CROWD CONTROLLER USING IR SENSOR AND ARDUINO

A project report submitted in partial fulfillment for the award of the

DIPLOMA

IN

ELECTRONICS AND COMMUNICATION

ENGINEERING

BY

D.MAHESWARI	**20255-EC-032**	**D.D.V.S.MANI PRASAD**	**20255-EC-034**
J.L.D.LAVANYA	**20255-EC-045**	**B. K.V.S.MANI DURGA**	**20255-EC-016**
G.V.YASWANTH	**20255-EC-044**	**B.VEERENDRA**	**20255-EC-019**

UNDER THE ESTEEMED GUIDANCE OF

Mrs. P.Y. VANI MTech

LECTURER

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADITYA ENGINEERING COLLEGE - 255

ADB ROAD, SURAMPALEM, EAST GODAVARI DISTRICT, ANDHRA PRADESH ,533437

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CERTIFICATE

"CROWD CONTROLLER USING IR SENSOR AND ARDUINO"

This is to certify that the project entitled is a bonafide work of **Mr/Ms. D.MAHESWARI (20255-EC-032) , J.L.D.LAVANYA (20255-EC-045), G.V.YASWANTH (20255-EC-044) , D.MANI PRASAD (20255-EC-034), B.KALPAVALLI (20255-EC-016) , B.VEERENDRA (20255-EC-019)** bearing of final year DECE along with her batch mates submitted in partial fulfillment of the requirements for the award of **DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING** of State Board Of Technical Education And Training, Vijayawada, Andhra Pradesh during the academic year 2020-2023.

Mrs.P.Y. VANI MTech	**Sri. R.V.V. SRINIVAS** MTech	**Sri. S.T.V.S. KUMAR** MTech
PROJECT GUIDE	HEAD OF DEPARTMENT	PRINCIPAL
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ECE DEPARTMENT		COLLEGES

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We thank all the staff members of our ECE department & the college administration and all our friends who helped us directly and indirectly in carrying out this work successfully.

Sincere Regards,

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ABSTRACT

Many times, we have seen that a gatekeeper or security guards who controls the people in overcrowded areas like shopping malls, political meeting, events, temples etc., But in some cases manually it is not possible to have an accurate count of the people entering or leaving the area. thus, it will lead to overcrowded accidents (like human stampede).

So Inorder to solve this problem we came up with a digital circuit, which will give a clear analysis about the population in a particular area. It will count and display the number of people entering, leaving the area and present inside the area. It is also capable of indicating overcrowd alert with the help of a buzzer and LCD.

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CHAPTER-1

INTRODUCTION

1. INTRODUCTION

1.1 OVERVIEW OF THE PROJECT:

In this project we have designed a digital circuit which is used for controlling population in high traffic areas.It gives a clear analysis about the population in a particular area.It will display the count of the people in LCD .Based upon the density of the area we will set the maximum limit of the people,so that whenever the count equals to the Maximum limit the LCD it shows that the area has been full and if in case irrespective of this message when anyone try's to enter this area the LCD shows the area has been overcrowded and the buzzer starts beeping to alert the people and security system.

The device is built on Arduino UNO which is a popular prototyping board.The Arduino board is interfaced with various components in the project like IR sensors to detect the persons ,16x2 LCD display to display the analysis of population,buzzer to give alert with the help of sound,potentiometer to adjust various parameters like current ,voltage and brightness of LCD. The power supply for Arduino is provided by 9v dc power adapter and all other components takes power supply that may be either 5v or 3.3v based on their requirement from the Arduino.

The Arduino Sketch running over the device implements the various functionalities of the project like reading sensor data, converting them into strings, displaying them on character LCD. The Sketch is written, compiled and loaded using the Arduino IDE.

1.2 BLOCK DIAGRAM:

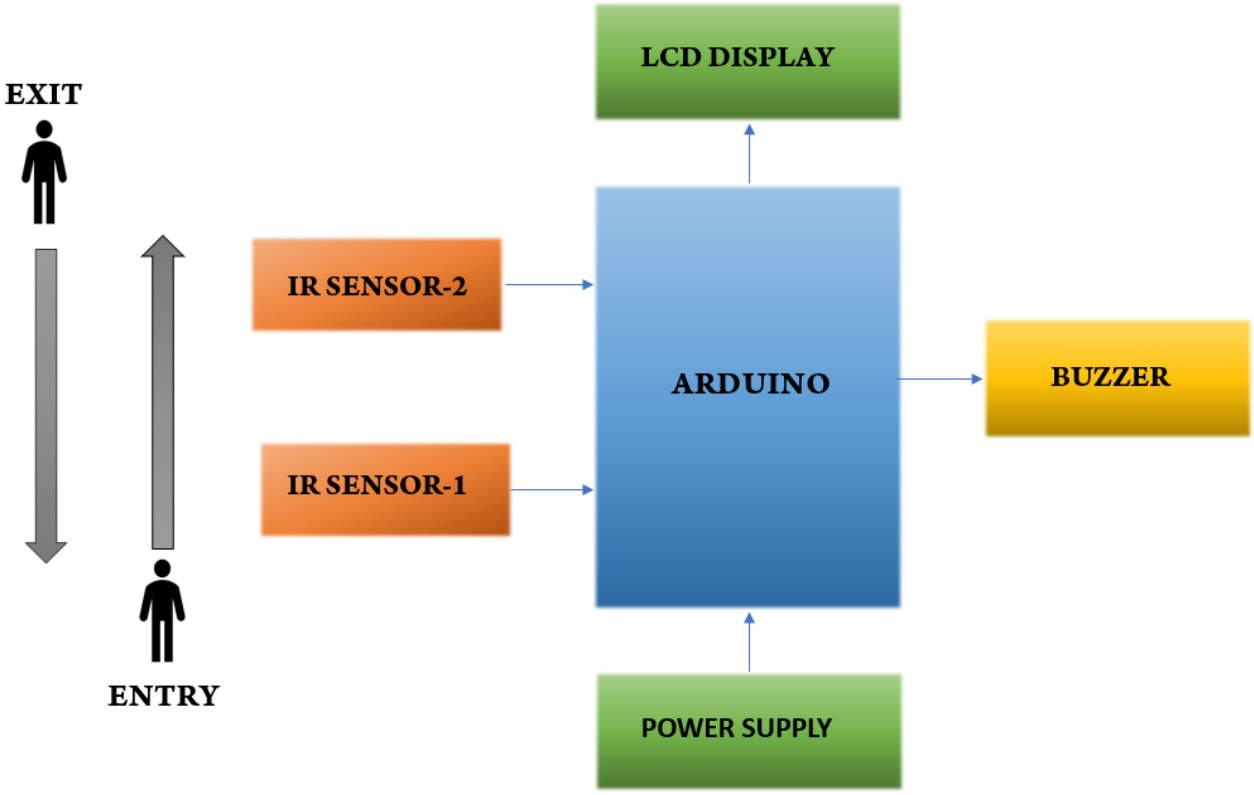


Fig: 1.1

CHAPTER-2

HARDWARE COMPONENTS

2.HARDWARE COMPONENTS

2.1 ARDUINO UNO

2.1.1 GENERAL DESCRIPTION:

The Arduino UNO is an open-source microcontroller board based on the microchip ATmega328p microcontroller and developed by Arduino.cc and initially released in 2010.The board is equipped with sets of digital and analog input/output(i/o) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O , 6 analog I/O pins, and is programmable with the Arduino Ide via a type B USB cable

The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the 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. A Software Serial library allows serial communication on any of the Uno's digital pins.

2.1.2 PIN DIAGRAM:

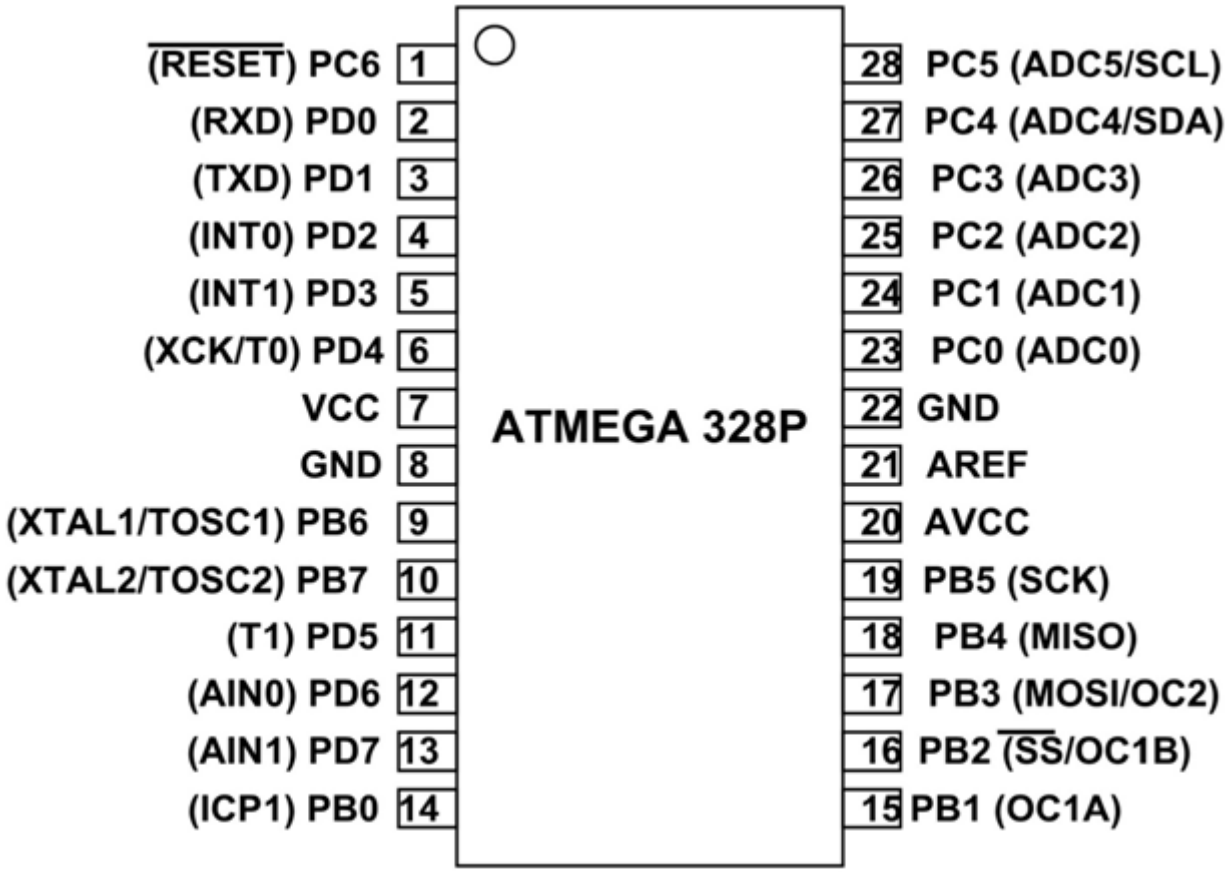


Fig: 2.1

➢ PIN DESCRIPTION:

Pin Category	Pin Name	Details
Power	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source. 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA. GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0-A5	Used to provide analog input in the range of 0-5V
Input/Output Pins	Input/Output Pins	Can be used as input or output pins.
Serial	0(Rx), 1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
TWI	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	Analogue Reference	To provide reference voltage for input voltage.

