A Project Report On

AUTOMATIC DETECTION OF DRIVER IMPAIRMENT BASED ON PUPILLARY LIGHT REFLEX

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IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted By

O.JYOTHI SAI	(19AP1A0423)
G.SAMUEL RAJU	(20AP5A0405)
S.DURGA PRASANNA	(19AP1A0429)
M.TEJA KRISHNA	(19AP1A0416)

Under The Esteemed Guidance of

MAHESH.GUDIVAKA, M.Tech

Assistant Professor, ECE

2019-2023

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

BHIMAVARAM INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by A.I.C.T.E & Affiliated to JNTU, Kakinada)Pennada,

Bhimavaram-534243, West Godavari Dt., A.P

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(Approved by A.I.C.T.E & Affiliated to JNTU, Kakinada) Pennada, Bhimavaram-534243, West Godavari Dt., A.P

CERTIFICATE

This is to certify that the project work entitled **"AUTOMATIC DETECTION OF DRIVER IMPAIRMENT BASED ON PUPILLARY LIGHT REFLEX"** is the bonafied work done by **O.JYOTHI SAI (19AP1A0423), G.SAMUEL RAJU (20AP5A0405), S.DURGA PRASANNA (19AP1A0429), M.TEJA KRISHNA (19AP1A0416)** in **ELECTRONICS AND COMMUNICATION ENGINEERING** of **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA,** during the year **2019-2023.**

Guide	Head of the Department
Mr.G.MAHESH,M.Tech	**Mr.A.B.S.R MANOHAR,M.Tech(Ph.D)**
Assistant Professor	**Associate Professor**

Internal Examiner **External Examiner**

DECLARATION

I, hereby declare that the work which is being presented in this dissertation entitled A"**AUTOMATIC DETECTION OF DRIVER IMPAIRMENT BASED ON PUPILLARY LIGHT REFLEX ",** submitted towards the partial fulfilment of requirements for the award of the degree of Bachelor of Technology (ELECTRONICS AND COMMUNICATION ENGINEERING) at **Bhimavaram Institute of Engineering & Technology, Pennada** is an authentic record of my work carried out under the supervision of **Mr.G.MAHESH**, **M. Tech**, Assistant Professor in Department of E.C.E, Bhimavaram Institute of Engineering & Technology, Pennada.

The matter embodied in this dissertation report has not been submitted by me for the award of any other degree. Further the technical details furnished in the various chapters in this report are purely relevant to the above project and there is no deviation from the theoretical point of view for design, development and implementation.

Place:

Date:

O.JYOTHI SAI (19AP1A0423)

G.SAMUEL RAJU (20AP5A0405)

S.DURGA PRASANNA (19AP1A0429)

M.TEJA KRISHNA (19AP1A0416)

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SUBMITTED BY:

O.JYOTHI SAI (19AP1A0423)

G.SAMUEL RAJU(20AP5A0405)

S.DURGA PRASANNA(19AP1A0429)

M.TEJA KRISHNA(19AP1A0416)

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ABSTRACT

Drowsiness due to drunken driving is increasing and falling sleep causes the major road accidents. If driver is found to be drowsiness in eyes more than 2 secs, then the IR sensor senses the blink rate. If the eyes are found to be closed, then the speed of the vehicle slows down. In our proposed system, along with drowsiness, alcohol detection is also detected by using alcohol MQ3 sensor. If alcohol is detected in driver's breathe, then the buzzer gives an alert to the Driver and Co-passengers. These sensors are interfaced with Arduino UNO. Buzzer rings in case of drowsiness detection and speed of the vehicle varies on detection of Eye blink based on pupillary light reflex.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION :

Drowsy driving is a major problem. No one knows the exact moment when sleep comes over their body. This makes the driver less able to pay attention to the road. It affects the driver's ability to make good decision. Each near nearly 1,00,000 traffic crashes can be attributed to drowsy driving, including more than 1,500 death and over 70,000 injuries, according to the Unsensational Highway Traffic Safety Administration. Another major factor of accidents are due to consumption of alcohol. The number of road accidents caused by drunken drivers was 41,643 in 2018. Hence in order the reduce the accidents due to drowsiness and alcohol consumption can be reduced by using the IR sensor and alcohol sensor respectively. Hence when they are detected the speed of the car slows down and stop which avoids the rash driving. Accidents due to driver drowsiness can be prevented using IR sensor. The driver is supposed to wear the eye blink sensor frame be for a couple of seconds to detect drowsiness.

The Eye Blink sensor works by illuminating the eye and eyelid area with infrared light, then monitoring the changes in the reflected light using a phototransistor and differentiator circuit. The exact functionality depends greatly on the positioning and aiming of the emitter and detector with respect to the eye. The sensor is connected with Arduino UNO. Any amount of alcohol in your bloodstream can impact your driving ability. The effects of alcohol abuse vary greatly, putting you at risk for causing an accident or highway injury. Safe driving requires the ability to concentrate, make good judgements and quickly react to situations. However, alcohol affects these skills, putting yourself and others in danger. The consumption of alcohol can be detected by using MQ3 sensor.MQ3 sensor detects the consumption of alcohol from the breath of the person. This helps in avoiding accidents caused by consumption of alcohol.

1.2 PROBLEM STATEMENT:

Driver's inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction. Driver distraction occurs when an object or event draws a person's attention away from the driving task. Unlike driver distraction, driver drowsiness involves no triggering event but, instead, is characterized by a progressive withdrawal of attention from the road and traffic demands. Both driver drowsiness and distraction, however, might have the same effects, that is decreased driving performance, longer reaction time, and an increased risk of crash involvement.

1.3 AIM OF THE PROJECT:

The aim of the drowsiness detection system is to aid in the prevention of accidents passenger and commercial vehicles. The system will detect the early symptoms of drowsiness before the driver has fully lost all attentiveness and warn the driver that they are no longer capable of operating the vehicle safely.

1.4 MOTIVATION:

Fatigue and falling asleep at the wheel are often the cause of serious automobile crashes. The report "The Prevalence and Impact of Drowsy Driving", published in 2010 by the American Automobile Association (AAA), is just one of many that draws this conclusion. During this investigation, it was found that 17 percent of all fatal crashes in the USA could be attributed to tired drivers. Monotonous driving is particularly exhausting and can rapidly lead to a loss of concentration. The transition from being fatigued to nodding off is subtle and generally goes unnoticed by the driver. For this reason, we have developed Driver Drowsiness Detection.

1.5 OBJECTIVE:

The objective of the proposed system is to design and develop Automatic Detection of Driver Impairment based on Pupillary Light Reflex.

1.6 SPECIFICATIONS:

The hardware and software tools required for this project are listed below:

- **HARDWARE REQUIREMENTS**
- Arduino UNO Microcontroller
- Eye-Blink Sensor
- MQ-3 Sensor
- LCD (Liquid Crystal Display) 16*2
- DC motor
- Buzzer
- **SOFTWARE REQUIREMENTS**
- Arduino IDE
- Proteus

1.7 STRUCTURE OF THE REPORT:

Chapter 1: "Introduction" gives the introduction of proposed system, aim, objective, problem statement, scope and various hardware and software requirements and Embedded systems.

Chapter 2: "Existing System" this includes block diagram,working and drawbacks of existing system.

Chapter 3: "Proposed System" this includes block diagram,working,experimental setup and flow chart of proposed method.

Chapter 4: "Hardware Requirements" this contains hardware requirements details.

Chapter 5: "Software Requirements" this contains software requirements details.

Chapter 6: "Results" this chapter includes schematic diagram and results.

Chapter 7: "Advantages & Application" includes various advantages and applications of the project.

Chapter 8: "Conclusion & Future Scope" it includes conclusion and future scope details of the project.

1.8 EMBEDDED SYSTEM:

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer are.

1.9 CHARACTERISTICS OF EMBEDDED SYSTEM:

- Speed (bytes/sec): Should be high speed
- Power (watts): Low power dissipation
- Size and weight: As far as possible small in size and low weight
- Accuracy (%error): Must be very accurate
- Adaptability: High adaptability and accessibility

- Reliability: Must be reliable over a long period of time

1.10 CLASSIFICATION OF EMBEDDED SYSTEMS:

Based on performance, functionality, requirement the embedded systems are divided into three categories:

- **Standalone systems embedded:** These systems take the input in the form of electrical signals from transducers or commands from human beings such as pressing of abutton etc.., process them and produces desired output. This entire process of taking input,processing it and giving output is done in standalone mode. Such embedded systems come under standalone embedded systems.Example: microwave oven, air conditioner etc.,
- **Soft real time embedded systems:** These embedded systems follow a relative deadline time period i.e.., if the task is not done in a particular time that will not cause damage the equipment.

Fig.1.1: TV with Remote

- Example: Consider a TV remote control system, if the remote control takes a few milliseconds delay it will not cause damage either to the TV or to the remote control. The systems that will not cause damage when they are not operated at considerable time period those systems come under soft real-time embedded systems.
- **Real-time embedded systems:** Embedded systems that are used to perform a specific task or operation in a specific time period those systems are called as real-time embedded systems.
- **Network communication embedded systems:** A wide range network interfacing communication is provided by using embedded systems. consider a web camera that is connected to the computer with internet can be used to spread communication like sending pictures, images, videos etc.., to another computer with internet connection throughout anywhere in the world. Consider a web camera that is connected at the door lock. Whenever a person comes near door, it captures the image of a person and sends to the desktop of your computer whichis connected to internet. This gives an alerting message with image on to the desktop of your computer, and then you can open the door lock just by clicking the mouse.

1.11 EXAMPLE OF EMBEDDED SYSTEM:

A Micro controller consists of a powerful CPU tightly coupled with memory, various I/O interfaces such as serial port, parallel port timer or counter, interrupt controller, data acquisition interfaces-Analog to Digital converter, Digital to Analog converter, integrated on to a single silicon chip.

Microcontrollers are dedicated for specific applications. A microcontroller may take an input from devices like sensors and displays the output or controls the output devices like fans, motors doing both of them shown below.

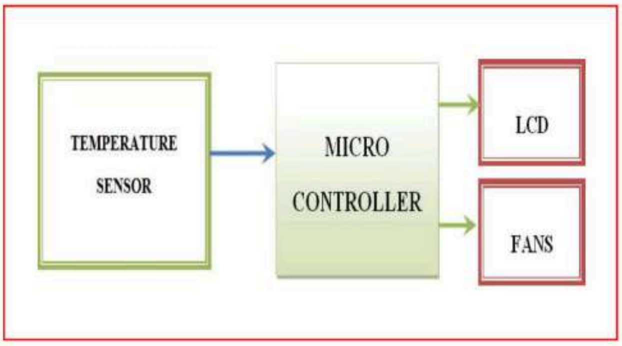

Fig.1.2: Application of microcontroller

The Temperature sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ℃). Example: LM35 - An Integrated Circuit Temperature Sensor can be used to measure temperature with an electrical output proportional to the temperature (in ℃).The Micro controller takes input from the external sources and routes them to the appropriate devices as programmed in it.

1.12 APPLICATION AREAS OF EMBEDDED SYSTEMS:

Consumer applications: At home, we use a number of embedded systems, which include microwave oven, remote control, VCD players, camera etc.
Office automation: We use systems like fax machine, modem, printer etc…

Fig.1.3: Printing Machine

Industrial automation: Today many industries are using embedded systems for process control. In industries we design the embedded systems to perform a specific operation like monitoring temperature, pressure, humidity, voltage, current etc.., and basing on these monitored levels we do control other devices, we can send information to a centralized monitoring station. In critical industries wherehuman presence is avoided there, we can use Robots, which are programmed to do a specific operation.

