

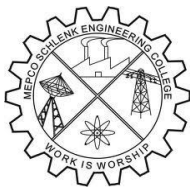
BIDIRECTIONAL OBJECT COUNTER AND DETECTOR USING ARDUINO UNO
MINIPROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this mini project report titled ***BIDIRECTIONAL OBJECT COUNTER AND DETECTOR USING ARDUINO UNO*** is the bonafide work of **N.V.SUDHARSAN(202004150) , S.SURIYA(202004153)** who carried out the mini project under our supervision in **the 19CS451 Microprocessors and Microcontrollers Laboratory.**

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1. Problem Statement

We observe that many of the person enters and exits in a room at random number of times. Our aim is to calculate the how many number of person entered and how many of them have exited and the remaining will be the number of person inside the room. We are automatically switching on the fan or light when there are any persons in the room.

2. Introduction

There is a necessity for automatic appliances in day today life. So developing an automatic circuits will be helpful. At present a user has to switch ON and OFF the lights according to his/her requirement. Since the user can switch on and off the lights as per their preferences so there is a chance of keeping the lights in on state even though it was not required.

This may occur because of carelessness of user and so a large amount of power is wasted. The most commonly used lighting control system used in buildings may cause wastage of valuable energy. [2]The energy loss is occurred when a fan is ON in an area which is not being used currently at that particular time or when a fan is ON even though sufficient lighting is available for work.

Our project describes a microcontroller based model used to count the number of persons entering in a particular room and accordingly Fan in the room will be ON and simultaneously send the picture of the person entering or leaving the room to the user for security purpose. [3]Infrared sensors are used to count the number of persons. This circuit also serve as the security system by sending the picture of the person entering and leaving the room.

The main purpose of our proposed system is to save energy by making the fans ON or OFF according to the presence of the person in a room, to reduce the efforts required to switch on the lights and for the security reasons.

3. System Requirements

3.1 : Hardware Requirements

- Arduino UNO
- Single channel relay module
- 2 IR sensors, Bread board
- 16X2 LED DISPLAY
- I2C Serial Adapter Module
- LED light
- 1K ohm Resistor
- Fan
- 9V Battery
- Jumper Wires
- Bread board.

