By opening the switches S1 and S4 and closing the switches S2 and S3, this voltage is inverted, allowing invert operation of the motor. Generally, the H-bridge motor driver circuit is used to reverse the direction of the motor and also to break the motor. When the motor comes to a sudden stop, as the terminals of the motor are shorted. Or let the motor run free to a stop, when the motor is

detached from the circuit. The table below gives the different operations with the four switches corresponding to the above circuit.

S1	S2	S3	S4	Operation
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes
1	0	1	0	Motor brakes
1	1	0	0	Short Power Supply
0	0	1	1	Short Power Supply
1	1	1	1	Short Power Supply

Table1: Operation of the H-Bridge

2.2 BUZZER:

A **buzzer** or **beeper** is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

Figure 6:BUZZER

2.3 POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

III GSM:

GSM is a digital mobile telephony system GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. Global System for Mobile communication (GSM) is digital cellular system used for mobile devices. It is an international standard for mobile which is widely used for long distance communication. There are various GSM modules available in the market like SIM900, SIM700, SIM800, SIM808, SIM5320 etc.

SIM900A module allows users to send/receive data over GPRS, send/receive SMS and make/receive voice calls. The GSM/GPRS module uses UART communication to communicate with microcontroller or PC terminal. AT commands are used to conFigure the module in different modes and to perform various functions like calling, posting data to a site, etc.

Figure 7: GSM

- Assemble GSM Antenna to the modem
- Connect serial cable to the modem.
- Give power supply in between 4.5V to 12V through the power jack provided
- Default factory Baud rate is 9600
- When the modem is successfully powered-up, the Red LED on the modem (PWR) will be ON, the STS LED (GREEN) will light after 1-2 seconds and the NET LED (BLUE) will blink every second. After the Modem registers in the network (takes between 10-60 seconds), this LED will blink in step of 3 .

3.1 INTERFACING GSM WITH MICROCONTROLLER:

The following Figure shows how to interface the GSM with microcontroller. The GSM is communicating the microcontroller with mobile phones through **UART**. To communicate over **UART** or **USART**, we just need three basic signals which are namely, RXD (receive), TXD (transmit), GND (common ground).

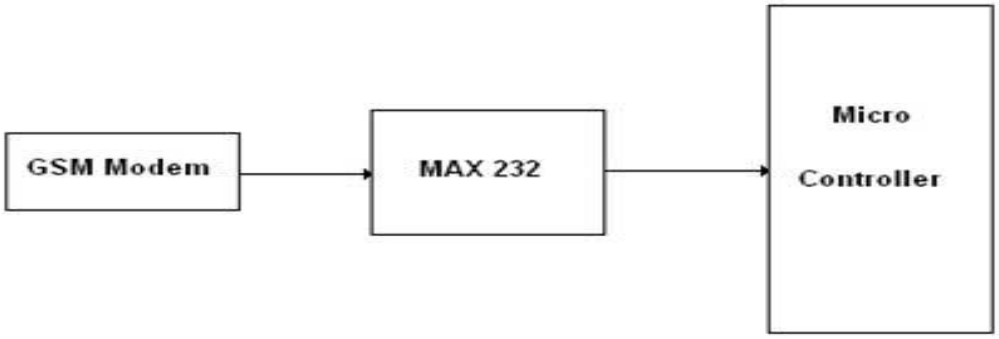

Figure8*:* Interfacing UART to Microcontroller

Text message may be sent through the modem by interfacing only three signals of the serial interface of modem with microcontroller i.e., TxD, RxD and GND. In this scheme RTS and CTS signals of serial port interface of GSM Modem are connected with each other. The transmit signal of serial port of microcontroller is connected with transmit signal (TxD) of the serial interface of GSM Modem while receive signal of microcontroller serial port is connected with receive signal (RxD) of serial interface of GSM Modem. The SMS message in text mode can contain only 140 characters at the most. It depends upon the amount of information collected from GPS Engine that you need at the base station for tracking vehicle or person.

IV SENSOR

What is an Alcohol Sensor

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers.