Fig.1.4: Robot

Medical Equipment's: Almost every medicalequipment in hospitals are embedded systems examples, like EEG, ECG, scanners, endoscopes, X-Ray etc..

Fig.1.5 : Pulse monitoring system

Wireless technology: Mobile phones are one of the very powerful embedded systems that provide voice communication while we are on any travel, PDAS, walkie-talkie etc.

Fig.1.6: Wireless communication

1.13 Overview of Embedded System Architecture:

Every embedded system consists of custom-built hardware built around a Central Processing Unit(CPU). This hardware also contains memory chips onto which the software is loaded. The software residing on the memory chip is also called the 'firmware'. The embedded system architecture can be represented as a layered architecture as shown in Fig. The operating system runs above the hardware, and the application software runs above the operating system. The same architecture is applicable to any computer including a desktop computer. However, there are significant differences. It is not compulsory to have an operating system in every embedded system.

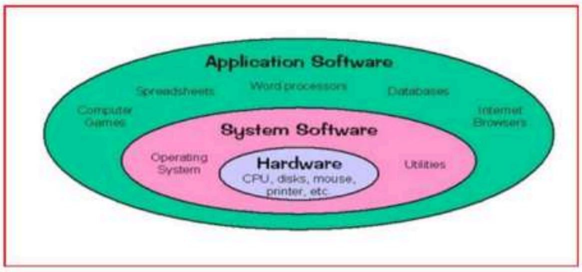

Fig.1.7: Layered architecture of Embedded System

The building blocks are;

- Central Processing Unit (CPU)
- Memory (Read-only Memory and Random Access Memory)
- Input Devices
- Output devices
- Communication interfaces
- Application-specific circuitry

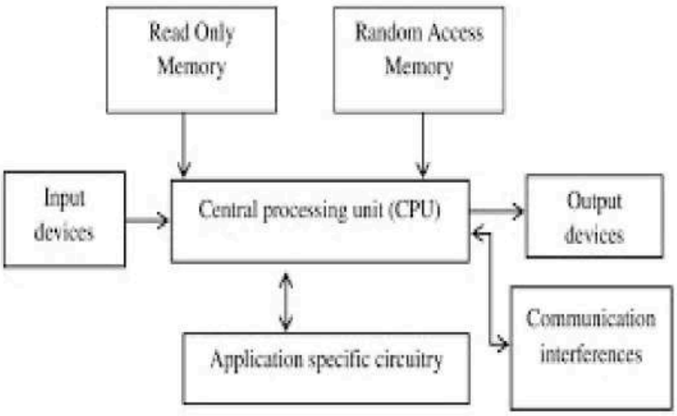

Fig.1.8: Basic building blocks of Embedded System

- **Central Processing Unit (CPU):**

The Central Processing Unit (processor, in short) can be any of the following: microcontroller, microprocessor or Digital Signal Processor (DSP). A micro-controller isa low-cost processor. Its main attraction is that on the chip itself, there will be many othercomponents such as memory, serial communication interface, analog-to digital converteretc.

- **Memory:**

The memory is categorized as Random Access 11emory (RAM) and Read Only Memory (ROM). The contents of the RAM will be erased if power is switched off to the chip, whereas ROM retains the contents even if the power is switched off. So, the firmware is stored in the ROM. When power is switched on, the processor reads the ROM;the program is program is executed.

- **Input devices:**

Unlike the desktops, the input devices to an embedded system have very limited capability. There will be no keyboard or a mouse, and hence interacting with the embeddedsystem is no easy task. Some embedded systems will have a few Light Emitting Diodes (LEDs) *to* indicate the health status of the system modules, or for visual indication of alarms. A small Liquid Crystal Display (LCD) may also be used to display some important parameters.

- **Communication interfaces**:

The embedded systems may need to, interact with other embedded systems at they have to transmit data to a desktop. To facilitate this, the embedded systems are provided with one or a few communication interfaces such as RS232, RS422, RS485, Universal Serial Bus (USB), IEEE 1394, Ethernet etc.

- **Application-Specific Circuitry:**

Sensors, transducers, special processing and control circuitry may be required fatan embedded system, depending on its application. This circuitry interacts with the processor to carry out the necessary work. The entire hardware has to be given power supply either through the 230 volts main supply or through a battery.

- **Microcontroller:**

A microcontroller is a general-purpose device, but that is meant to read data, perform limited calculations on that data and control its environment based on those calculations. The prime use of a microcontroller is to control the operation of a machine using a fixed program that is stored in ROM and that does not change over the life time of the system.

CHAPTER 2

EXISTING SYSTEM

2.1 PLC MICROCONTROLLER BASED DRIVER DROWSINESS DETECTION SYSTEM:

The Existing system detects the drowsiness of the driver with the help of IR sensor, alerts the driver using buzzer and displays the message on the LCD.

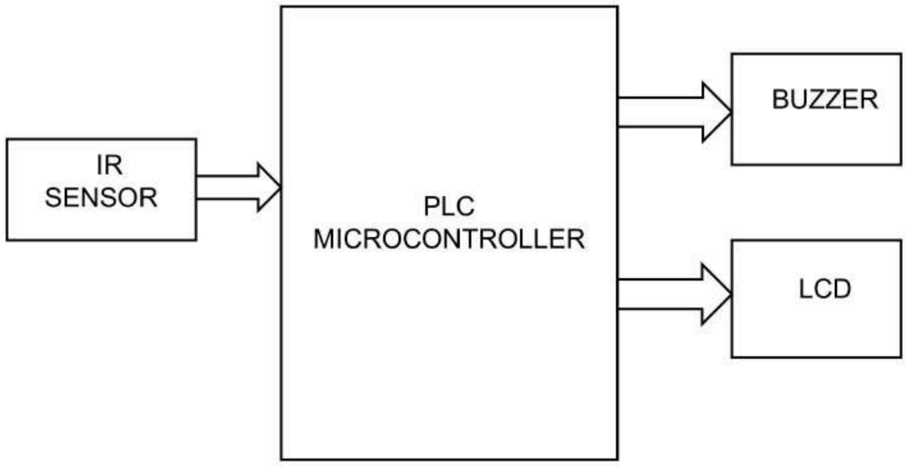

Fig.2.1: Block Diagram Of Existing System

2.2 WORKING:

- PLC Microcontroller is the heart of the existing system.
- IR sensor is used to detect the eyes of the driver.
- If the IR sensor detects the eyes of the driver as drowsy then buzzer gets ON and a message displays on the LCD.

2.3 DRAWBACKS OF EXISTING SYSTEM:

- The existing system is not efficient.
- It will not control the vehicle when the driver is not conscious.
- It might not provide safety precautions to save the human life.

CHAPTER 3

PROPOSED SYSTEM

The proposed system consists of Arduino UNO microcontroller which is the heart of the project. It also consists 16*2 LCD Display, Buzzer, IR Sensor, MQ-3 Sensor, Relay and DC Motor.

3.1 BLOCK DIAGRAM:

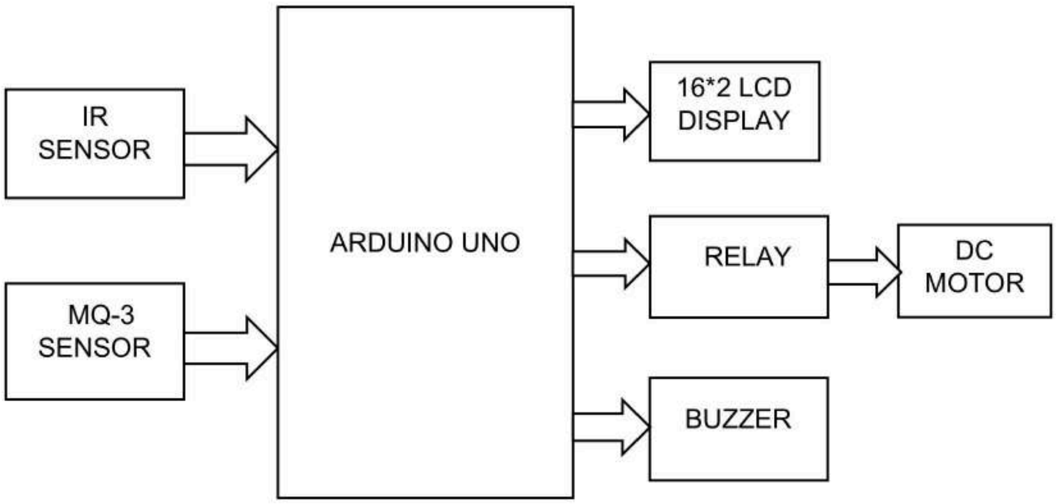

Fig.3.1: Block Diagram Of Proposed System

3.2 WORKING:

- The proposed system consists of Arduino UNO micro controller, IR Sensor, Gas sensor, DC motor, LCD display, Buzzer.
- Driver enters the vehicle.
- The MQ3 sensor detects the alcohol levels of the drivers.
- If alcohol is detected ,then the driver gets alert through the buzzer and message displays on LCD.
- The Eye blink sensor observes the eye blinks of the driver through IR radiations.
- When the driver eyes are open, the engine works as usually.
- If the driver closes his eyes, then engine stops and he is alerted through buzzer.

3.3 EXPERIMENTAL SETUP:

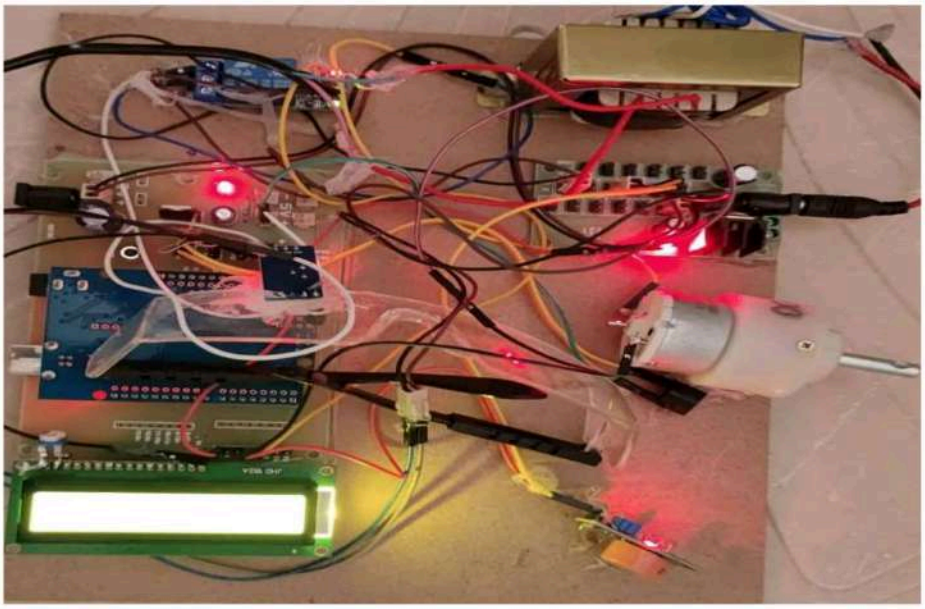

Fig.3.2: Experimental Setup

3.4 FLOWCHART:

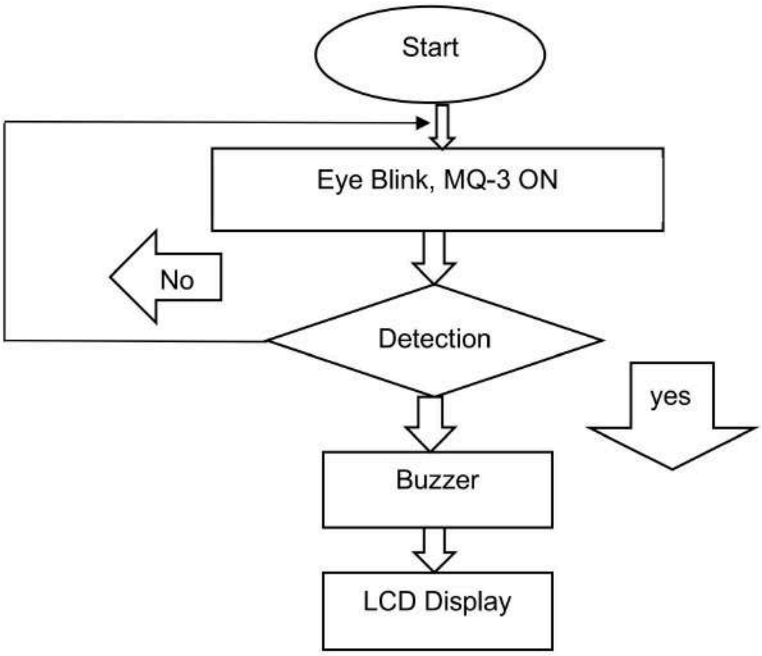

Fig.3.3: Flow Chart

3.5 ALGORITHM:

Step 1: Start

Step 2: Power supply is given to the board and all hardware components such as Arduino UNO controller, LCD, IR Sensor, Gas Sensor and motor are initialized.