3.2 : Software Requirements

- Arduino 1.8.19

4. System Design

4.1 : System Diagram

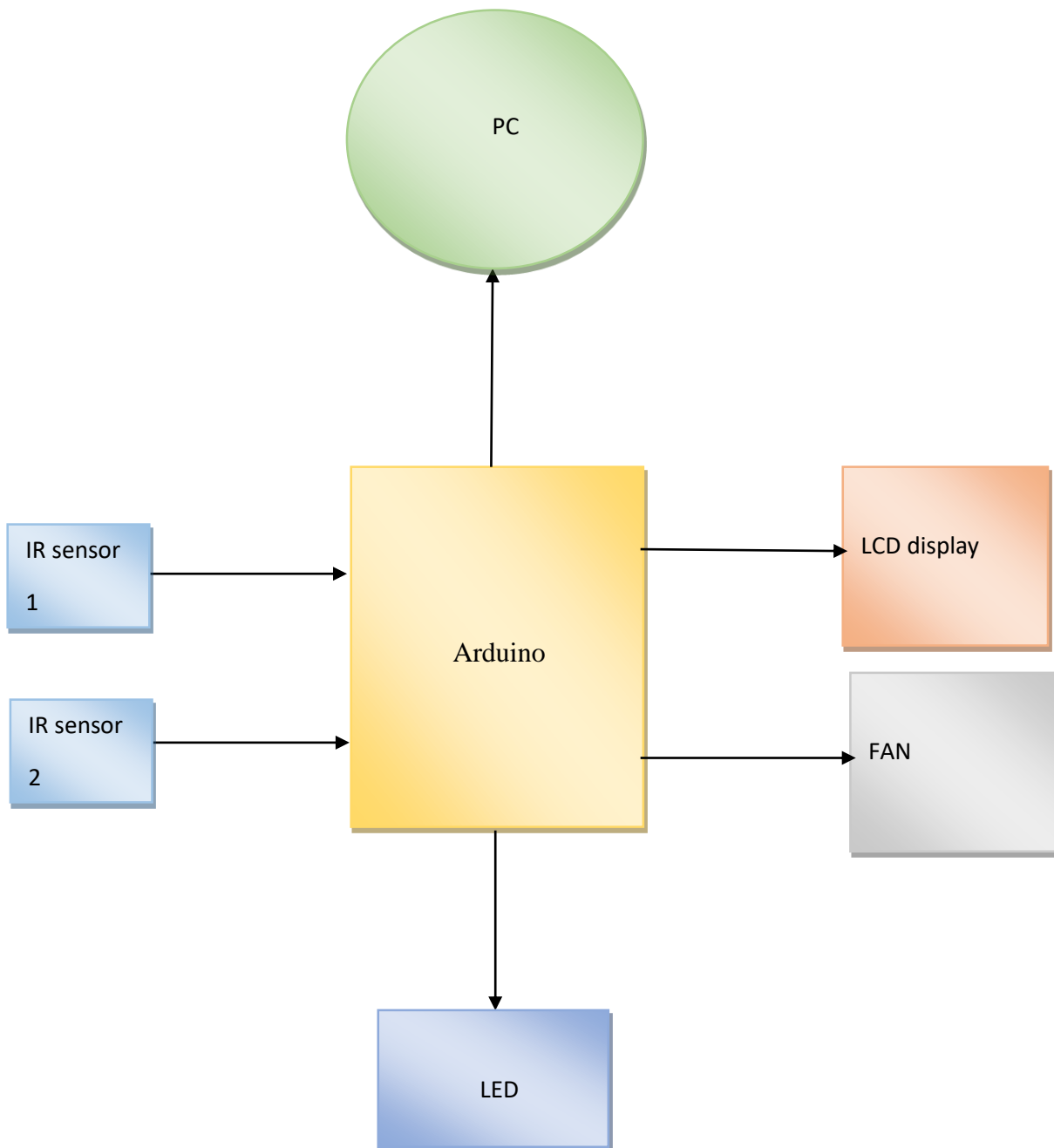


Figure: 4.1 System diagram of bidirectional object counter

The above figure explains connection of the system bidirectional object counter.

4.2 : Algorithm

1. Detect the object crossed over 2 sensors
2. If sensor 1 and sensor 2 is crossed then count incremented
3. If sensor 2 and sensor 1 is crossed then count decremented
4. If sensor 1 is crossed but sensor 2 is not crossed then no change
5. If sensor 2 is crossed but sensor 1 is not crossed the no change
6. Count increment and decrement gives us the number of persons in the room
7. If $\text{count} < 1$ then no person is there , so room is empty and fan is turned off
8. Assume maximum room capacity as 10 then, if $\text{count} > 10$ then room is full