4.1 MQ-135 Gas Sensor

The MQ-135 gas sensor senses the gases like ammonia nitrogen, oxygen, alcohols, aromatic compounds, sulfide and smoke. The boost converter of the chip MQ-3 gas sensor is PT1301. The operating voltage of this gas sensor is from 2.5V to 5.0V. The MQ-3 gas sensor has a lower conductivity to clean the air as a gas sensing material. In the atmosphere we can find polluting gases, but the conductivity of gas sensor increases as the concentration of polluting gas increases. MQ-135 gas sensor can be implementation to detect the smoke, benzene, steam and other harmful gases. It has potential to detect different harmful gases. The MQ-135 gas sensor is low cost to purchase. The basic image of the MQ-135 sensor is shown in the below Figure.

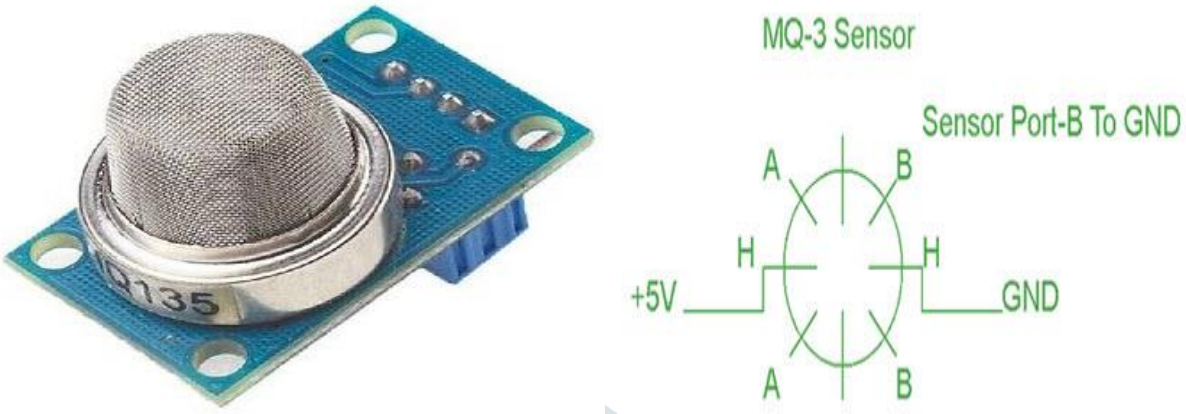

Figure 9: MQ-135 Gas Sensor

Basic Pin Configuration of Alcohol Sensor

The MQ-3 alcohol gas sensor consists of total 6-pins including A, H, B and the other three pins are A, H, B out of the total 6-pins we use only 4 pins. The two pins A, H are used for the heating purpose and the other two pins are used for the ground and power. There is a heating system inside the sensor, which is made up of aluminum oxide, tin dioxide. It has heat coils to produce heat, and thus it is used as a heat sensor.

Working Principle and Circuit Diagram

The MQ-135 alcohol sensor consists of a tin dioxide (SnO2), a perspective layer inside aluminum oxide micro tubes (measuring electrodes) and a heating element inside a tubular casing. The end face of the sensor is enclosed by a stainless steel net and the back side holds the connection terminals. Ethyl alcohol present in the breath is oxidized into acetic acid passing through the heat element. With the ethyl alcohol cascade on the tin dioxide sensing layer, the resistance decreases. By using the external load resistance the resistance variation is converted into a suitable voltage variation. The circuit diagram and the connection arrangement of an MQ 135 alcohol is shown below.