Step 3: The welcome message is displayed on LCD.

Step 4: IR Sensor, MQ-3 Sensor and detects the eyes & breathe of the driver and condition of the vehicle.

Step 5: If any of the conditions found True then the buzzer alerts the driver.

Step 6: If there is no response from the driver, then the DC motor connected to vehicle engine slows down and makes the vehicle stop.

Step 7: Stop.

CHAPTER 4

HARDWARE COMPONENTS

➢ HARDWARE COMPONENTS AND DESCRIPTION:

The hardware utilized in the proposed system are listed below:

- ARDUINO UNO MICROCONTROLLER
- EYE-BLINK SENSOR
- GAS(MQ3) SENSOR
- POWER SUPPLY
- LCD (LIQUID CRYSTAL DISPLAY) 16*2
- DC MOTOR
- BUZZER

4.1 HARDWARE COMPONENTS AND DESCRIPTION:

4.1.1 ARDUINO UNO MICROCONTROLLER:

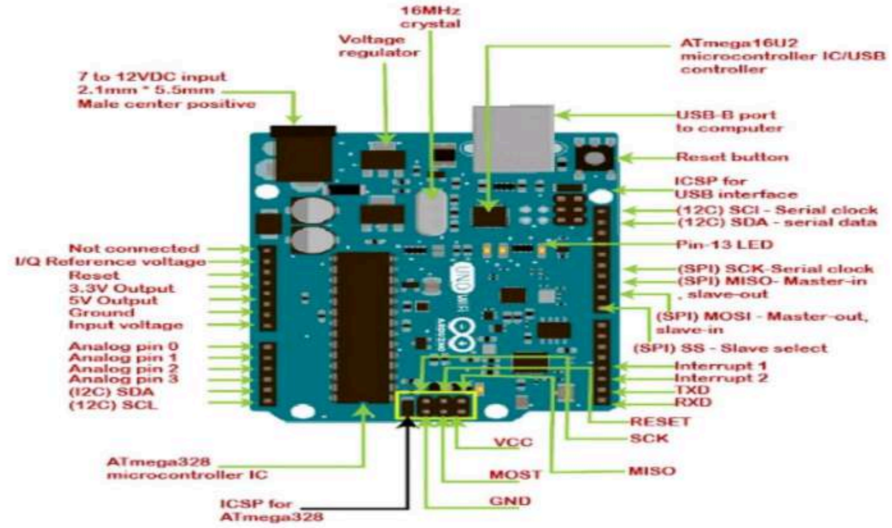

Fig.4.1: Arduino UNO Microcontroller

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5Vpin may supply less than 5 volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

V_{IN}: The input voltage to the Arduino board when it's using an external power source (as opposed to5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
5V: The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
3.3V: A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
GND: Ground pins.
Memory: The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the bootloader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).
Input and Output: Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 k Ohms. In addition, some pins have specialized functions:
Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, arising or falling edge, or a change in value. See the attach Interrupt () function for details.
PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which although provided by the underlying hardware, is not currently included in the Arduino language.
LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, each of which provide 10 bits of resolution (i.e., 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function. Additionally, some pins have specialized functionality:

I2C: 4 (SDA) and 5 (SCL). Support I2C (TWI) communication using the Wire library.

There are a couple of other pins on the board:

- **AREF:** Reference voltage for the analog inputs. Used with AnalogReference().
- **Reset:** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication:

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX).

An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. However, on Windows, an *.inf file is required.

The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB- to serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

4.1.2 ARDUINO UNO BOARD:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

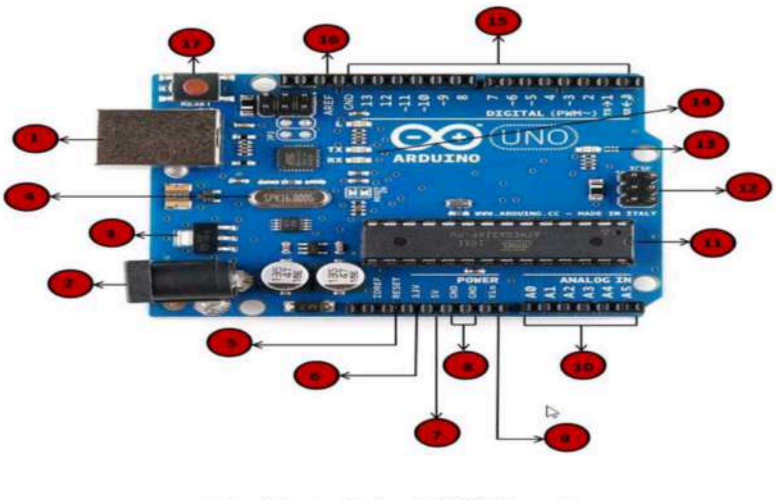

Fig.4.2: Arduino UNO Board

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converters.

Technical Specifications:

FEATURE	SPECIFICATION
Microcontroller	ATmega 328
Operating Voltage	5V
Input Voltage(recommended)	7-12V
Input Voltage(limits)	6-20V
Digital I/O Pins	14(of which 6 provide PVM output)
Analog Input Pins	6
DC current per I/O pin	40 mA
DC current for3.3V Pin	50 mA
Flash Memory	32 KB(ATmega328) of which 0.5KBUsed by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1KB (ATmega328)
Clock Speed	16 MHZ

Table 4.1: Arduino uno specifications

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

1.USB Interface:

Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection.

2.External power supply:

Arduino boards can be powered directly from the AC mains power supply by connecting it to the power supply (Barrel Jack)

3.Voltage Regulator:

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

4.Crystal Oscillator:

The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.

5. Arduino Reset:

It can reset your Arduino board, i.e., start your program from the beginning. It can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).

6-9. Pins (3.3, 5, GND, Vin):

- 3.3V (6): Supply 3.3 output volt
- 5V (7): Supply 5 output volt
- Most of the components used with Arduino board works fine with 3.3 volt and 5 volts.
- GND (8) (Ground): There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- Vin (9): This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.

10.Analog pins:

The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

11.Main microcontroller:

Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE.For more details about the IC construction and functions, you can refer to the data sheet.

The Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0.

The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

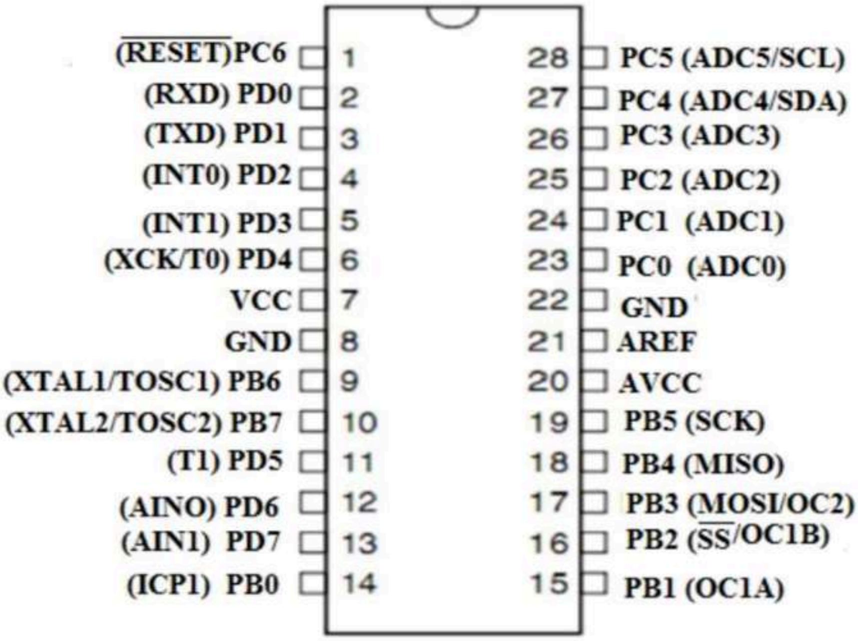

Fig.4.3: Pin Diagram Arduino Uno Board

PIN DESCRIPTION:

VCC: Digital supply voltage.

GND: Ground.

Port B (PB [7:0]) XTAL1/XTAL2/TOSC1/TOSC2:

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit.Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier.

If the Internal Calibrated RC Oscillator is used as chip clock source, PB [7:6] is used as TOSC [2:1] input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

Port C (PC [5:0]):

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC [5:0] output buffers have symmetrical drive characteristics with both high sink and source capability.

Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

PC6/RSET:

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C.

If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are not guaranteed to generate a Reset.

Port D (PD [7:0]):

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

AVCC:

AVCC is the supply voltage pin for the A/D Converter, PC [3:0], and PE [3:2]. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC [6:4] use digital supply voltage, VCC.

AREF:

AREF is the analog reference pin for the A/D Converter.

ADC [7:6] (TQFP and VFQFN Package Only):

In the TQFP and VFQFN package, ADC [7:6] serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

ICSP pin:

Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

Power LED indicator:

This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.

TX and RX LEDs:

On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led (13).

The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

Digital I / O:

The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labelled "~" can be used to generate PWM.

AREF:

AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins working.

4.1.3 EYE-BLINK SENSOR:

Eye blink Sensor is a relatively simple sensor used to detect eye blinks. It uses a simple infrared sensor to detect if the person's eye is closed and the corresponding data received can further be processed by any logic as required for the application.

IR LED is used as a source of infrared rays. It comes in two packages 3mm or 5mm. 3mm is better as it is requiring less space. IR sensor is nothing but a diode, which is sensitive for infrared radiation. This infrared transmitter and receiver are called as IR TX-RX pair. It can be obtained from any decent electronics component shop and costs less than 10Rs. Following snap shows 3mm and 5mm IR pairs.

The infrared sensor is mounted on the glasses and positioned in a way so that it lines up with the user's eye. The infrared then gives an output HIGH signal when the sensor detects a blink, that is the uses closes their eyes. The infrared sensor also has an onboard indicator LED to alert the user of the same.

Fig.4.4: Eye Blink Sensor

The onboard infrared sensor comes with three pins
VCC – 5V input
OUT – output based on blink detection
GND – ground connection
VCC and GND can be connected to the system and blink detection will be signaled using the onboard LED. In case further logics are required to keep track of the duration of the blink, number of times blinked, etc. a microcontroller can easily be paired up with a system and an appropriate code can be written on the controller to record the above. For cases such as the above, an OUT pin is given where the logic state can either be HIGH or LOW based on the blink state. The OUT pin can directly connected to any digital input pin of any microcontroller.