Table:2.1

2.1.3 COMPONENTS PRESENT ON ARDUINO UNO BOARD:

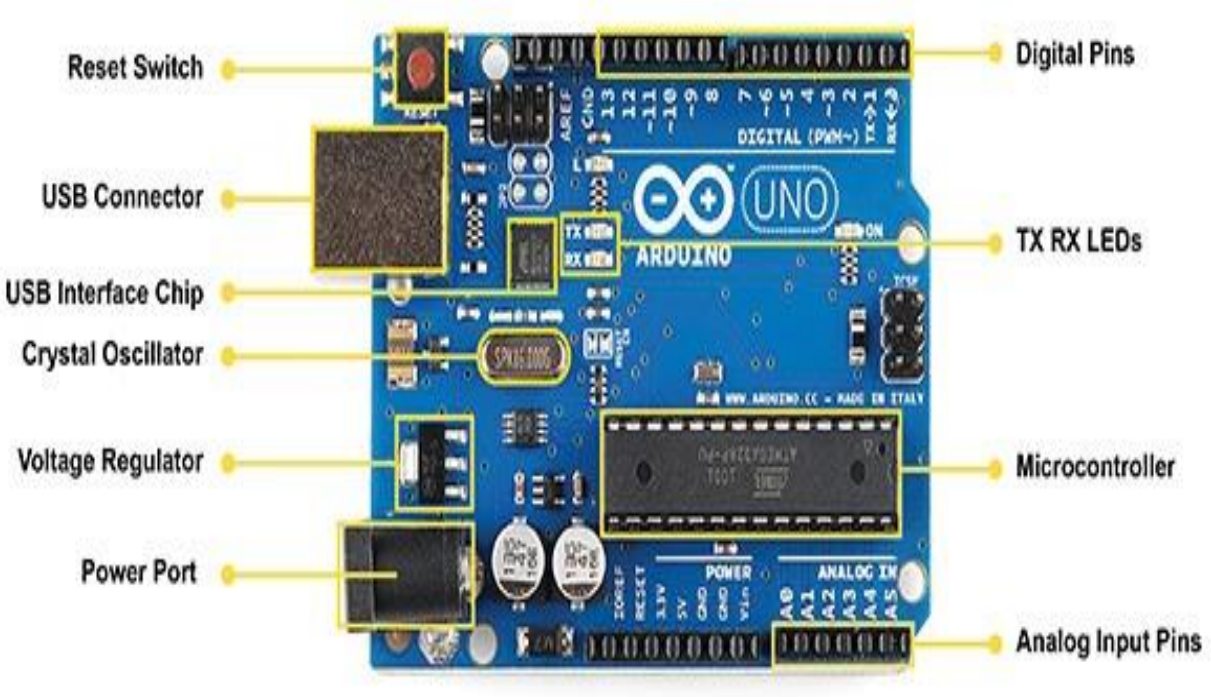


Fig:2.2

➢ USB - B Socket

The USB socket on the UNO has two functions. One is for communication, to connect with the computer through a USB port, and also to load the firmware into the Arduino with the help of the bootloader. The second is to power the Arduino. You can use the USB port to power the Uno directly from any USB port.

➢ ISCP PINS

In the UNO you can find two 6 pin connectors. One is near the USB – TTL Chip and the other one is at the end of the board. These pins are used to program those two microcontrollers. The USB – TTL chip on this board is an ATMgega16U. The connector marked as 1 is used to program the USB-TTL firmware into this chip. And the connector marked as 2 is used to burn the bootloader into the ATMega328 microcontroller.

➢ RESET BUTTON

As the name indicates this tactile switch is used to reset the ATMega328 microcontroller. It's connected to the PC6/Reset pin, which is pulled up through a 10K. When the switch is pressed, the pin is pulled to the ground and the chip will reset.

➢ USB-TTL INTERFACE CHIP

To communicate with the computer, the Arduino relies on a USB-TTL interface. In UNO, ATMega16U with custom firmware act as a USB – TTL interface chip.

➢ CRYSTALL OSCILLATOR

The clock circuit determines the speed with which the microcontroller operates. How many instructions per second it will execute is dependent on the clock frequency. We will be using a Quartz crystal oscillator or a ceramic resonator for this purpose. The first one is a 16MHz crystal oscillator used for the ATMega16U2 chip and the second one is a 16MHZ resonator used for the ATmega328p microcontroller.

2.1.4 BLOCK DIAGRAM:

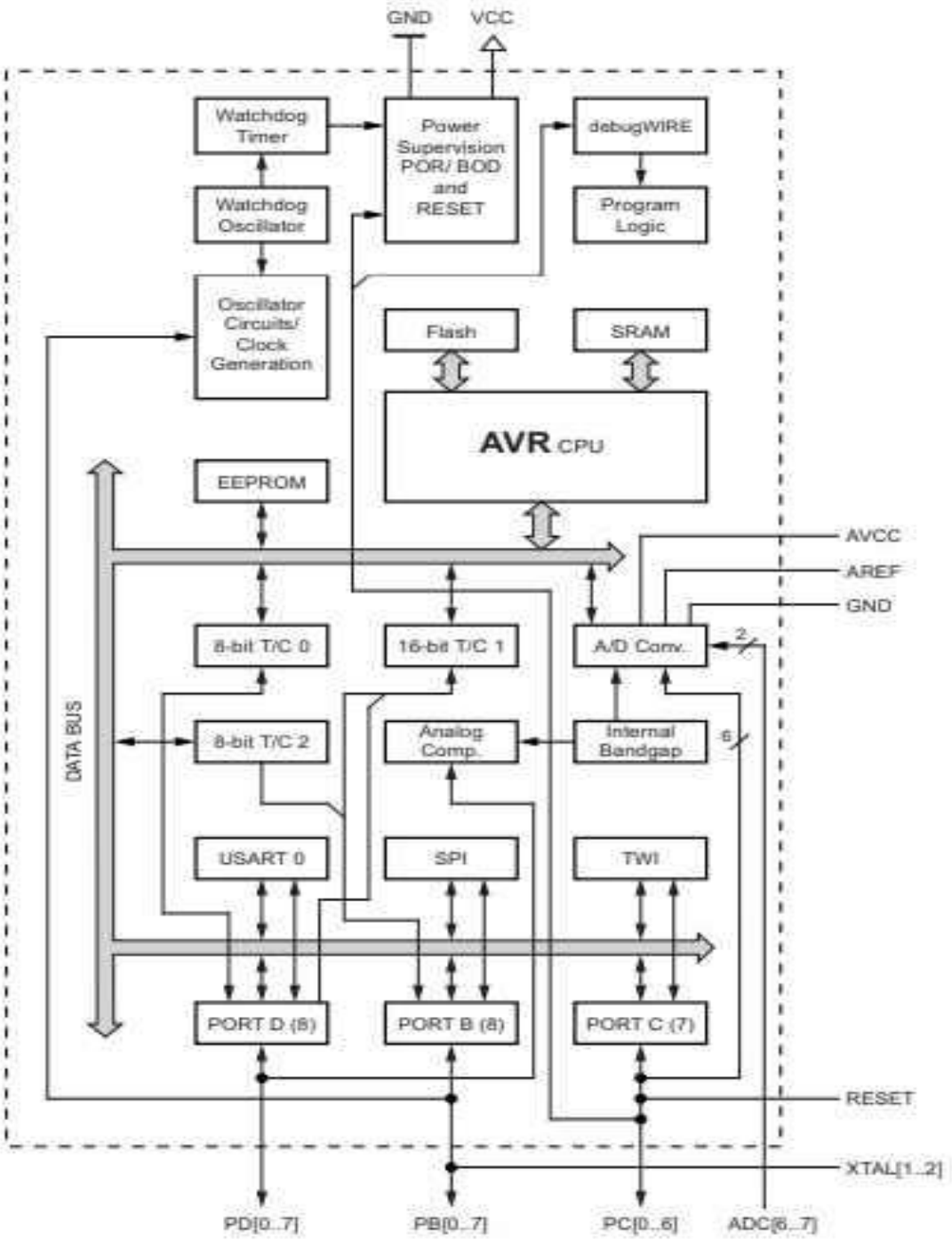


FIG:2.3

2.1.5 SPECIFICATIONS OF ARDUINO:

Microcontroller	ATmega38P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0-A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40mA
DC Current on 3.3V Pin	50mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2kB
EEPROM	1kB
Frequency (Clock Speed)	16MHz

Table:2.2

2.1.6 APPLICATIONS OF ARDUINO:

- Weighing machines
- Traffic light count down timer
- Parking LOT counter
- Embedded systems
- Home automation
- Medical instruments
- Industrial automation

2.2 IR SENSOR

2.2.1 GENERAL DESCRIPTION:

Fig:2.4

IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode . Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

2.2.2 PIN DESCRIPTION:

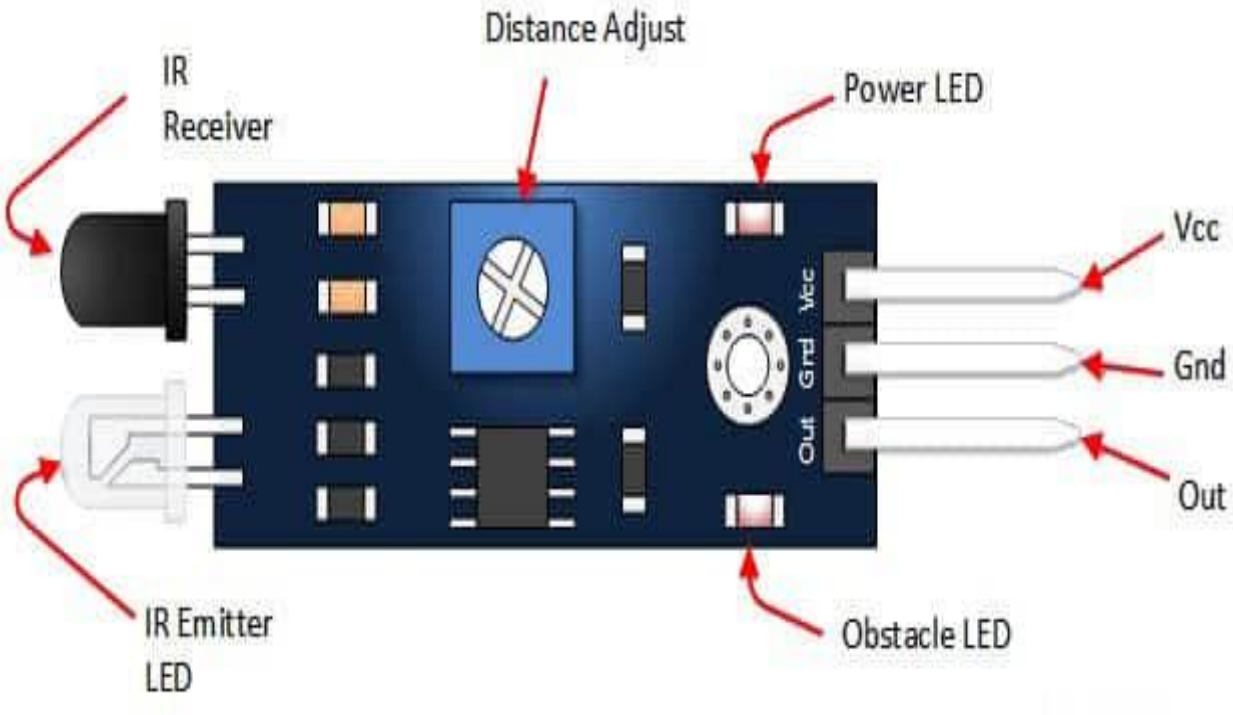


Fig:2.5

Pin Name	Description
VCC	Power Supply +5v
GND	Power Supply Ground
OUTPUT	Active High Output