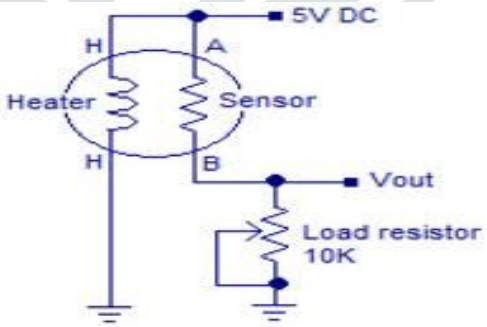

Figure10: MQ-135 Circuit Diagram

- Sensitive for benzene, alcohol, smoke
- Output voltage boosts along with the concentration of the measured gases increases
- Fast response and recovery
- Adjustable sensitivity
- Signal output indicator

- Specifications.
- Power: 2.5V ~ 5.0V
- Dimension: 40.0mm * 21.0mm
- Mounting holes size: 2.0mm
- In the case of working with a MCU:
- VCC ↔ 2.5V ~ 5.0V
- GND ↔ power supply ground
- AOUT ↔ MCU.IO (analog output)
- DOUT ↔ MCU.IO (digital output)
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4.2 EYEBLINK SENSOR

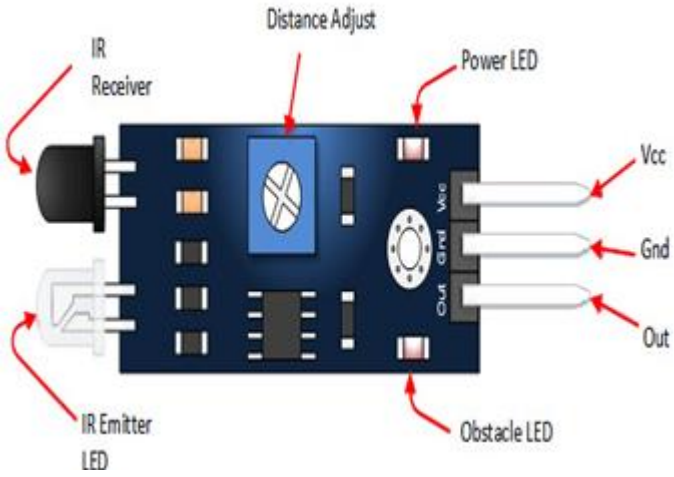

Figure11: Eyeblink sensor

It involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position. This output is give to logic circuit to indicate the alarm.

This paper helps in controlling accidents due to unconsciousness through Eye blink. Here one eye blink sensor is fixed in vehicle where if driver looses consciousness, then it is indicate through alarm. A car simulator study was designed to collect physiological data for validation of this technology. Methodology for analysis of physiological data, independent assessment of driver drowsiness and development of drowsiness detection algorithm by means of sequential fitting and selection of regression models is presented.

V WORKING PROCEDURE:

- The eye-blink sensor illuminates the eye with infrared light, monitoring the changes in the reflected light.
- The sensor output is active high for eye close and can b given directly to microcontroller for interfacing applications.
- When this output remains high for a specific time period say 10sec, the driver is taken to be asleep.
- Consequently a buzzer is activated in order to wake the driver.
- The motor of the vehicle is sowed down through a relay switch so as to prevent impending accident.

VI ADVANTAGES:

- This method of analyzing on detecting the presence of alcohol in breath is relatively a quick analysis as compared to other technologies.
- The sensors used in this project are similar in size, not so bulky, hence can be carried.
- The project based on this technology is self sufficient within itself and thus can be used as a safety system for any vehicle and the human being driving it by preventing the accidents to occur.
- The system isn't police department.
- In case if we drunk, our family members will drive us safely in that case. Also unauthorized access to the car and rash driving is not possible.

VII RESULTS:

The drowsiness level detection through eye and processing the image from spectacle with actual level using image processing. The consumption of alcohol by the driver is identified & alerted through buzzer and LCD. The automatic parking controls of vehicle corresponding to the level of drowsiness detected.

VII CONCLUSION:

This is because of the fact that the driver is not able to control his vehicle when he is asleep and by the time he realizes it, there is an accident. The vehicle is at very high speed on highways due to which handling is tough and getting the vehicle t halt in such a condition is difficult. Due to this many automobile companies are trying to research onto how an accident which occurs due to driver fatigue can be prevented. In this project we will generate a model which can prevent such an incident.

The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. This project involves measure and controls through alcohol sensor and eye blink using IR sensor.

VIII FUTURE SCOPE:

- This is extended with alcoholic detection also.
- If the person took alcohol who is driving then the vehicle will be stopped immediately by giving alarm

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