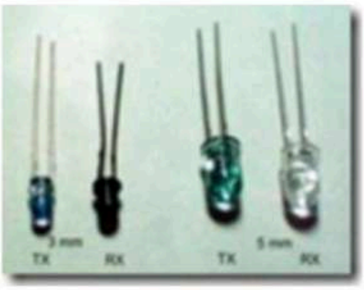

Fig.4.5: IR Sensor

Colour of IR transmitter and receiver is different. However, you may come across pairs which appear exactly same or even has opposite colours than shown in above picture and it is not possible to distinguish between TX and RX visually. In case you will have to take help of multi-meter to distinguish between them.

Here is how you can distinguish between IR TX-RX using DMM:

- Connect anode of the same LED to common terminal of DMM(means connect LED such that It gets reverse biased by DMM).
- Set DMM to measure resistance up to 2M Ohm.
- Check the reading.
- Repeat above procedure with second LED.

In above process, when you get the reading of the few hundred Kilo Ohms on DMM, then it indicated that LED that you are testing is IR sensor. In case of IR transmitter DMM will not show any reading.

Following figure shows typical DMM reading obtained when IR receiver is connected to it as mentioned above. Second snap shows how sensor's resistance increases when it is covered by a finger. While buying an IR sensor, make sure that its reverse resistance in ambient light is below 1000K. If it is more than this value, then it will not be able to generate sufficient voltage across external resistor and hence will be less sensitive to small variation in incident light.

The circuit diagram Circuit diagram for IR sensor module is very simple and straight forward.

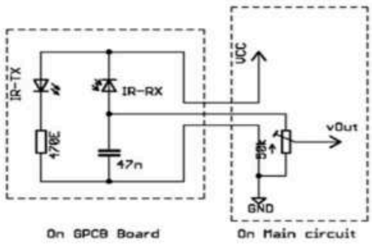

Fig.4.6: Infrared Sensor Schematic

Circuit is divided into two sections. IR TX and IR RX are to be soldered on small general purpose Grid PCB.

IR TRANSMITTER:

IR LED emits infrared radiation. This radiation illuminates the surface in front of LED. Surface reflects the infrared light. Depending on the reflectivity of the surface, amount of light reflected varies. This reflected light is made incident on reverse biased IR sensor. When photons are incident on reverse biased junction of this diode, electron-hole pairs are generated, which results in reverse leakage current. Amount of electron-hole pairs generated depends on intensity of incident IR radiation. More intense radiation results in more reverse leakage current. This current can be passed through a resistor so as to get proportional voltage. Thus, as intensity of incident rays varies, voltage across resistor will vary accordingly.

This voltage can then be given to OPAMP based comparator. Output of the comparator can be read by uc. Alternatively, you can use on-chip ADC in AVR microcontroller to measure this voltage and perform comparison in software.

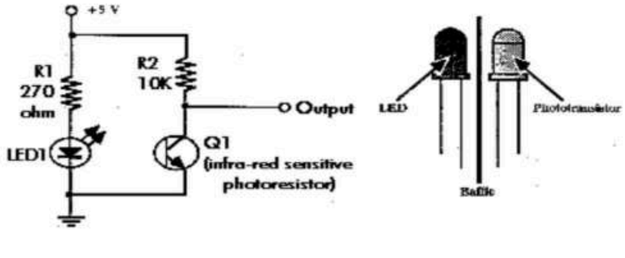

Fig.4.7: IR Sensor Circuit Diagram

IR RECEIVER:

A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation. Photodiodes are similar to regular semiconductor diodes except that they may be either exposed (to detect vacuum UV or X-rays) or packaged with a window or optical fibre connection to allow light to reach the sensitive part of the device.

A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation. Photodiodes are similar to regular semiconductor diodes except that they may be either exposed (to detect vacuum UV or X-rays) or packaged with a window or connection to allow light to reach the sensitive part of the device. Many diodes designed for use specifically as a photodiode will also use a PIN junction rather than the typical PN junction.

Principle of operation: A photodiode is a PN junction or PIN structure. When a photon of sufficient energy strikes the diode, it excites an electron thereby creating a mobile electron and a positively charged electron hole. If the absorption occurs in the junction's depletion region, or one diffusion length away from it, these carriers are swept from the junction by the built-in field of the depletion region. Thus, holes move toward the anode, and electrons toward the cathode, and a photocurrent is produced.

Photovoltaic mode: When used in zero bias or photovoltaic mode, the flow of photocurrent out of the device is restricted and a voltage builds up. The diode becomes forward biased and "dark current" begins to flow across the junction in the direction opposite to the photocurrent. This mode is responsible for the photovoltaic effect, which is the basis for solar cells—in fact, a solar cell is just an array of large photodiodes.

Photoconductive mode: In this mode the diode is often (but not always) reverse biased. This increases the width of the depletion layer, which decreases the junction's capacitance resulting in faster response times. The reverse bias induces only a small amount of current (known as saturation or back current) along its direction while the photocurrent remains virtually the same. Although this mode is faster, the photovoltaic mode tends to exhibit less electronic noise. (The leakage current of a good PIN diode is so low – < 1nA – that the Johnson–Nyquist noise of the load resistance in a typical circuit often dominates.

Avalanche photodiodes have a similar structure to regular photodiodes, but they are operated with much higher reverse bias. This allows each photo-generated carrier to be multiplied by avalanche breakdown, resulting in internal gain within the photodiode, which increases the effective responsivity of the device.

Phototransistors also consist of a photodiode with internal gain. A phototransistor is in essence nothing more than a bipolar transistor that is encased in a transparent case so that light can reach the base-collector junction. The electrons that are generated by photons in the base-collector junction are injected into the base, and this current is amplified by the transistor operation. Note that although phototransistors have a higher responsivity for light, they are unable to detect low levels of light any better than photodiodes. Phototransistors also have slower response times.

Materials

The material used to make a photodiode is critical to defining its properties, because only photons with sufficient energy to excite electrons across the material's bandgap will produce significant photocurrents.Materials commonly used to produce photodiodes include:

Material	Wavelength range(nm)
Silicon	190 – 1100
Germanium	400 – 1700
Indium gallium arsenide	800 – 2600
Lead Sulphide	<1000 – 3500

Table 4.2: Materials

Silicon-based photodiodes generate less noise than germanium-based photodiodes, but germanium photodiodes must be used for wavelengths longer than approximately 1 μm. Since transistors and ICs are made of semiconductors, and contain P-N junctions, almost every active component is potentially a photodiode. Many components, especially those sensitive to small currents, will not work correctly if illuminated, due to the induced photocurrents. Since housings are not completely opaque to X-rays or other high energy radiation, these can still cause many ICs to malfunction due to induced photo-currents.

Features: Critical performance parameters of a photodiode include:

Responsivity:

The ratio of generated photocurrent to incident light power, typically expressed in A/W when used in photoconductive mode. The responsivity may also be expressed as a quantum efficiency, or the ratio of the number of photogenerated carriers to incident photons and thus a unitless quantity.

Dark current:

The current through the photodiode in the absence of light, when it is operated in photoconductive mode. The dark current includes photocurrent generated by background radiation and the saturation current of the semiconductor junction. Dark current must be accounted for by calibration if a photodiode is used to make an accurate optical power measurement, and it is also a source of noise when a photodiode is used in an optical communication system.

Noise-equivalent power:

(NEP) The minimum input optical power to generate photocurrent, equal to the rms noise current in a 1 hertz bandwidth. The related characteristic detectivity (D) is the inverse of NEP, 1/NEP; and the specific detectivity () is the detectivity normalized to the area (A) of the photodetector. The NEP is roughly the minimum detectable input power of a photodiode.

When a photodiode is used in an optical communication system, these parameters contribute to the sensitivity of the optical receiver, which is the minimum input power required for the receiver to achieve a specified bit error ratio.

A photodiode is a semiconductor diode that functions as a photo detector. Light is let in by either a window or optical fibre. The two most important characteristics when dealing with a photodiode are the range of wavelengths needed to detect, and whether a normal, PIN, or APD (Avalanche) photodiode are needed. Before choosing the type of photodiode, the choice of maximum wavelength photosensitivity must be made. Photosensitivity is measured in the units of A/W for different wavelengths. Students will want maximum photosensitivity to match up with the wavelength of the laser diode or the wavelength of light spectrum.

The simple breakdown for which type of photodiode to use is recognition of two major qualities. The strength of the signal and the speed of the rise time. Often a photodiode will be either have no suffix (ex. Silicon Photodiode), PIN suffix (ex. Silicon PIN Photodiode), or APD suffix (Silicon APD Photodiode). A normal photodiode is to be used in instances when the light levels are high and speed is not a particular issue (ex. microsecond efficiency is enough). If a higher speed is needed then a PIN Photodiode would be suggested (ex. nanosecond efficiency), as well as most useful needs of sensitivity.

The following is sample datasheet for a normal photodiode. The noteworthy characteristics in the datasheet are:

- Spectral response range: range of wavelengths detected (example can be seen in Figure 3)
- Peak sensitivity wavelength: wavelength at which there is maximum sensitivity.
- Photo sensitivity: photodiodes conversion of impinging light energy to a current.
- Dark current: current produced by photodiode and the absence of light.
- Rise time: time elapsed to detect a signal (plot of effect of rise can be seen in Figure 4)
- Reverse Bias, Capacitance, and Reverse breakdown voltage: Increasing the reverse voltage increases the response speed of the photodiode, by reducing the junction capacitance. However, the reverse breakdown voltage should not be exceeded. Capacitance and Reverse bias relationship can be seen.

Applications:

P-N photodiodes are used in similar applications to other photo detectors, such as photoconductors, charge-coupled device.

- Photodiodes are used in consumer electronics devices such as compact disc players, smoke detectors, and the receivers for remote controls in VCRs and televisions.
- In other consumer items such as camera light meters, clock radios (the ones that dim the display when it's dark) and street lights, photoconductors are often used rather than photodiodes, although in principle either could be used.

- Photodiodes are often used for accurate measurement of light intensity in science and industry. They generally have a better, more linear response than photoconductors.

USE OF INFRARED DETECTORS BASIC:

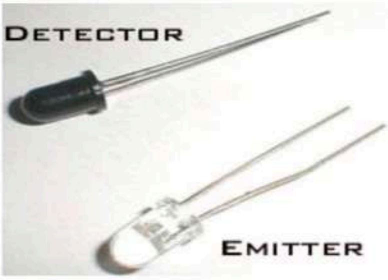

Fig.4.8: IR Emitter and IR Phototransistor

An infrared emitter is an LED made from gallium arsenide, which emits near-infrared energy at about 880nm. The infrared phototransistor acts as a transistor with the base voltage determined by the amount of light hitting the transistor. Hence it acts as a variable current source. Greater amount of IR light causes greater currents to flow through the collector-emitter leads.

As shown in the diagram below, the phototransistor is wired in a similar configuration to the voltage divider. The variable current traveling through the resistor causes a voltage drop in the pull-up resistor. This voltage is measured as the output of the device.

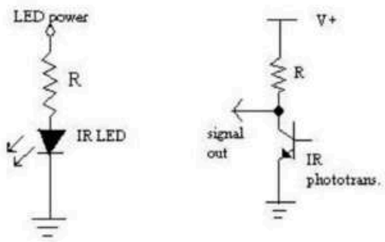

Fig.4.9: Circuit Diagram of IR Emitter and Photo Transistor

IR reflectance sensors contain a matched infrared transmitter and infrared receiver pair. These devices work by measuring the amount of light that is reflected into the receiver. Because the receiver also responds to ambient light, the device works best when well shielded from ambient light, and when the distance between the sensor and the reflective surface is small (less than 5mm). IR reflectance sensors are often used to detect white and black surfaces. White surfaces generally reflect well, while black surfaces reflect poorly. Onof such applications is the line follower of a robot.