Table:2.3

2.2.3 SPECIFICATIONS:

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Range: Up to 20cm
- Adjustable Sensing range
- Built-in Ambient Light Sensor
- 20mA supply current
- Mounting hole

2.2.4 TYPES OF IR SENSORS:

There are two types of IR sensors are available and they are,

Active Infrared Sensor

Active infrared sensors consist of two elements: infrared source and infrared detector. Infrared sources include the LED or infrared laser diode. Infrared detectors include photodiodes or phototransistors. The energy emitted by the infrared source is reflected by an object and falls on the infrared detector.

Passive Infrared Sensor

Passive infrared sensors are basically Infrared detectors. Passive infrared sensors do not use any infrared source and detector. They are of two types: quantum and thermal. Thermal infrared sensors use infrared energy as the source of heat. Thermocouples, pyroelectric detectors and bolometers are the common types of thermal infrared detectors. Quantum type infrared sensors offer higher detection performance. It is faster than thermal type infrared detectors. The photo sensitivity of quantum type detectors is wavelength dependent.

2.2.5 WORKING OF IR SENSOR:

An infrared sensor works similarly as an object detection sensor does. This sensor contains an infrared LED and an infrared photodiode, which can be combined to make a photo-coupler or an optocoupler. Planks radiation, Stephan Boltzmann, and Weins displacement are the physics laws used in this sensor.

IR Transmitter or IR LED:

FIG:2.6

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations called as IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

IR Receiver or Photodiode:

IR Photodiode functions as an IR receiver used to detect the light rays reflected from an IR LED. The photodiode is basically a reverse-biased PN junction diode. When the photodiode is exposed to light, the electrical resistance across the diode decreases. Thereby increasing the reverse current. In case if the photodiode is not exposed to light, the resistance across the diode

will be high. Hence the reverse current will be extremely small. This current is also known as a dark current.

There are various types of IR receivers based on wavelength, voltage, packaging, and other factors. The wavelength of the receiver should match that of the transmitter when utilised in an infrared transmitter – receiver combo.

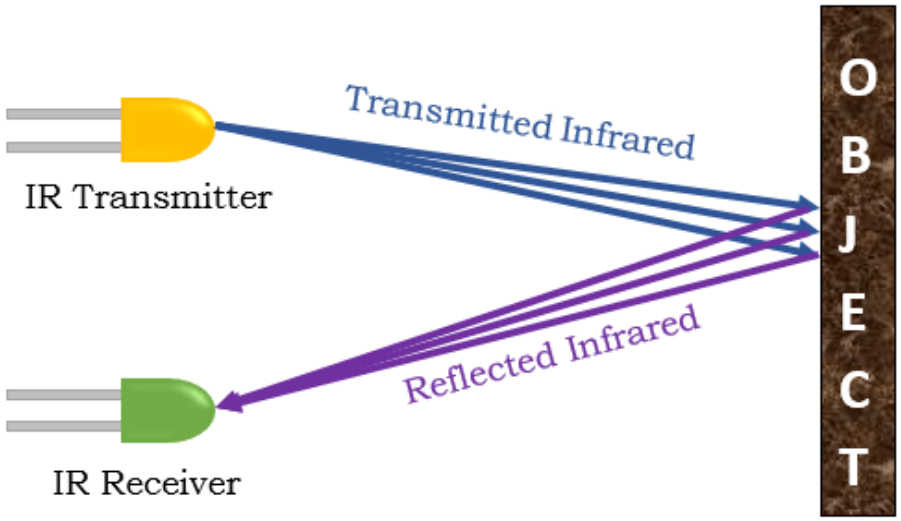


FIG:2.7

These lights are not visible by naked eyes but can be seen through a camera. That is the reason why these IR sensors used in night vision cameras. When light falls on the IR sensor, the photodiode response in terms of change in resistance. This change in resistance measured in terms of voltage. This module can be connected directly to a microcontroller, Arduino, or Raspberry Pi with a few current limiting resistors.

IR Sensor Circuit Diagram:

This IR Sensor circuit comprises the following components

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo-ohms.
- Variable resistors.
- LED (Light Emitting Diode).

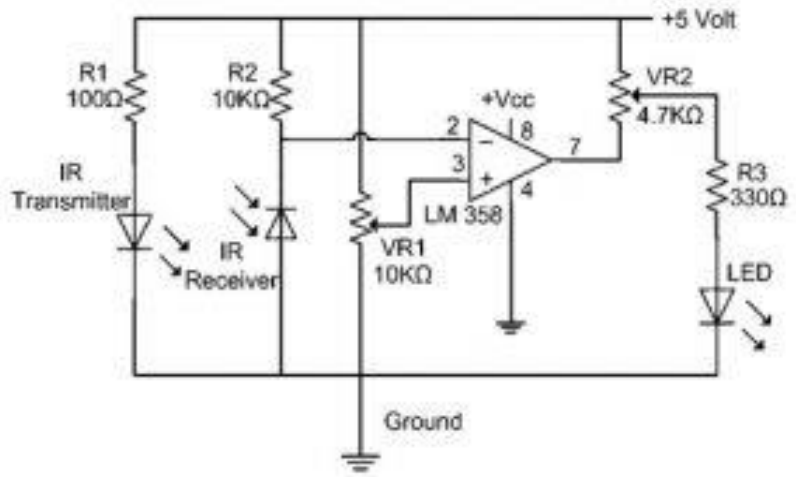


FIG:2.8

The transmitter part of this project includes an IR sensor that emits continuous IR rays that are received by an IR receiver module. The receiver's IR output terminal changes depending on how well it receives IR photons. This output can be passed to a comparator circuit because this variation cannot be analysed separately. As a comparator circuit, an LM 339 operational amplifier (op-amp) is employed.

When the IR receiver does not receive a signal, the inverting input of the comparator IC has a higher potential than the comparator IC's non-inverting input (LM339). As a result, the comparator's output goes low, but the LED does not glow. The voltage at the inverting input goes low when the IR receiver module gets a signal. As a result, the comparator's output (LM 339) turns high, and the LED begins to glow.

Resistor R1 (100), R2 (10k), and R3 (330) are used to ensure that a minimum of 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k) is used to adjust the output terminals. Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit Diagram.

2.2.6 ADVANTAGES:

- Low power consumption
- There is no data leakage because of the ray direction
- These sensors are not affected by oxidation & corrosion
- Noise immunity is strong
- Detects motion when the light is present or absent
- These sensors are not affected by rust
- They do not need to get in touch with objects for detection.
- No data leakage because of the directionality infrared radiation of ray
- These are more modest in size and are more moderate.
- It responds very quickly as compared to thermocouples.
- It provides high reliability

2.2.7 APPLICATIONS:

- Climatology
- Meteorology
- Photo bio modulation
- Flame Monitors
- Gas detectors
- Water analysis
- Moisture Analyzers
- Anesthesiology testing
- Petroleum exploration
- Rail safety
- Gas Analyzers

2.3 LCD DISPLAY

2.3.1 GENERAL DESCRIPTION:

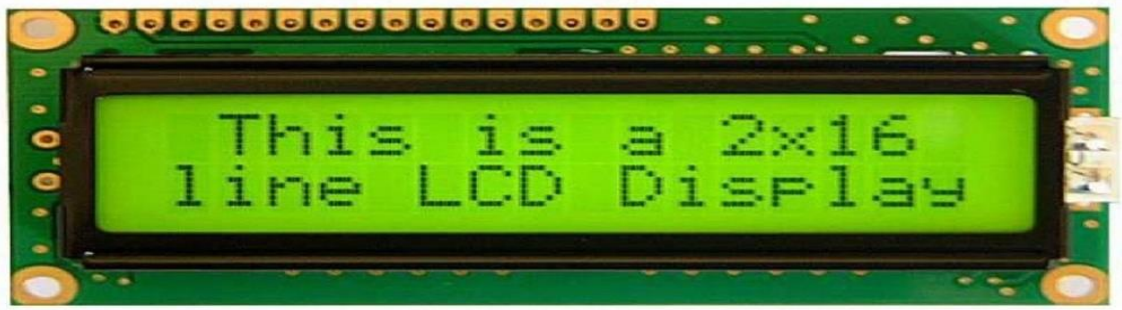


FIG:2.9

A liquid crystal display or LCD draws its definition from its name itself. It is a combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screens that are generally used in laptop computer screens, TVs, cell phones, and portable video games. LCD's technologies allow displays to be much thinner when compared to a cathode ray tube (CRT) technology.

Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. LCD technology is used for displaying the image in a notebook or some other electronic devices like mini computers. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image. This image is then displayed on the screen.

2.3.2 PIN DESCRIPTION:

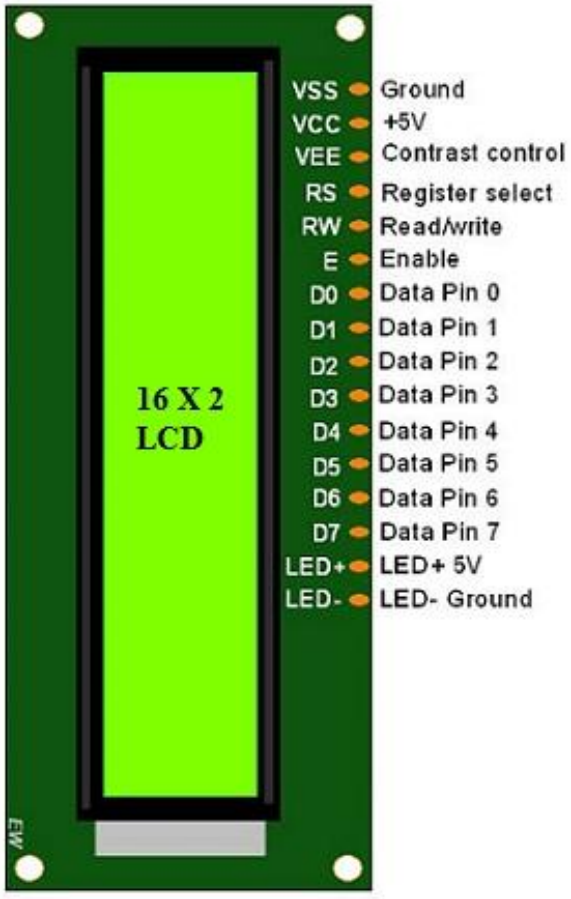


FIG:2.10

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.

- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.

2.3.3 FEATURES OF LCD:

The features of this LCD mainly include the following.

- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Is display can work on two modes like 4-bit & 8-bit
- These are obtainable in Blue & Green Backlight
- It displays a few custom generated characters

2.3.4 CONSTRUCTION OF LCD:

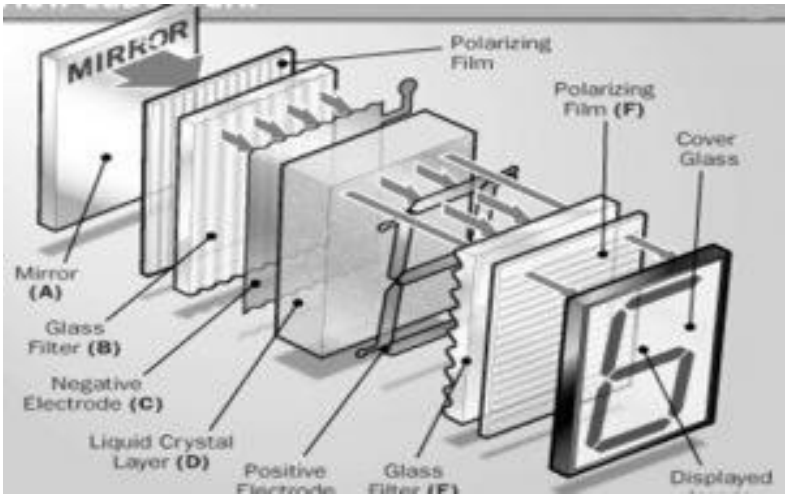


FIG:2.11

As mentioned above that we need to take two polarized glass pieces filter in the making of the liquid crystal. The glass which does not have a polarized film on the surface of it must be rubbed with a special polymer that will create microscopic grooves on the surface of the polarized glass filter. The grooves must be in the same direction as the polarized film.

Now we have to add a coating of pneumatic liquid phase crystal on one of the polarizing filters of the polarized glass. The microscopic channel causes the first layer molecule to align with filter orientation. When the right angle appears at the first layer piece, we should add a second piece of glass with the polarized film. The first filter will be naturally polarized as the light strikes it at the starting stage.

Thus, the light travels through each layer and guided to the next with the help of a molecule. The molecule tends to change its plane of vibration of the light to match its angle. When the light reaches the far end of the liquid crystal substance, it vibrates at the same angle as that of the final layer of the molecule vibrates. The light is allowed to enter into the device only if the second layer of the polarized glass matches with the final layer of the molecule.

2.3.5 WORKING OF LCD:

The principle behind the LCDs is that when an electrical current is applied to the liquid crystal molecule, the molecule tends to untwist. This causes the angle of light which is passing through the molecule of the polarized glass and also causes a change in the angle of the top polarizing filter. As a result, a little light is allowed to pass the polarized glass through a particular area of the LCD.

Thus, that particular area will become dark compared to others. The LCD works on the principle of blocking light. While constructing the LCDs, a reflected mirror is arranged at the back. An electrode plane is made of indium-tin-oxide which is kept on top and a polarized glass with a polarizing film is also added on the bottom of the device. The complete region of the LCD has to be enclosed by a common electrode and above it should be the liquid crystal matter.

Next comes the second piece of glass with an electrode in the form of the rectangle on the bottom and, on top, another polarizing film. It must be considered that both the pieces are kept at the right angles. When there is no current, the light passes through the front of the LCD it will be reflected by the mirror and bounced back. As the electrode is connected to a battery the current from it will cause the liquid crystals between the common-plane electrode and the electrode shaped like a rectangle to untwist. Thus, the light is blocked from passing through. That particular rectangular area appears blank.

2.3.6 APPLICATIONS:

- Liquid crystal thermometer
- Optical imaging
- The liquid crystal display technology is also applicable in the visualization of the radio frequency waves in the waveguide
- Used in the medical applications

2.4 BUZZER

2.4.1 GENERAL DESCRIPTION:

FIG:2.12

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

These buzzers were invented by manufacturers of Japanese & fixed into a broad range of devices during the period of 1970s – 1980s. So, this development primarily came due to cooperative efforts through the manufacturing companies of Japanese. In the year 1951, they recognized the Application Research Committee of Barium Titanate that allows the corporations to be cooperative competitively & bring about numerous piezoelectric creations.

2.4.2 PIN DESCRIPTION :

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

2.4.3 TYPES OF BUZZERS

A buzzer is available in different types which include the following.

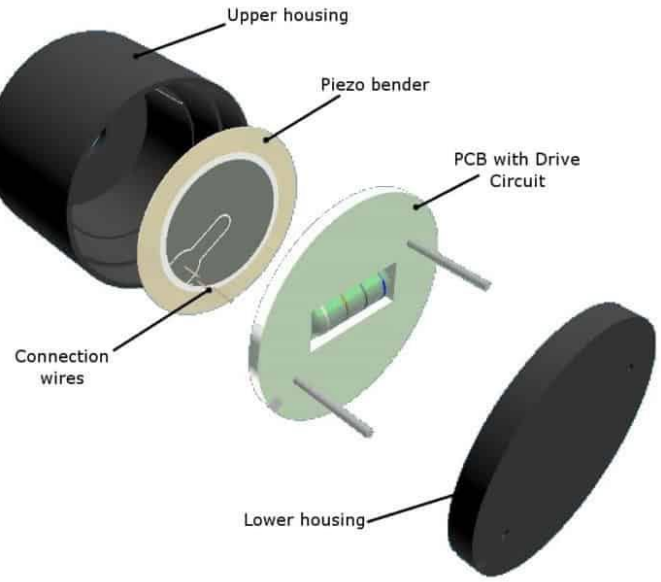
- Piezoelectric
- Electromagnetic
- Mechanical
- Electromechanical
- Magnetic

Piezo electric:

As the name suggests, the piezoelectric type uses the piezoelectric ceramic's piezoelectric effect & pulse current to make the metal plate vibrate & generate sound. This kind of buzzer is made with a resonance box, multi resonator, piezoelectric plate, housing, impedance matcher, etc. Some of the buzzers are also designed with LEDs.

The multi resonator of this mainly includes ICs and transistors. Once the supply is given to this resonator, it will oscillate and generates an audio signal with 1.5 to 2 kHz. The impedance matcher will force the piezoelectric plate to produce sound.

2.4.4 CONSTRUCTION OF BUZZER:



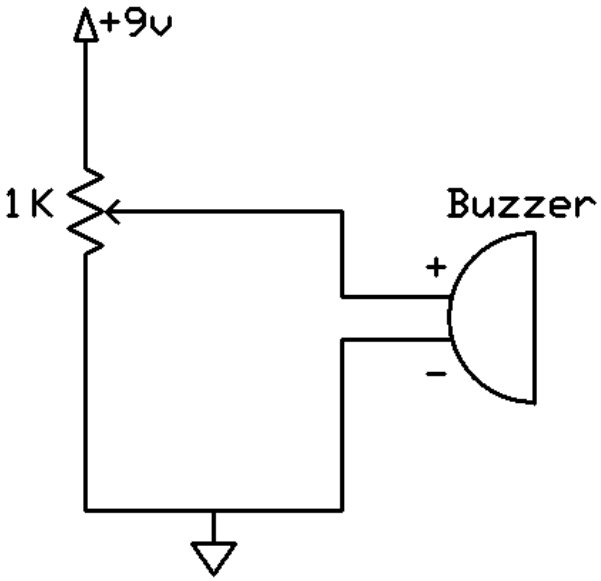
Piezo Buzzer Construction

FIG:2.13

Piezoelectric sound elements have a very unique convention. There is no magnetic field, and no coil used in the construction. Applying an electric field to a piezoelectric material changes its size, i.e. the diaphragm expands/ retracts as charges are introduced/ removed. The base material in the assembly remains fixed.

Piezo buzzers are constructed by placing electrical contacts on the two faces of a disk of piezoelectric material and then supporting the disk at the edges in an enclosure. When a voltage is applied across the two electrodes, the piezoelectric material mechanically deforms due to the applied voltage. This movement of the piezo disk within the buzzer creates sound .

2.4.5 WORKING PRINCIPLE OF A BUZZER:



Fig;2.14

The piezoelectric buzzer uses the piezoelectric effect of the piezoelectric ceramics and uses the pulse current to drive the vibration of the metal plate to generate sound. Piezoelectric buzzer is mainly composed of multi-resonator, piezoelectric plate, impedance matcher, resonance box, housing, etc. Some of the piezoelectric buzzers are also equipped with light-emitting diodes. The multi-resonator consists of transistors or integrated circuits.

The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors.Once a potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.

2.4.6 Specifications of a buzzer:

- Colour is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15mA
- Sound pressure level 90db

2.4.7 Applications:

The applications of the buzzer include the following.

- Communication Devices
- Electronics used in Automobiles
- Alarm Circuits
- Portable Devices
- Security Systems
- Timers
- Household Appliances
- Electronic Metronomes
- Sporting Events
- Annunciator Panels
- Game shows

2.5 POTENTIOMETER

2.5.1 GENERAL DESCRIPTION:

Fig:.2.15

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.

The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name.

Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

2.5.2 PIN DESCRIPTION:

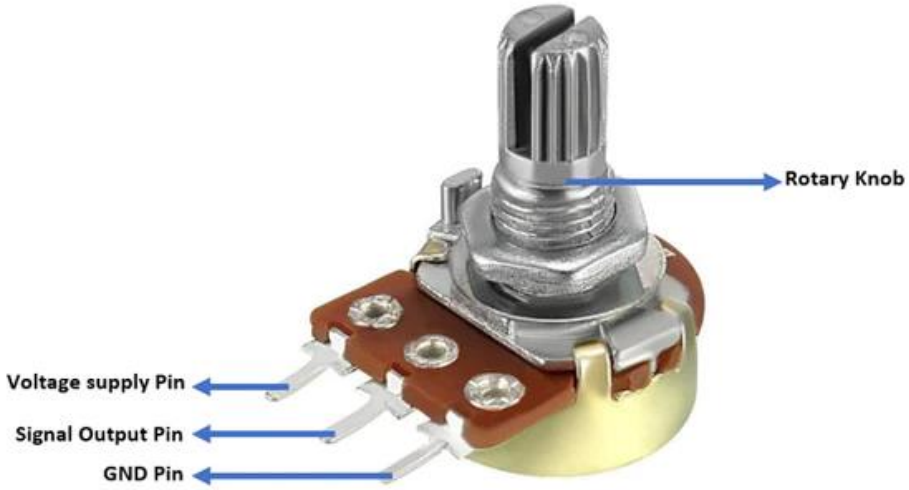


FIG:2.16

A potentiometer is a manually adjustable variable resistor with 3 terminals. Two of the terminals are connected to the opposite ends of a resistive element, and the third terminal connects to a sliding contact, called a wiper, moving over the resistive element.

2.5.3 SPECIFICATIONS OF A POTENTIOMETER:

- Material Used : Plastic
- Linear type with a single turn
- Compact size
- Value:- 0- 10K
- Resistance Tolerance:- ±10%
- Rotation angel:- 210 ±20 °
- Rotational Life Cycle:- 200 cycles
- Temperature range : - -55 to +125 ℃

2.5.4 CONSTRUCTION OF POTENTIOMETER:

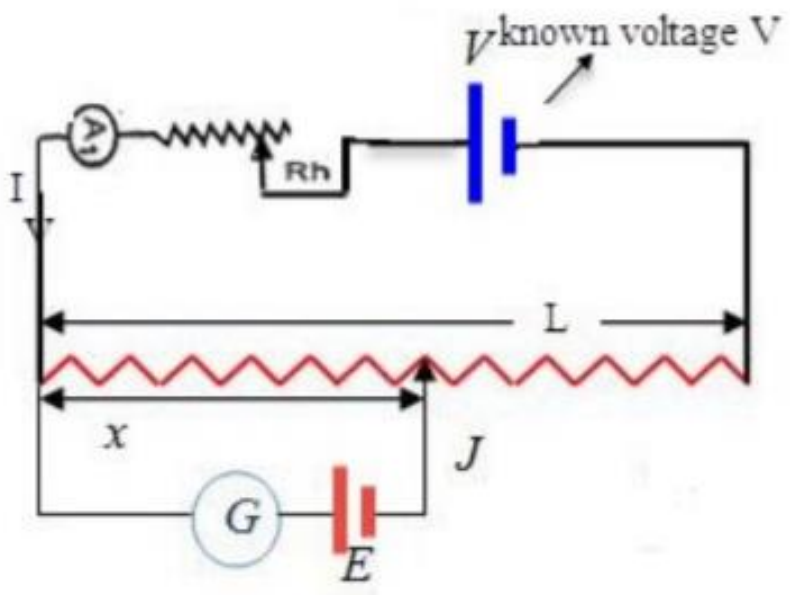


Fig:2.17

The potentiometer consists of a long resistive wire L made up of magnum or with constantan and a battery of known EMF V. This voltage is called as driver cell voltage. Connect the two ends of the resistive wire L to the battery terminals as shown below; let us assume this is a primary circuit arrangement.

One terminal of another cell (whose EMF E is to be measured) is at one end of the primary circuit and another end of the cell terminal is connected to any point on the resistive wire through a galvanometer G. Now let us assume this arrangement is a secondary circuit. The arrangement of the potentiometer as shown below.

2.5.5 ADVANTAGES OF POTENTIOMETER:

- There is no chance of getting errors because it uses the zero-reflection method.
- The standardization can be done by using a normal cell directly
- It is used to measure small emf's due to highly sensitive
- Based on the requirement, the potentiometer length can be increased to get accuracy.
- When the potentiometer is used in the circuit for measurement then it doesn't draw any current.
- It is used to measure the inner resistance of a cell as well as compares the e.m.f. of two cells but by using a voltmeter, it is not possible.

2.5.6 APPLICATIONS:

- Potentiometer as a voltage divider

- Audio control: Both linear, and rotary potentiometers, are used to control audio equipment for changing the loudness and other audio-related signals.

- Television: They are used to control the picture brightness, colour response and contrast.

- Motion control: In order to create a closed-loop control, potentiometers are used as position feedback devices known as a servomechanism.

- Transducers: As these give large output signals, they find applications in the design of displacement transducers.

2.6 POWER SUPPLY

2.6.1 GENERAL DESCRIPTION:

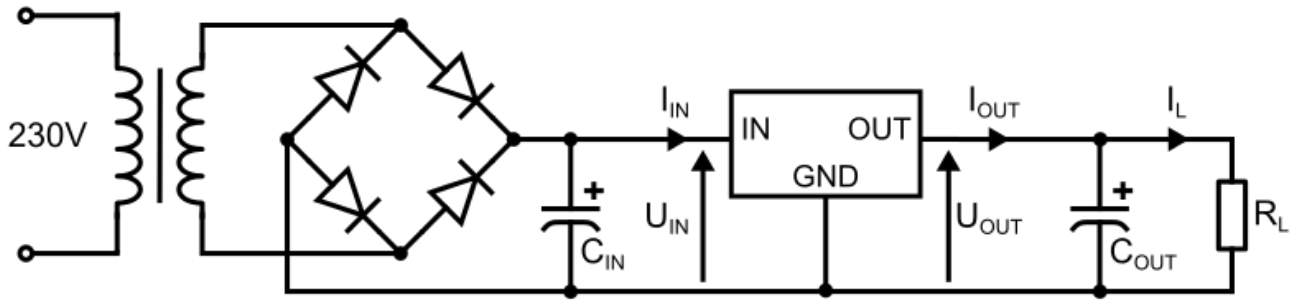


Fig:2.18

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can be broken down into a series of blocks, each of which performs a particular function. A DC power supply which maintains the output voltage constant irrespective of ac mains fluctuations or load variations is known as “REGULATED D.C POWER SUPPLY”.

The Regulated power supply (RPS) is one kind of electronic circuit, designed to provide the stable DC voltage of fixed value across load terminals irrespective of load variations. The main function of the regulated power supply is to convert an unregulated alternating current (AC) to a steady direct current (DC). The RPS is used to confirm that if the input changes then the output will be stable. This power supply is also called a linear power supply, and this will allow an AC input as well as provides steady DC output.

2.6.2 BLOCK DIAGRAM:

The block diagram of a regulated power supply mains includes a step-down transformer, a rectifier, a DC filter, and a regulator. The construction & working of a regulated power supply is discussed below.

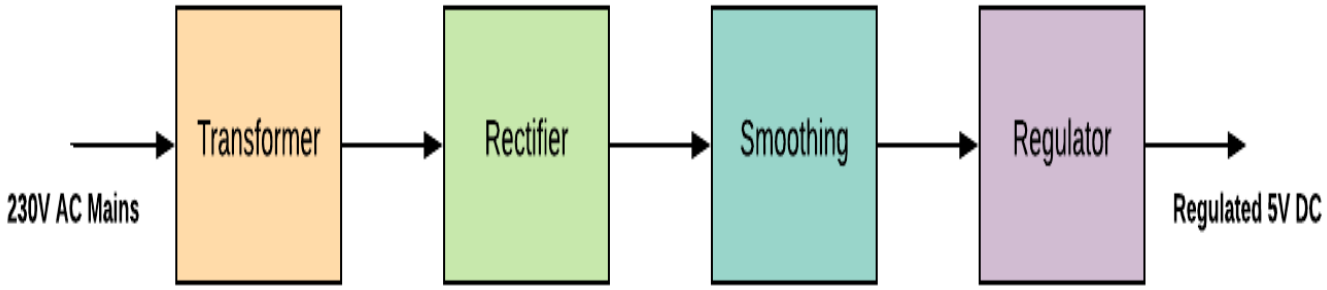


Fig:2.19

1.TRANSFORMER:

A power supply can be used for providing the necessary amount of power at the precise voltage from the main source like a battery. A transformer alters the AC mains voltage toward a necessary value and the main function of this is to step up and step down the voltage.For instance, a step-down transformer is used in a transistor radio, and a step-up transformer is used in a CRT. Transformer gives separation from the power-line, and must be used even as any modify within voltage is not required.

2.FILTER:

A filter in the regulated power supply is mainly used for leveling the ac differences from the corrected voltage. Rectifiers are classified into four types namely capacitor filter, Inductor filter, LC filter & RC filter.

3.RECTIFIER:

Fig:2.20

A circuit which is used to convert ac to pulsating dc is known as RECTIFIER. The process of conversion from ac to dc is called "rectification". It can be a full wave rectifier as well as half wave rectifier with the help of a transformer by a bridge rectifier otherwise center tapped secondary winding. However, the rectifier's o/p can be variable.

4.VOLTAGE REGULATOR:

Fig:2.21

A **voltage regulator** in the regulated power supply is essential for keeping a steady DC output voltage by supplying load regulation as well as line regulation. For this reason, we can employ regulators like a Zener, transistorized, otherwise 3-terminal integrated regulators. An SMPS-switched mode power supply can be used for supplying huge load current by small power dissipation within the series pass transistor.

2.6.3 DC POWER ADAPTER:

Fig:2.22

An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Other common names include plug pack, plug-in adapter, adapter block, domestic mains adapter, line power adapter, wall wart, power brick, and power adapter.

2.6.4 SPECIFICATIONS OF ADAPTER:

- 2-flat-pin plug
- 110V input voltage / 9VDC 1A output voltage
- For use with Arduino Uno, Mega and MB102 Power supply boards
- Connector size: 5.5 x 2.1mm
- Centre or Tip is positive, sleeve is negative

2.6.5 ADVANTAGES:

- High efficiency
- Low power consumption
- Low cost
- Small size
- Light weight
- Wide voltage regulator range
- More filter efficiency
- Low noise
- Fast transient response
- Simplicity of design

2.6.6 APPLICATIONS:

- Mobile charging circuits
- Testing circuits
- Bench power supplies
- Oscillators and amplifiers
- Electronic computers
- Automatic control systems
- Medical Equipment
- Radio , RF communication systems
- AV systems
- Small power supply units
- Televisions
- Computers

CHAPTER-3

SOFTWARE TOOLS

3.SOFTWARE TOOLS

3.1 ARDUINO IDE SOFTWARE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Fig:3.1

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino.'