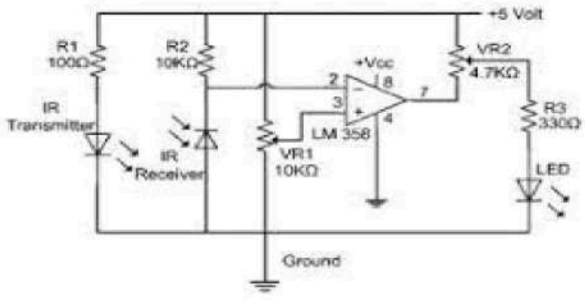

Fig.4.10: Infrared Emitter/Detector Circuit

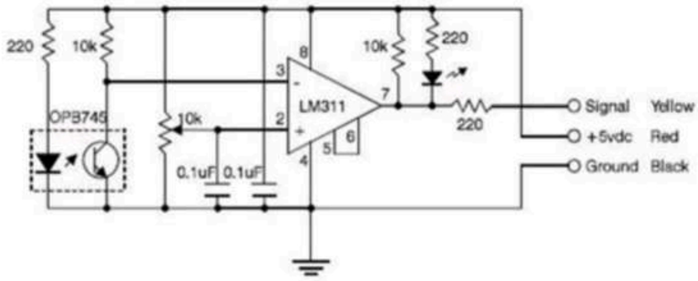

Fig.4.11: Schematic Diagram for a Single Pair of Infrared Transmitter and Receiver.

To get a good voltage swing, the value of R1 must be carefully chosen. If Rsensor = a when no light falls on it and Rsensor = b when light falls on it. The difference in the two potentials is:

$$Vcc * \{ a/(a+R1) - b/(b+R1) \}$$

$$Vcc= Vcc * \{ a/(a+R1) - b/(b+R1) \} / Vcc=a/(a+R1)-b/(b+R1)$$

The resistance of the sensor decreases when IR light falls on it. A good sensor will have near zero resistance in presence of light and a very large resistance in absence of light. We have used this property of the sensor to form a potential divider.

The potential at point '2' is Rsensor / (Rsensor + R1). Again, a good sensor circuit should give maximum change in potential at point '2' for no-light and bright-light conditions. This is especially important if you plan to use an ADC in place of the comparator.
To get a good voltage swing, the value of R1 must be carefully chosen. If Rsensor = a when no light falls on it and Rsensor = b when light falls on it. The difference in the two potentials:

$$Vcc*\{a/(a+R1)-b/(b+R1)\}$$

Relative voltage swing = Actual Voltage Swing /Vcc

$$= Vcc * \{ a/(a+R1) -b/(b+R1) \} / Vcc$$

If the emitter and detector (aka phototransistor) are not blocked, then the output on pin 2 of the 74LS14 will be high (app. 5 Volts. The 74LS14 is a Schmitt triggered hex inverter. A Schmitt trigger is a signal conditioner. It ensures that above a threshold value, we will always get "clean" HIGH and LOW signals.

Not Blocked Case: Pin 2 High Current from Vcc flows through the detector. The current continues to flow through the base of Q2. Current from Vcc also flows through R2, and Q2's Drain and Emitter to ground. As a result of this current path, there will be no current flowing through Q1's base. The signal at U1's pin 1 will be low, and so pin2 will be high.

Blocked Case: Pin 2 Low Current "stops" at the detector. Q2's base is not turned on. The current is re-routed passing through R2 and into the base of Q1. This allows current to flow from Q1's detector and exiting out Q1's emitter. Pin 1 is thus high and pin 2 will be low. To detect a line to be followed, we are using two or more number of photo-reflectors. Its output current that proportional to reflection rate of the floor is converted to voltage with a resister and tested it if the line is detected or not.

4.1.4 MQ-3 SENSOR:

Gas sensors main aim is to sense hazardous gases that evolve its surroundings. Gas sensor detects the concentrations of combustible gas in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of flammable gas of 300 to 10,000 ppm. The sensor can operate at temperatures from -20 to 50°C and consumes less than 150 mA at 5 V. High sensitivity to LPG, Propane and Hydrogen.

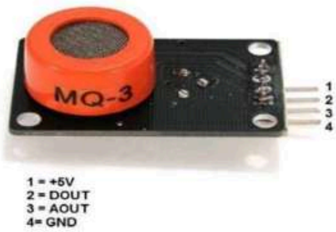

Fig.4.12: MQ-3 Sensor.

4.1.5 POWER SUPPLY:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to othersThis power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage (no frequency) with the amplitude of +5V and +12V for various applications.

In this section we have Transformer, Bridge rectifier, are connected serially and voltage regulators for +5V and +12V (7805 and 7812) via a capacitor (1000µF) in parallel are connected parallel as shown in the circuit diagram below. Each voltage regulator output is again is connected to the capacitors of values (100µF, 10µF, 1 µF, 0.1 µF) are connected parallel through which the corresponding output (+5V or +12V) are taken into consideration.

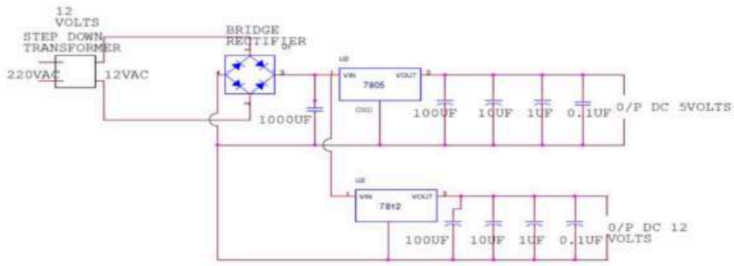

Fig.4.13: Circuit Diagram

Circuit Explanation:

1)**Transformer:**

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. The secondary induced voltage V_S, of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

The transformer is based on two principles: firstly, that an electric current can produce a magnetic field (electromagnetism) and secondly that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, it changes the strength of its magnetic field; since the changing magnetic field extends into the secondary coil, a voltage is induced across the secondary. A simplified transformer design is shown below.The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron; this ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.

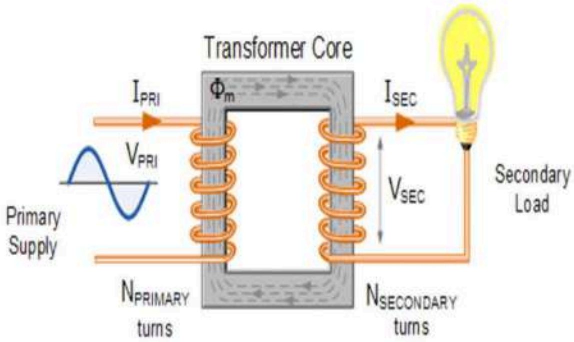

Fig.4.14: An Ideal Step-Down Transformer showing Magnetic Flux in the core.

Induction Law: The voltage induced across the secondary coil may be calculated from Faraday's law induction, which states that:

$$V_S = N_S \frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

Where V_S is the instantaneous voltage, N_S is the number of turns in the secondary coil and Φ equals the magnetic flux through one turn of the coil. If the turns of the coil are oriented perpendicular to the magnetic field lines, the flux is the product of the magnetic field strength B and the area A through which it cuts. The area is constant, being equal to the cross-sectional area of the transformer core, whereas the magnetic field varies with time according to the excitation of the primary. Since the same magnetic flux passes through both the primary and secondary coils in an ideal transformer, the instantaneous voltage across the primary winding equals.

$$V_P = N_P \frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

Taking the ratio of the two equations for V_S and V_P gives the basic equation for stepping up or stepping down the voltage

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

Ideal power equation:

If the secondary coil is attached to a load that allows current to flow, electrical power is transmitted from the primary circuit to the secondary circuit. Ideally, the transformer is perfectly efficient; all the incoming energy is transformed from the primary circuit to the magnetic field and into the secondary circuit. If this condition is met, the incoming electric power must equal the outgoing power.

$$P_{\text{incoming}} = I_P V_P = P_{\text{outgoing}} = I_S V_S$$

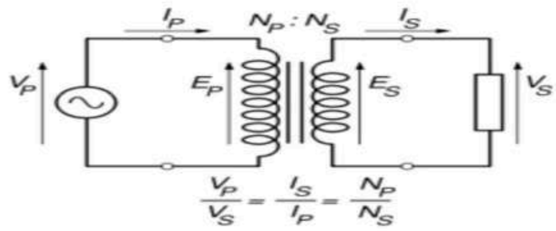

Fig.4.15: Transformer

If the voltage is increased (stepped up) ($V_S > V_P$), then the current is decreased (stepped down) ($I_S < I_P$) by the same factor

The impedance in one circuit is transformed by the *square* of the turn's ratio. For example, if an impedance Z_S is attached across the terminals of the secondary coil, it appears to the primary circuit to have an impedance of

$$Z_S\left(\frac{N_P}{N_S}\right)^2$$

This relationship is reciprocal, so that the impedance Z_P of the primary circuit appears to the secondary to be

$$Z_P\left(\frac{N_S}{N_P}\right)^2$$

Detailed Operation:

The simplified description above neglects several practical factors, in particular the primary current required to establish a magnetic field in the core, and the contribution to the field due to current in the secondary circuit. Models of an ideal transformer typically assume a core of negligible reluctance with two windings of zero resistance. When a voltage is applied to the primary winding, a small current flow, driving flux around the magnetic circuit of the core.

The changing magnetic field induces an electromotive force (EMF) across each winding. Since the ideal windings have no impedance, they have no associated voltage drop, and so the voltages V_P and V_S measured at the terminals of the transformer, are equal to the corresponding EMFs. The primary EMF, acting as it does in opposition to the primary voltage, is sometimes termed the "back EMF".

This is due to Lenz's law which states that the induction of EMF would always be such that it will oppose development of any such change in magnetic field.

Bridge Rectifier:

A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a center-tapped transformer design, but has two diode drops rather than one, thus exhibiting reduced efficiency over a center-tapped design for the same output voltage.

Basic Operation:

When the input connected at the left corner of the diamond is positive with respect to the one connected at the right-hand corner, current flows to the right along the upper coloured.

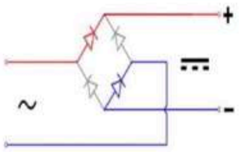

Fig.4.16: Circuit Operation of Bridge Rectifier(i)

When the right-hand corner is positive relative to the left-hand corner, current flows along the upper coloured path and returns to the supply via the lower coloured path. In each case, the upper right output remains positive with respect to the lower right one. Since this is true whether the input is AC or DC, this circuit not only produces DC power when supplied with AC power: it also can provide what is sometimes called "reverse polarity protection".

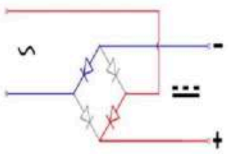

Fig.4.17: Circuit Operation of Bridge Rectifier(ii)

That is, it permits normal functioning when batteries are installed backwards or DC input-power supply wiring "has its wires crossed" (and protects the circuitry it powers against damage that might occur without this circuit in place). Prior to availability of integrated electronics, such a bridge rectifier was always constructed from discrete components. Since about 1950, a single four-terminal component containing the four diodes connected in the bridge configuration became a standard commercial component and is now available with various voltage and current ratings.