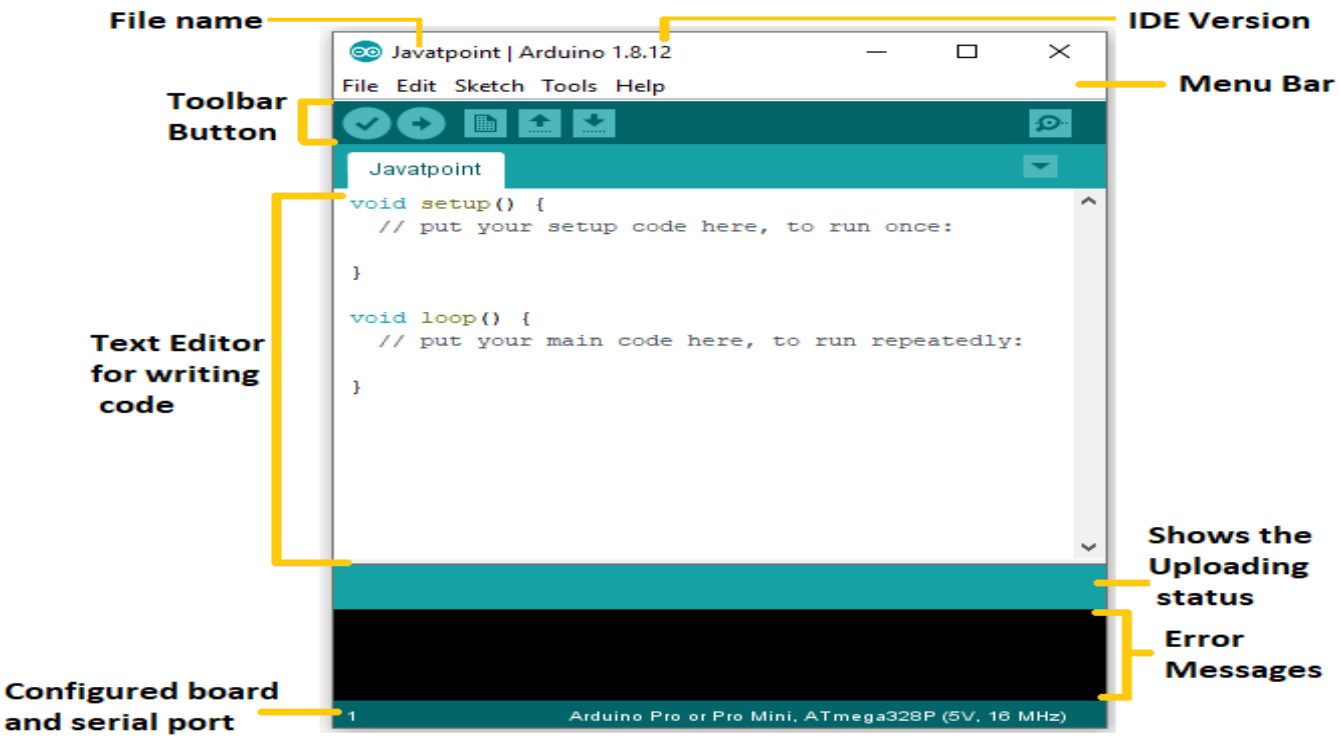


Fig:3.2

1. → **Verify** Checks your code for errors compiling it.

2. → **Upload** Compiles your code and uploads it to the configured board. See uploading below for details.

Note: If you are using an external programmer with your board, you can hold down the "shift" key on your computer when using this icon. The text will change to "Upload using Programmer"

3. → **New** Creates a new sketch.

4. → **Open** Presents a menu of all the sketches in your sketchbook. Clicking one will open it within the current window overwriting its content.

➢ FILE:

It contains many options such as:

New → Creates a new instance of the editor, with the bare minimum structure of a sketch already in place.
Open → Allows to load a sketch file browsing through the computer drives and folders.
Sketchbook → Shows the current sketches within the sketchbook folder structure.
Close → Closes the instance of the Arduino Software from which it is clicked.
Save → Saves the sketch with the current name. If the file hasn't been named before, a name will be provided in a "Save as.." window.
Save as... → Allows to save the current sketch with a different name.
Page Setup → It shows the Page Setup window for printing.
Print → Sends the current sketch to the printer according to settings defined in Page Setup.
Quit → Closes all IDE windows.

➢ EDIT:

Edit contains the following options:

Undo/Redo → Goes back of one or more steps you did while editing; when you go back, you may go forward with Redo.
Cut → Removes the selected text from the editor and places it into the clipboard.
Copy → Duplicates the selected text in the editor and places it into the clipboard.
Paste → Puts the contents of the clipboard at the cursor position, in the editor.
Select All → Selects and highlights the whole content of the editor.
Comment/Uncomment → Puts or removes the // comment marker at the beginning of each selected line.
Increase/Decrease → Indent Adds or subtracts a space at the beginning of each selected line, moving the text one space on the right or eliminating a space at the beginning.
Find → Opens the Find and Replace window where you can specify text to search inside the current sketch according to several options.

➢ SKETCH:

Verify/Compile → Checks your sketch for errors compiling it; it will report memory usage for code and variables in the console area.

Upload → Compiles and loads the binary file onto the configured board through the configured Port.

Upload Using Programmer → This will overwrite the bootloader on the board; you will need to use Tools > Burn Bootloader to restore it and be able to Upload to USB serial port again. However, it allows you to use the full capacity of the Flash memory for your sketch. Please note that this command will NOT burn the fuses. To do so a Tools -> Burn Bootloader command must be executed.

Export → Compiled Binary Saves a .hex file that may be kept as archive or sent to the board using other tools.

Show Sketch Folder → Opens the current sketch folder.

Include Library → Adds a library to your sketch by inserting #include statements at the start of your code. Additionally, from this menu item you can access the Library Manager and import new libraries from .zip files.

Add File... → Adds a supplemental file to the sketch (it will be copied from its current location). The file is saved to the data.

subfolder of the sketch → which is intended for assets such as documentation. The contents of the data folders are not compiled, so they do not become part of the sketch program.

➢ ADVATAGES:

Not much knowledge required to get started

Fairly low cost, depending on shields you need

Lots of sketches and shields available

No external programmer or power supply needed

3.2 EMBEDDED C LANGUAGE

3.2.1 INTRODUCTION:

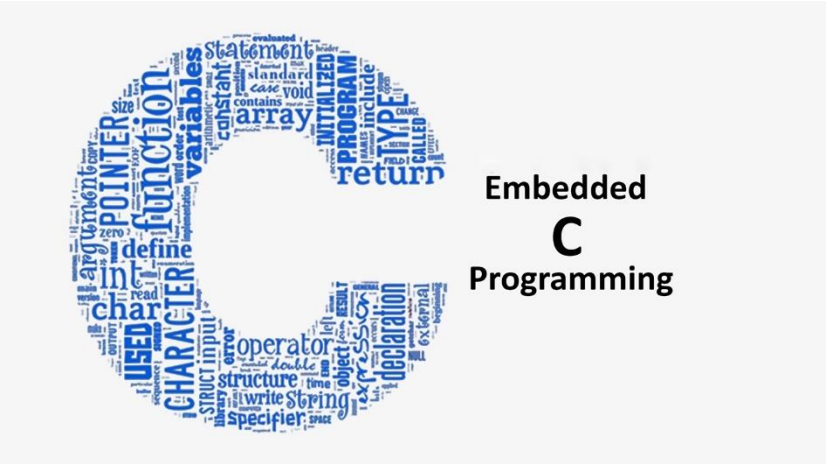


Fig:3.3

Embedded C is the most popular programming language in the software field for developing electronic gadgets. Each processor is associated with embedded software. Embedded C Programming plays a major role in performing specific functions by the processor.

In our day- to-day life, we frequently use many electronic devices such as washing machines, mobile phones, digital camera and so on will work based on microcontrollers that are programmed by embedded C.

The C code written is more reliable, portable, and scalable; and in fact, much easier to understand. The first and foremost tool is the embedded software that decides the operation of an embedded system. Embedded C programming language is most frequently used for programming the Arduino UNO.

3.2.2 BASIC EMBEDDED C PROGRAMMING STEPS:

Let's see the block diagram representation of Embedded C Programming Steps:

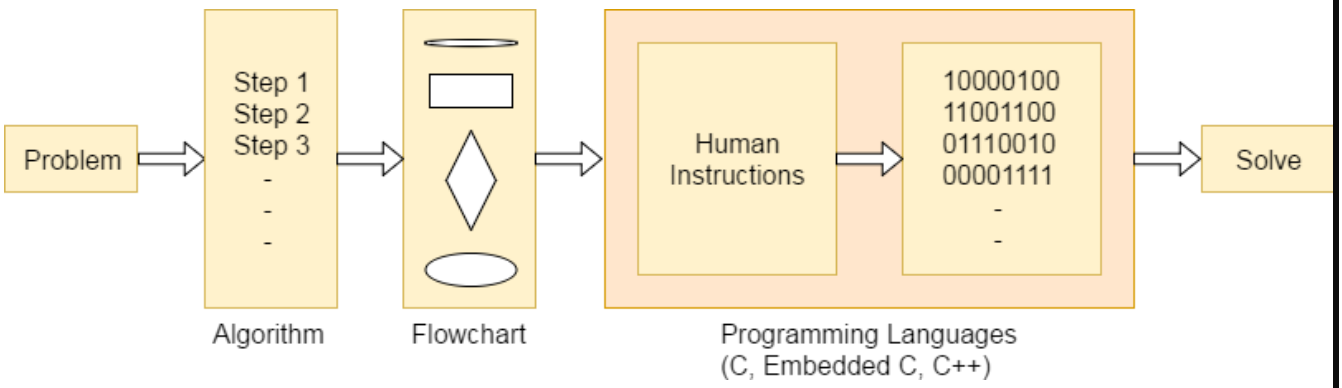


Fig:3.4

The microcontroller programming is different for each type of operating system. Even though there are many operating systems are existed such as Windows, Linux, RTOS, etc but RTOS has several advantages for embedded system development.

Function is a collection of statements that is used for performing a specific task and a collection of one or more functions is called a programming language. Every language is consisting of basic elements and grammatical rules. The C language programming is designed for function with variables, character set, data types, keywords, expression and so on are used for writing a C program.