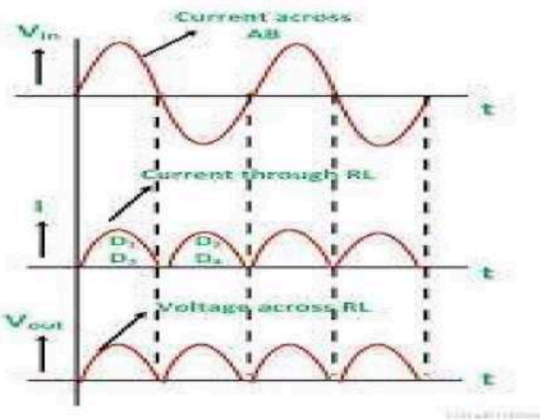

Fig.4.18: Waveforms

For many applications, especially with single phase AC where the full-wave bridge serves to convert an AC input into a DC output, the addition of a capacitor may be important because the bridge alone supplies an output voltage of fixed polarity but pulsating magnitude (see diagram above). The function of this capacitor, known as a reservoir capacitor (aka smoothing capacitor) is to lessen the variation in (or 'smooth') the rectified AC output voltage waveform from the bridge.

This charge flows out as additional current through the load. Thus, the change of load current and voltage is reduced relative to what would occur without the capacitor. Increases of voltage correspondingly store excess charge in the capacitor, thus moderating the change in output voltage / current. Also see rectifier output smoothing.

The capacitor and the load resistance have a typical time constant $\tau = RC$ where C and R are the capacitance and load resistance respectively. As long as the load resistor is large enough so that this time constant is much longer than the time of one ripple cycle, the above configuration will produce a smoothed DC voltage across the load.

The idealized waveforms shown above are seen for both voltage and current when the load on the bridge is resistive. When the load includes a smoothing capacitor, both the voltage and the current waveforms will be greatly changed. While the voltage is smoothed, as described above, current will flow through the bridge only during the time when the input voltage is greater than the capacitor voltage.

Output can also be smoothed using a choke and second capacitor. The choke tends to keep the current (rather than the voltage) more constant. Due to the relatively high cost of an effective choke compared to a resistor and capacitor this is not employed in modern equipment.

Some early console radios created the speaker's constant field with the current from the high voltage ("B +") power supply, which was then routed to the consuming circuits, (permanent magnets were considered too weak for good performance) to create the speaker's constant magnetic field.

Voltage Regulator:

A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level.

The 78xx (also sometimes known as LM78xx) series of devices is a family of self-contained fixed linear voltage regulator integrated circuits. When specifying individual ICs within this family, the xx is replaced with a two-digit number, which indicates the output voltage the particular device is designed to provide (for example, the 7805 has a 5-volt output, while the 7812 produces 12 volts). There is a related line of 79xx devices which are complementary negative voltage regulators.

78xx and 79xx ICs can be used in combination to provide both positive and negative supply voltages in the same circuit, if necessary.78xx ICs have three terminals and are moO220 form factor, although smaller surface-mount and larger TrO3 packages are also available from some manufacturers.

These devices typically support an input voltage which can be anywhere from a couple of volts over the intended output voltage, up to a maximum of 35 or 40 volts, and can typically provide up to around 1 or 1.5 amps of current (though smaller or larger packages may have a lower or higher current rating).

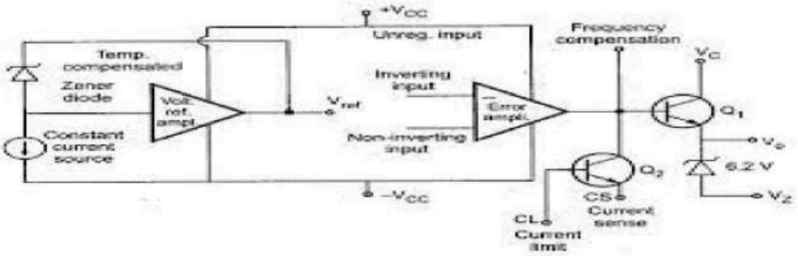

Fig.4.19: Internal Block Diagram of Voltage Regulator

4.1.6 LCD DISPLAY:

The liquid Crystal Displays (LCD) is the small screens to various applications.The LCD combines properties of both liquids and crystals to display the characters.

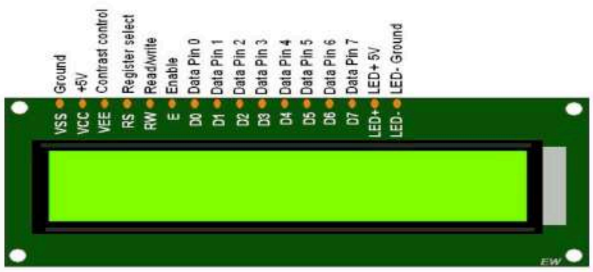

Fig.4.20: 16X2 LCD

In LCD, the liquid crystal material is sandwiched between the two glass panels. The 43LCDs are able to display number, alphabets and special character. The LCD consists of 16 pins out of which 8 pins are for the data (D0 to D7). The LCD consist of command Register & Data register, the command register stores the task to be performed by LCD & data register stores the data to be displayed on the LCD. The LCD doesn't have backlight, the contrast of LCD is adjusted by V_E pins. It operates at 5V and ground (GND) pins is used for grounding purpose.

LCD PIN DESCRIPTIONS :

Pin	Symbol	I/O	Description
1	Vss	--	Ground
2	Vcc	--	+5V Power Supply
3	VEE	--	Power supply to control contrast
4	RS	I	Rs=0 to select command register RS=1 to select data register
5	R/W	I	R/W=0 for write , R/W=1 for read
6	E	I/O	Enable
7	DB0	I/O	The 8-bit data bus
8	DB1	I/O	The 8-bit data bus
9	DB2	I/O	The 8-bit data bus
10	DB3	I/O	The 8-bit data bus
11	DB4	I/O	The 8-bit data bus
12	DB5	I/O	The 8-bit data bus
13	DB6	I/O	The 8-bit data bus
14	DB7	I/O	The 8-bit data bus

Table 4.3: LCD Pin Descriptions

4.1.7 DC MOTOR:

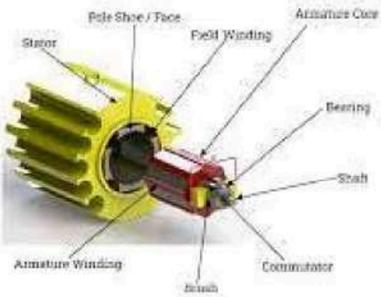

Fig.4.21: DC Motor

The electronic devices that convert electrical energy into mechanical energy are called as DC Motors. The DC motor works or operates at 12V. The spe of DC motor is measured in terms of Rotations per Minute (RPM). The speed of DC motor in this proposed system is set to 10RPM. The external structure of the DC Gear motor is shown in the below figure:

Fig.4.22: External View of DC Gear Motor

The lateral view of the DC Gear motor is shown in the below figure

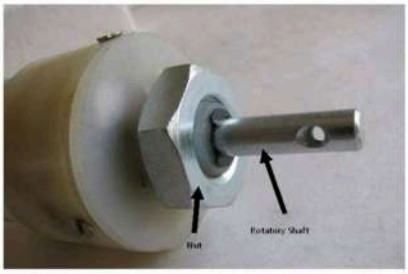

Fig.4.23: Lateral View of DC Gear Motor

The DC motor works on the principle of electromagnetism which states that when a current carrying conductor placed in a magnetic field experiences the force which is proportional to the current present in the conductor.

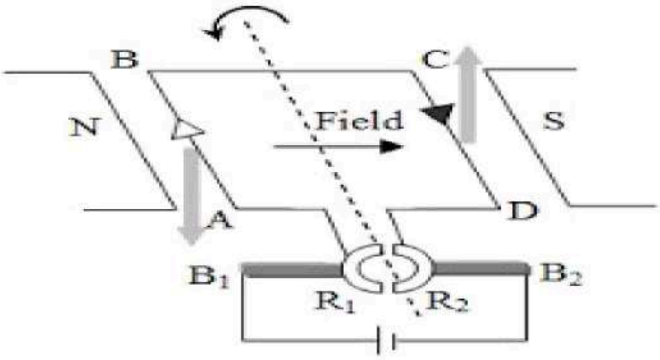

Fig.4.24: Working of DC Motor

Features of DC Motor:

Operating Voltage	12 V DC
Torque	3KG- cm
Load Current	16mA(max)
Speed	10RPM

Table 4.4: Features of DC Motor

4.1.8 BUZZER:

1. Magnetic Transducer:

Magnetic transducers contain a magnetic circuit consisting of a iron core with a wound coil and a yoke plate, a permanent magnet and a vibrating diaphragm with a movable iron piece. The diaphragm is slightly pulled towards the top of the core by the magnet's magnetic field. When a positive AC signal is applied, the current flowing through the excitation coil produces a fluctuating magnetic field, which causes the diaphragm to vibrate up and down, thus vibrating air. Resonance amplifies vibration through resonator consisting of sound hole(s) and cavity and produces a loud sound.

2. Magnetic Buzzer (Sounder):

Buzzers like the TMB-series are magnetic audible signal devices with built-in oscillating circuits. The construction combines an oscillation circuit unit with a detection coil, a drive coil and a magnetic transducer. Transistors, resistors, diodes, and other small devices act as circuit devices for driving sound generators. With the application of voltage, current flows to the drive coil on primary side and to the detection coil on the secondary side. This AC magnetic field magnetizes the yoke comprising the magnetic circuit. The oscillation from the intermittent magnetization prompts the vibration diaphragm to vibrate up and down, generating buzzer sounds through the resonator.

Fig.4.25: Buzzer

Introduction of Magnetic Buzzer (Transducer)

Specifications:

Rated Voltage: A magnetic buzzer is driven by 1/2 square waves (Vo-p).
Operating Voltage: For normal operating. But it is not guaranteed to make the minimum Sound Pressure Level (SPL)under the rated voltage. Sound Pressure Level (SPL)under the rated voltage.

Consumption Current: The current is stably consumed under the regular operation. However, it normally takes three times of current at the moment of starting to work.

Direct Current Resistance: The direct current resistance is measured by ammeter directly.

Sound Output: The sound output is measured by decibel meter. Applying rated voltage and 1/2 square waves, and the distance of 10 cm.

Rated Frequency: A buzzer can make sound on any frequencies, but we suggest that the highest and the most stable SPL comes from the rated frequency.

Operating Temp.: Keep working well between -30℃ and +70℃.

How to choose:

Driving methods: AX series with built drive circuit will be the best choice when we cannot

Dimension: Dimension affects frequency, small size result in high frequency.

Voltage: Depend on V o-p (1/2 square waves)

Fixed methods: From the highest cost to the lowest- DIP, wires/ connector, SMD.

Operating voltage: Normally, the operating voltage for a magnetic buzzer is from 1.5V to 24V, for a piezo buzzer is from 3V to 220V. However, in order to get enough SPL, we suggest giving at least 9V to drive a piezo buzzer.

Consumption current: According to the different voltage, the consumption current of a magnetic buzzer is from dozens to hundreds of mill amperes; oppositely, the piezo type saves much more electricity, only needs a few mill amperes, and consumes three times current when the buzzer starts to work.

Driving method: Both magnetic and piezo buzzer have self-drive type to choose. Because of the internal set drive circuit, the self-drive buzzer can emit sound as long as connecting with the direct current. Due to the different work principle, the magnetic buzzer needs to be driven by 1/2 square waves, and the piezo buzzer need square waves to get better sound output.

Sound Pressure Level (SPL): Buzzer is usually tested the SPL at the distance of 10 cm, if distance double, the SPL will decay about 6 dB; oppositely, the SPL will increase 6 dB when the distance is shortened by one time. The SPL of the magnetic buzzer can reach to around 85 dB/ 10 cm; the piezo buzzer can be designed to emit very loud sound, for example, the common siren, are mostly made of piezo buzzer.

Specifications:

Rated Voltage: A piezo buzzer is driven by square waves (V p-p).

Operating Voltage: For normal operating. But it is not guaranteed to make the minimum SPL under the rated voltage

Consumption Current: The current is stably consumed under the regular operation.

However, it normally takes three times of current at the moment of starting to work.

Capacitance: A piezo buzzer can make higher SPL with higher capacitance, but it consumes more electricity.

Sound Output: The sound output is measured by decibel meter. Applying rated voltage and square, and the distance of 10 cm.

Rated Frequency: A buzzer can make sound on any frequencies, but we suggest that the highest and the most stable SPL comes from the rated frequency.

Operating Temp.: Keep working well between -30°C and +70°C.

How to choose:

Driving methods: AZ-xxxxS-x series with built drive circuit will be the best choice when we cannot provide frequency signal to a buzzer, it only needs direct current. Besides, there are different tone nature for you to choose, such continuous, fast pulse, and slow pulse.

Voltage: Driven by square waves (V p-p), the higher voltage results in the higher SPL.

Pin Pitch: The numerous spec. for the piezo buzzers lead to the difficulty in finding a spec. in facsimile, therefore we suggest that you can firstly choose a spec. with the same pitch and similar frequency.

The factors which affect the SPL: the square measure of diaphragm, the amplitude of vibration, magnetic field intensity, power, impedance, resonant chamber, the pattern and the thickness of diaphragm, and the holes.

Power vs SPL: Suppose all the conditions are the same, increasing the power does not mean the SPL will increase as well. We need to revise the diaphragm and the sound coil to load the higher power, but it leads to lower SPL instead.

Dimension vs SPL: A larger speaker can vibrate more air; therefore, it provides higher SPL. In addition, the thicker speaker can give wider amplitude of vibration which also leads to higher SPL.

Acoustics: What we request most is how much SPL a micro speaker can output.

Matching: It will be better to provide the power slightly higher than the rated power for the enlarged circuit

The volume of the resonant chamber: The general problem of the consuming products is that the resonant chambers are not big enough.

We can only try to find space to enlarge the volume of the resonant chamber.

Sound Hole: Must be more than 1/8 of the diaphragm's area at least.

Airtight: The front and back sound fields of the speaker should be separated to avoid neutralization.

Shock absorber: When a speaker works the vibration will also happen at the same time. In order to reduce interference, it will do good to have some material between speakers and case.
Mounting: The speakers are usually fixed on the case. Firmly fixed is important especially for the iron housing or the large size to avoid separating in the drop test.

How to choose the speaker

Dimension: To the micro speaker, size has decisive influence on its volume. 5mm difference of diameter might result in double or half area of diaphragm, therefore the SPL is quite different. Besides, the thicker speaker has more space to vibrate the air, and usually has bigger magnet, so it will be more powerful to push the air and emit louder sound.

Power: Mainly refer to how much power can a speaker bear, there is no direct relation to the SPL. The speaker with larger power needs to use thicker diaphragm and sound coil to bear larger power, which will lead to lower efficiency (SPL).

Impedance: Higher impedance can save more electricity however; the SPL and the loaded power will go down. The reason is that we have to use thinner wire or to coil more, the front makes the power lower, and the after leads to heaviness and low efficiency.

The patterns of diaphragm: The speaker with concentric circles diaphragm is good for the speech sounds. Generally, the SPL is good at the frequency before 5-6 KHz, but will dramatically decrease after 6 KHz. On the other hand, the speaker with radiate diaphragm has average frequency response. Supposing other conditions are all the same, the SPL of radiate diaphragm will lower than the concentric circles one at the frequency before 6 KHz.

4.1.9 RELAY:

A relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances.The relay allows the isolation of two separate sections of a system with two different voltage sources i.e., a small amount of voltage/current on one side can handle large amount of voltage/current on the other side but there is no chance that these two voltages mix up.

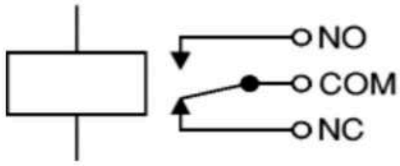

Fig.4.26: Circuit Symbol of a Relay

Operation:

When current flows through the coil, a magnetic field is created around the coil i.e., the coil is energized. This causes the armature to be attracted to the coil. The armature's contact acts like a switch and closes or opens the circuit. When the coil is not energized, a spring pulls the armature to its normal state of open or closed. There are all types of relays for all kinds of applications.

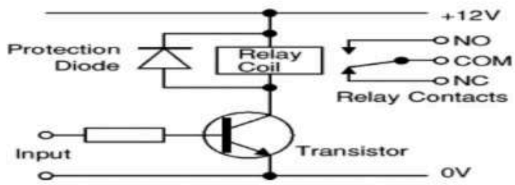

Fig.4.27: Relay Operation and use of Protection Diodes

Transistors and ICs must be protected from the brief high voltage 'spike' produced when the relay coil is switched off. The above diagram shows how a signal diode (e.g. 1N4148) is connected across the relay coil to provide this protection. The diode is connected 'backwards' so that it will normally not conduct. Conduction occurs only when the relay coil is switched off, at this moment the current tries to flow continuously through the coil and it is safely diverted through the diode. Without the diode no current could flow and the coil would produce a damaging high voltage 'spike' in its attempt to keep the current flowing.

Choosing a relay, the following characteristics need to be considered:

1. The contacts can be normally open (NO) or normally closed (NC). In the NC type, the contacts are closed when the coil is not energized. In the NO type, the contacts are closed when the coil is energized.

2. There can be one or more contacts. i.e., different types like SPST (single pole single throw), SPDT (single pole double throw) and DPDT (double pole double throw) relays.

3. The voltage and current required to energize the coil. The voltage can vary from a few volts to 50 volts, while the current can be from a few milliamps to 20milliamps.
4. The minimum DC/AC voltage and current that can be handled by the contacts. This is in the range of a few volts to hundreds of volts, while the current can be from a few amps to 40A or more, depending on the relay.

DRIVING A RELAY:

An SPDT relay consists of five pins, two for the magnetic coil, one as the common terminal and the last pins as normally connected pin and normally closed pin. When the current flows through this coil, the coil gets energized. Initially when the coil is not energized, there will be a connection between the common terminal and normally closed pin. But when the coil is energized, this connection breaks and a new connection between the common terminal and normally open pin will be established. Thus, when there is an input from the microcontroller to the relay, the relay will be switched on. Thus, when the relay is on, it can drive the loads connected between the common terminal and normally open pin. Therefore, the relay takes 5V from the microcontroller and drives the loads which consume high currents. Thus, the relay acts as an isolation device.

CHAPTER 5

SOFTWARE COMPONENTS

- **SOFTWARE REQUIREMENTS:**
  - Arduino IDE.
  - Proteus.

5.1 ARDUINO IDE:

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are:

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

Arduino data types:

Data types in C refers to an extensive system used for declaring variables or functions of different types. The type of a variable determines how much space it occupies in the storage and how the bit pattern stored is interpreted.The following table provides all the data types that you will use during Arduino programming.

Void:

The void keyword is used only in function declarations. It indicates that the function is expected to return no information to the function from which it was called.

Boolean:

A Boolean holds one of two values, true or false. Each Boolean variable occupies one byte of memory.

Char:

A data type that takes up one byte of memory that stores a character value. Character literals are written in single quotes like this: 'A' and for multiple characters, strings use double quotes: "ABC".However, characters are stored as numbers. You can see the specific encoding in the ASCII chart. This means that it is possible to do arithmetic operations on characters, in which the ASCII value of the character is used. For example, 'A' + 1 has the value 66, since the ASCII value of the capital letter A is 65.

Char chr_c = 97 ;//declaration of variable with type char and initialize it with character 97

Unsigned char:

Unsigned char is an unsigned data type that occupies one byte of memory. The unsigned char data type encodes numbers from 0 to 255.

Byte:

A byte stores an 8-bit unsigned number, from 0 to 255.

int:

Integers are the primary data-type for number storage. int stores a 16-bit (2-byte) value. This yields a range of -32,768 to 32,767 (minimum value of -2^15 and a maximum value of (2^15) - 1).

The int size varies from board to board. On the Arduino Due, for example, an int stores a 32-bit (4-byte) value. This yields a range of -2,147,483,648 to 2,147,483,647 (minimum value of -2^31 and a maximum value of (2^31) - 1).

Unsigned int:

Unsigned ints (unsigned integers) are the same as int in the way that they store a 2-byte value. Instead of storing negative numbers, however, they only store positive values, yielding a useful range of 0 to 65,535 (2^16) - 1). The Due stores a 4-byte (32-bit) value, ranging from 0 to 4,294,967,295 (2^32 - 1).

Word:

On the Uno and other ATMEGA based boards, a word stores a 16-bit unsigned number. On the Due and Zero, it stores a 32-bit unsigned number.

Long:

Long variables are extended size variables for number storage, and store 32 bits (4 bytes), from 2,147,483,648 to 2,147,483,647.

Unsigned long:

Unsigned long variables are extended size variables for number storage and store 32 bits (4 bytes). Unlike standard longs, unsigned longs will not store negative numbers, making their range from 0 to 4,294,967,295 (2^32 - 1).

Short:

A short is a 16-bit data-type. On all Arduinos (ATMega and ARM based), a short store a 16-bit (2-byte) value. This yields a range of -32,768 to 32,767 (minimum value of -2^15 and a maximum value of (2^15) - 1).

Float:

Data type for floating-point number is a number that has a decimal point. Floating-point numbers can be as large as 3.4028235E+38 and as low as 3.4028235E+38. They are stored as 32 bits (4 bytes) of information.

Double:

On the Uno and other ATMEGA based boards, Double precision floating-point number occupies four bytes. That is, the double implementation is exactly the same as the float, with no gain in precision. On the Arduino Due, doubles have 8-byte (64 bit) precision.

Step 1: First you must have your Arduino board (you can choose your favourite board) and a USB cable. In case you use Arduino UNO, Arduino Duemilanove, Nano, Arduino Mega2560, or Diecimila, you will need a standard USB cable (A plug to B plug), the kind you would connect to a USB printer as shown in the following image.

Fig.5.1: USB Cable

Step 2: Download Arduino IDE Software.

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.

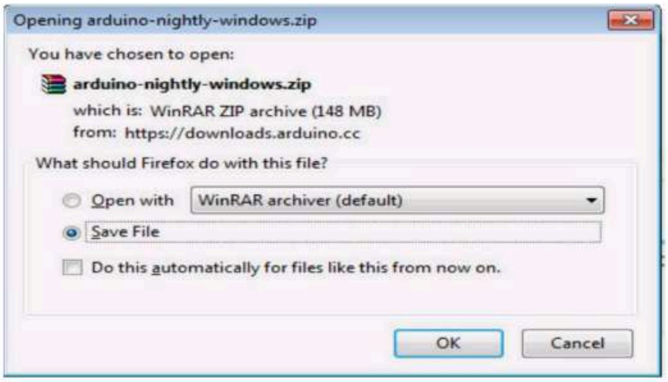

Fig.5.2: Download Arduino IDE Software.

Step 3: Power up your board.

The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an Arduino Diecimila, you have to make sure that the board is configured to draw power from the USB connection. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED (labelled PWR) should glow.

Step 4: Launch Arduino IDE.

After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Double click the icon to start the IDE.