➢ ADVANTAGES:

- Easy to understand
- High Reliability

- Portability
- Scalability

3.3 CODE USED IN PROJECT

```
#include <LiquidCrystal.h>

Liquid Crystal lcd(12, 11, 10, 9, 8, 7);

// Define pins for IR sensors and LED
const int IR_LED = 13;
const int IR_SENSOR_1 = 2;
const int IR_SENSOR_2 = 3;
int buzzer=4;
int maximum=5;
// Initialize person count and sensor states
int count = 0;
int sensor_1_state = LOW;
int sensor_2_state = LOW;

void setup() {
  // Initialize serial communication
  Serial.begin(9600);
  lcd.begin(16, 2);
  // Initialize 16x2 display
   lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("CROWD CONTROLLER");
     lcd.setCursor(0, 1);
    lcd.print("*USING ARDUINO*");
    delay(1000); // wa
```

```
  // Initialize IR sensor and LED pins
  pinMode(IR_LED, OUTPUT);
   pinMode(buzzer, OUTPUT);
  pinMode(IR_SENSOR_1, INPUT);
  pinMode(IR_SENSOR_2, INPUT);
}

void loop() {
  // Turn on IR LED

   digitalWrite(buzzer,LOW);
  // Read IR sensor states
  sensor_1_state = digitalRead(IR_SENSOR_1);
  sensor_2_state = digitalRead(IR_SENSOR_2);

  // Check if a person entered or left the room
  if (sensor_1_state == HIGH && sensor_2_state == LOW) {
    count++;
    Serial.println("Person entered the room.");
    Serial.print("Total persons: ");
    Serial.println(count);
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("NO.OF PERSONS: ");
    lcd.print(count);
    delay(1000); // wait for person to leave
  } else if (sensor_1_state == LOW && sensor_2_state == HIGH) {
    count--;
    Serial.println("Person left the room.");
    Serial.print("Total persons: ");
    Serial.println(count);
```

```
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("NO.OF PERSONS:");
  lcd.print(count);
  delay(1000); // wait for person to enter
}

// Turn off IR LED

if( maximum<count){
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("NO.OF PERSONS: ");
  lcd.print(count);
  lcd.setCursor(0, 1);
  lcd.print("AREA FULL");
  delay(100);
}
if( 6<count){
  digitalWrite(buzzer,HIGH);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("NO.OF PERSONS: ");
  lcd.print(count);
  lcd.setCursor(0, 1);
  lcd.print("OVER CROWDED");
  delay(500);
}
}
```

CHAPTER-4

CIRCUIT DESCRIPTION

4.CIRCUIT DESCRIPTION

4.1 CIRCUIT DIAGRAM

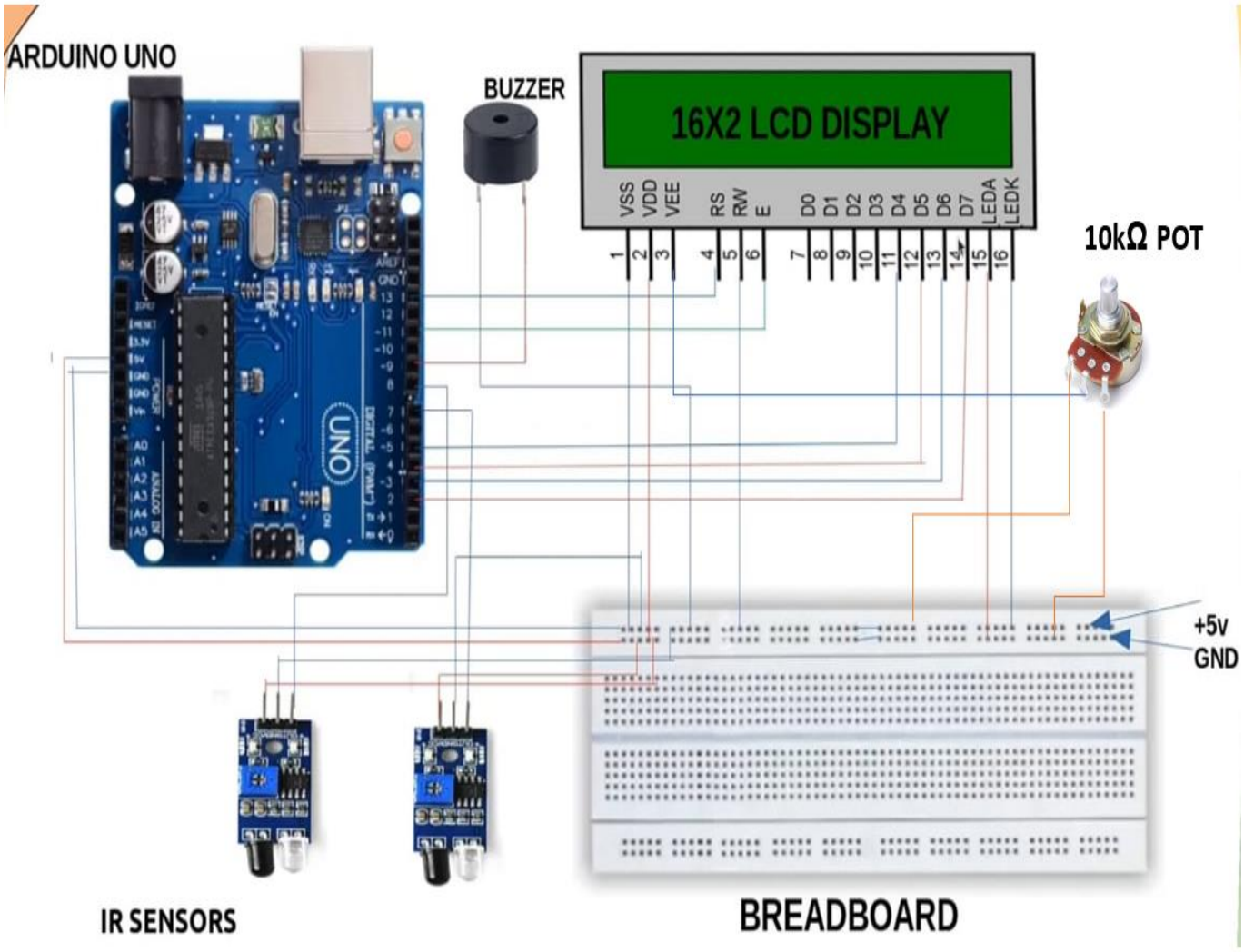


Fig:4.1

4.2 CONSTRUCTION OF PROJECT

We have connected all the components as shown in the **fig:4.1**

- **Connection of IR sensor in the circuit:**

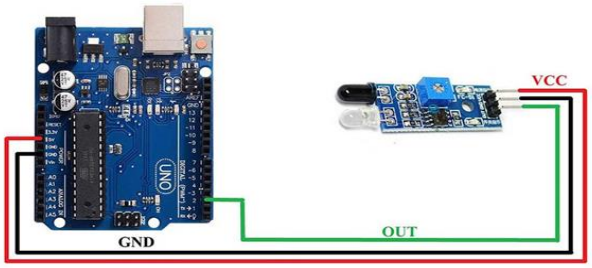


Fig:4.2

Vcc is connected to +5v in arduino uno

Gnd terminal is connected to gnd in arduino

The output terminal is connected to pin2 of arduino

- **Connection of buzzer in circuit:**

The positive terminal is connected to the pin 9.

Negative terminal is connected to the ground pin.

- **Connection of potentiometer in the circuit:**

Connect middle terminal of potentiometer to VEE of LCD

Vcc is connected to +5v in arduino uno

Gnd terminal is connected to gnd in arduino

➢ Connection of LCD in the circuit:

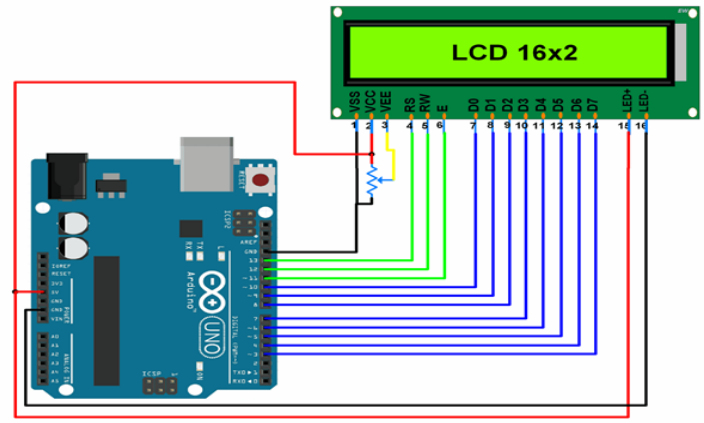


Fig:4.3

RS pin to digital pin 12

Enable pin to digital pin 11

D4 pin to digital pin 5

D5 pin to digital pin 4

D6 pin to digital pin 3

D7 pin to digital pin 2

R/W pin to GND

VSS pin to GND

VCC pin to 5V

➢ Connection of power adapter to arduino:

The power adapter pin is connected to dc power jack of the arduino .

The power adapter provides 9 volts and 1 ampere current to arduino.

4.3 WORKING OF PROJECT

The basic working principle behind this circuit can be clearly observed from the block diagram.

Here two IR sensors are used to keep track of entry and exit of the persons.
The IR sensor gives an electrical signal as an output when an object comes in front of it.
By using the output electrical signal, the arduino can decide whether there is an obstacle or not.

Whenever any person passes from sensor-1 to sensor-2 it will be treated as entry and the count will be incremented.
Whenever any person passes from sensor-2 to sensor-1 it will be treated as exit and the count will be decremented.

If the counts equal to the density of the area, then the LCD will displays a message of “area is full”.
If the count exceeds the density of the area, then the LCD will display that “the area has been over crowded”.
The buzzer will starts beeping inorder to alert the people and security team about the overcrowd.

4.4 ADVANTAGES OF PROJECT

- Low cost
- Prevention of overcrowded accidents
- No need of manpower
- Less complex and more accurate
- Can be implemented wherever single entry/exit point is present
- Easy to setup and use

4.5 APPLICATIONS OF PROJECT

- ❖ Shopping malls
- ❖ Political events
- ❖ High-traffic areas
- ❖ Offices
- ❖ Temples
- ❖ Transport field
- ❖ Seminar halls
- ❖ Schools and colleges
- ❖ Parking areas

CHAPTER-5

RESULT

5.RESULT

5.1 PROTOTYPE

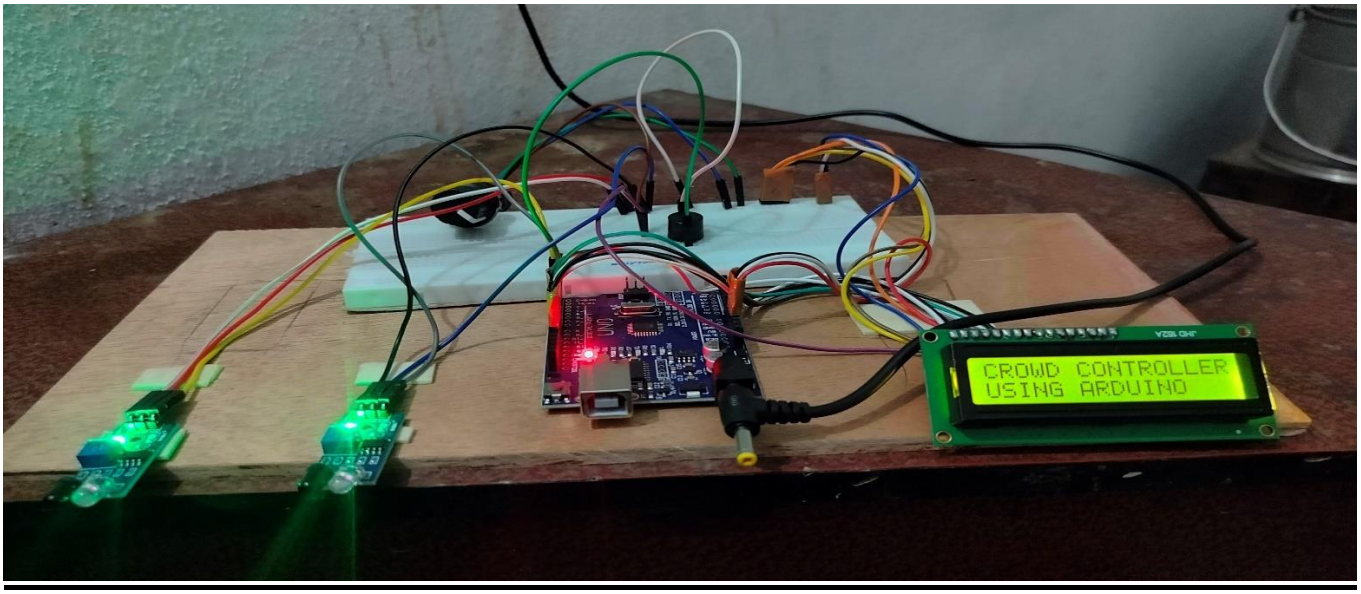


Fig:5.1 Prototype Model

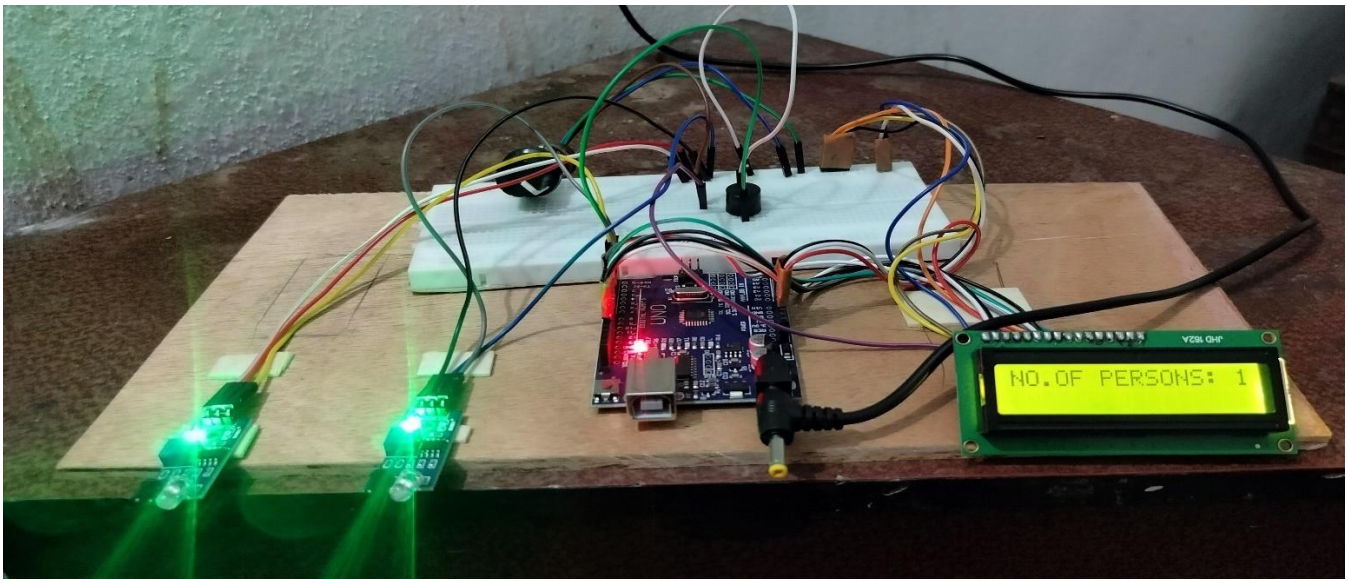


FIG:5.2 Increasing / decreasing the count when people entering / leaving the area

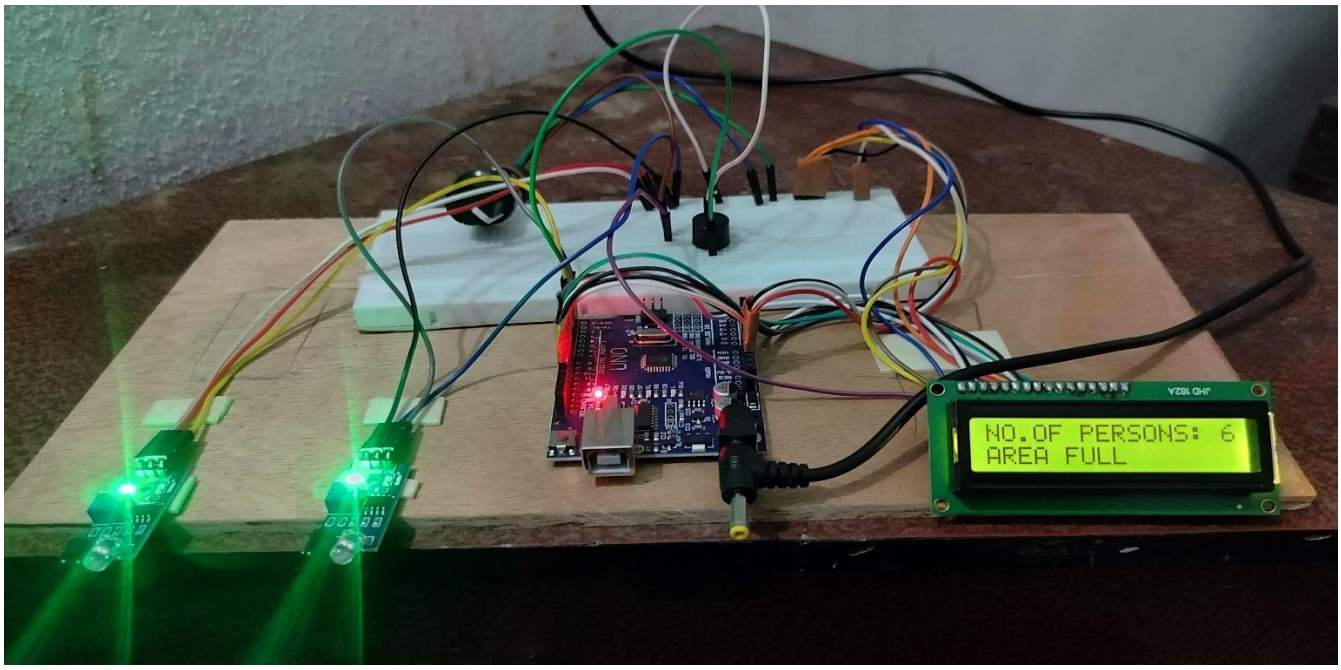


FIG:5.3 Displaying alert message when area has been filled

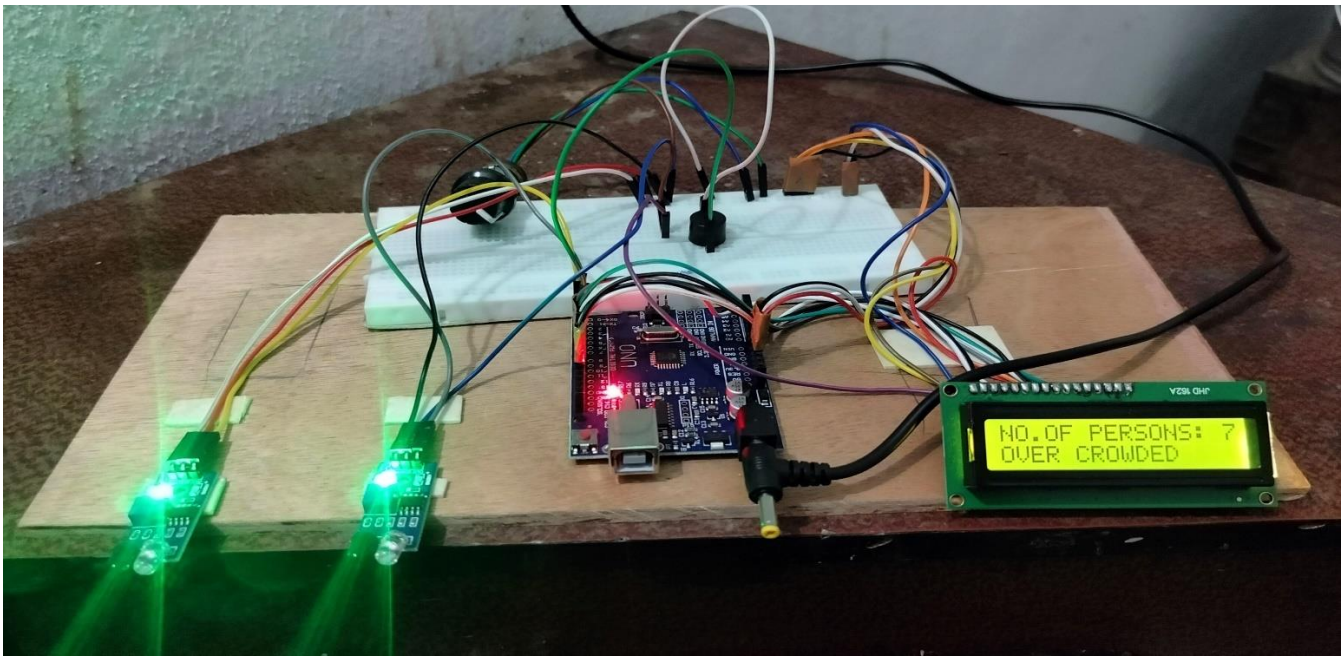


FIG:5.4 Alerting when area is overcrowded with the help of buzzer and LCD

5.2 CONCLUSION

This paper describes a circuit which is used for controlling crowd based on area density, according to the count of persons in the area and simultaneously works as a security system when the camera is attached.

The circuit counts the number of persons in a particular area.

It also designed to indicate the overcrowd with the help of LCD and buzzer.

5.3 FUTURE ENHANCEMENT

This crowd controller circuit is a real time application based and most useful one nowadays. It works as a security system when camera is attached.

If we attach a small IC chip to the persons entering in the area , then we can monitor the movements of the people.

So that we can avoid missing cases in overcrowd areas and we can also able to monitor the health conditions of the people to help them in emergency cases.

5.4 PROJECT COST ESTIMATION

S. No	COMPONENT	QUANTITY	PRICE
1.	ARDUINO UNO	1	1100 /-
2.	IR SENSOR	2	600/-
3.	16x2 LCD DISPLAY	1	350 /-
4.	BUZZER	1	70/-
5.	JUMPER WIRES	FEW	250 /-
6.	POTENTIOMETER	2	80/-
7.	BREAD BOARD	1	150/-
8.	USB CABLE	1	200/-
8.	POWER ADAPTER	1	300/-
			TOTAL – 3100/-

Table:5.1

CHAPTER-6

BIBLIOGRAPHY

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- Advanced Technology in Satellite Communication Antennas - Takashi Kitsuregawa
- Principles of Digital Communication – Robert G. Gallager
- Hands-On Embedded System Design - Felipe Neves

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- https://www.amazon.in/AVS-COMPONENTS-Proximity-follower-Obstacle
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- https://www.amazon.in/Ovicart-Decibel-Alarm-Buzzer-Active