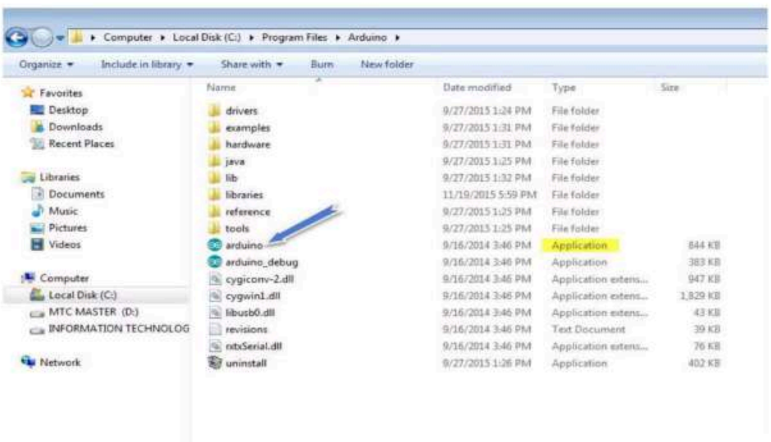

Fig.5.3: Launch Arduino IDE.

Step 5: Open your first project.

Once the software starts, you have two options:

- Create a new project.
- Open an existing project example.

To create a new project, select File --> New. To open

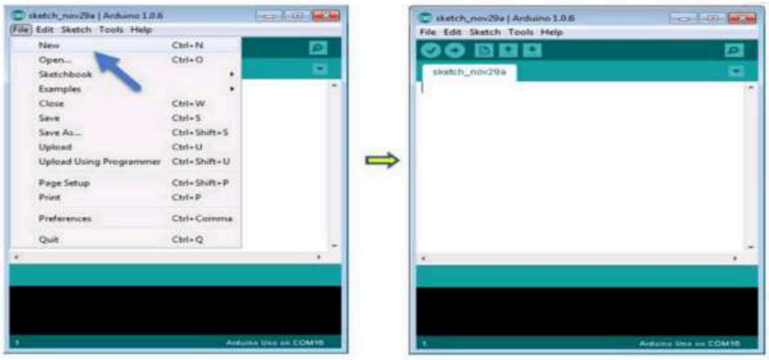

Fig.5.4: Open your First Project

To open an existing project example, select File -> Example -> Basics -> Blink.

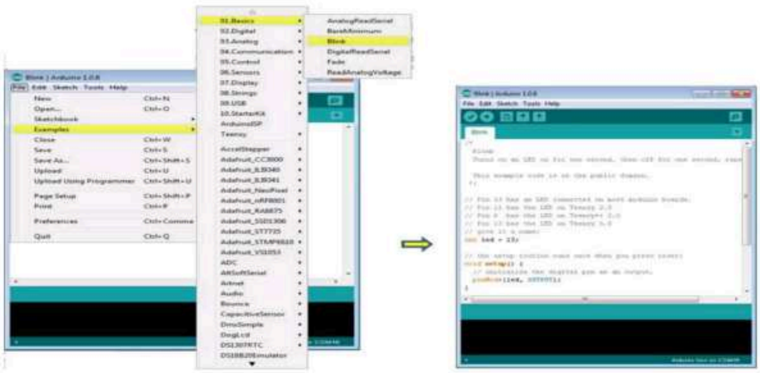

Fig.5.5: To open an Existing Project.

Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. You can select any other example from the list.

Step 6: Select your Arduino board.

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

Go to Tools -> Board and select your board

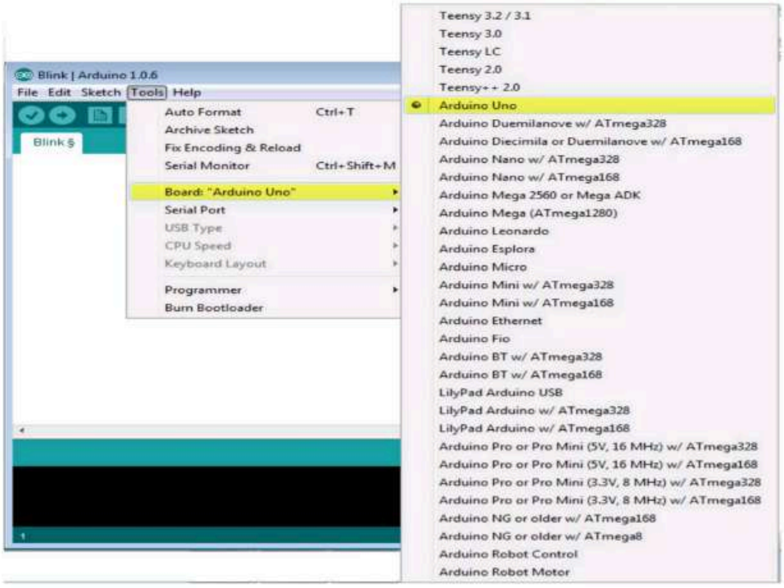

Fig.5.6: Select your Arduino Board.

Here, we have selected Arduino Uno board according to our tutorial, but you must select the name matching the board that you are using.

Step 7: Select your serial port.

Select the serial device of the Arduino board. Go to Tools ->Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.

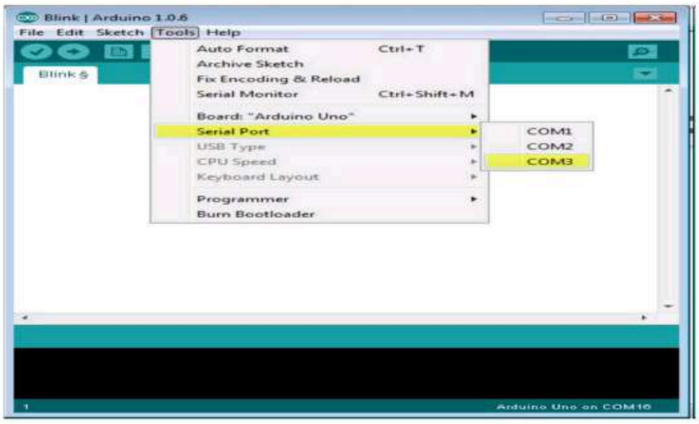

Fig.5.7: Select your Serial Port.

Step 8: Upload the program to your board. Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.

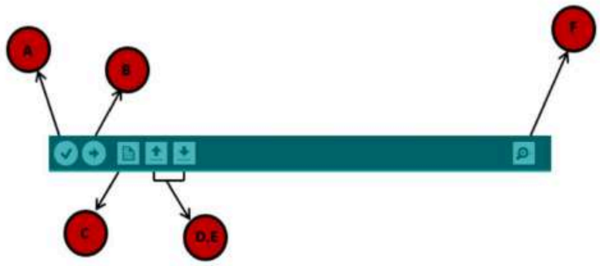

Fig.5.8: Upload the Program to your Board.

A- Used to check if there is any compilation error.

B- Used to upload a program to the Arduino board.

C- Shortcut used to create a new sketch.

D- Used to directly open one of the example sketch.

E- Used to save your sketch.

F- Serial monitor used to receive serial data from the board and send the data to the board.

Now, simply click the "Upload" button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

Note: If you have an Arduino Mini, NG, or other board, you need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

Arduino programming structure:

In this chapter, we will study in depth, the Arduino program structure and we will learn more new terminologies used in the Arduino world. The source code for the Java environment is released under the GPL and the C/C++ microcontroller libraries are under the LGPL.

Sketch: The first new terminology is the Arduino program called “sketch”.

Structure: Arduino programs can be divided in three main parts: Structure, Values (variables and constants), and Functions. In this tutorial, we will learn about the Arduino software program, step by step, and how we can write the program without any syntax or compilation error.

Let us start with the Structure. Software structure consist of two main functions:

- Setup() function
- Loop() function

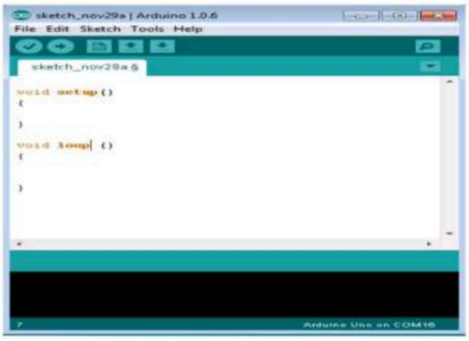

Fig.5.9: Arduino programming structure.

Void setup (){

}

PURPOSE:

After creating a setup() function, which initializes and sets the initial values, the loop() function does precisely what its name suggests, and loops secutively, allowing your program to change and respond. Use it to actively control the Arduino board.

5.2 PROTEUS:

The Proteus design suite provides simulation of circuits & PCB designs. The Proteus design suite provides functions such as schematic capture, microcontroller simulation, PCB design and 3D verification of the designs.

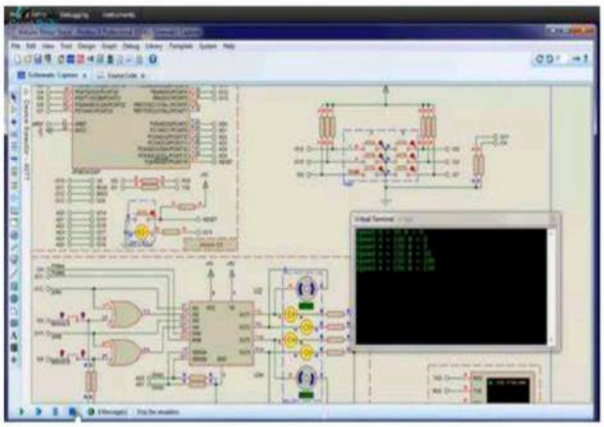

Fig.5.10: Proteus

CHAPTER 6

RESULTS

6.1 RESULTS:

The results of the proposed system Driver Drowsiness and Alcohol Monitoring System results are discussed below:

The power supply is applied to the board and all the hardware components are initialized. The LCD displays the welcome message which is shown in the following figure.

Fig.6.1: LCD Displays Welcome Message

The output of the MQ-3 sensor is display on the LCD, When alcohol is not detected.

Fig.6.2: LCD Displays the MQ-3 Sensor Output(i)

The output of the MQ-3 sensor is display on the LCD, When alcohol is detected.

Fig.6.3: LCD Displays the MQ-3 Sensor Output(ii)

The output of the Eye Blink sensor, When the driver eyes are open.

Fig.6.4: LCD Displays the eye blink sensor output(i)

The output of the Eye Blink sensor, When the driver eyes are closed.

Fig.6.5: LCD Displays the eye blink sensor output(ii)

CHAPTER 7

ADVANTAGES AND APPLICATIONS

7.1 ADVANTAGES:

- Efficiency while driving and safe driving.
- Decreased death rates.
- Reduced manual work.
- As the system is automated it doesn't require more resources like hand written record of driver's safety, but the record is maintained in the database.
- The system has less hardware requirements in comparison to the other biometric system.
- As the system uses fewer resources therefore the cost of the system is less.
- The system also reduces the human effort.
- No fatigue while driving.

7.2 APPLICATIONS:

- The proposed system can be used for long distance travellers.
- The proposed system is utilized in cars.
- The proposed system can be used in Lorries.
- The proposed system can be implemented in motor vehicles.

CHAPTER 8

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION:

This proposed system helps in finding drowsiness and alcohol detection using Arduino. This helps in avoiding many accidents. If the driver's eyes are closed cumulatively more than a standard value, the system draws the conclusion that the driver is falling asleep, and then it will activate an alarm sound to alert the driver. A non-invasive system to localize the eyes and monitor fatigue was developed.

8.2 FUTURE SCOPE:

Further we can extend this project

- By adding camera sensor to the device, we can find the drowsiness of the driver more accurately.
- We can implement this project in organizations to observe the employee's activeness.
- We can also implement this project in schools and colleges.
- An application can be developed where it can alert or prevent the user from sleeping. It can be used to develop an IOT device that can be installed in the car to detect driver's drowsiness.
- Further we can extend this project by using camera sensor to detect the drowsiness of the driver.

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