4.3 : Circuit Diagram

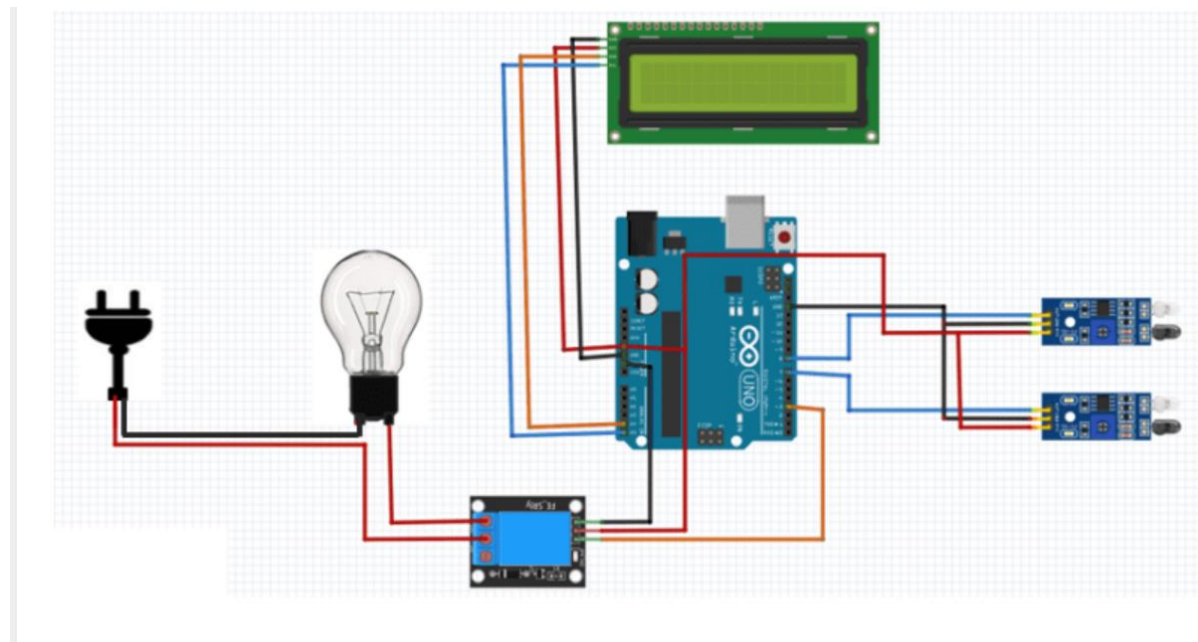


Figure: 4.2 Circuit diagram of bidirectional object counter

The above figure provide the actual circuit diagram which gives an idea of connection

4.4 : Hardware Specifications

➤ Sensor Images and 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

IR Sensor

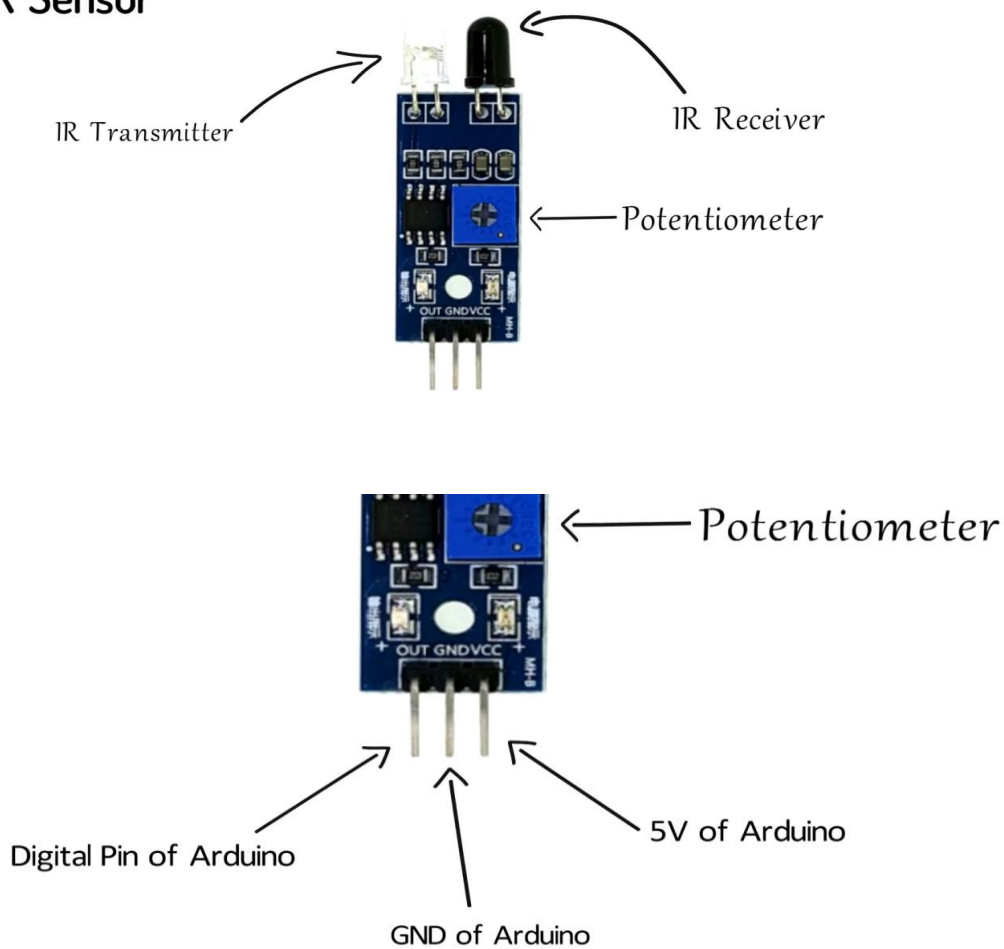


Figure: 4.3 Image of IR sensor specification

The above figure gives the specification of the IR sensor

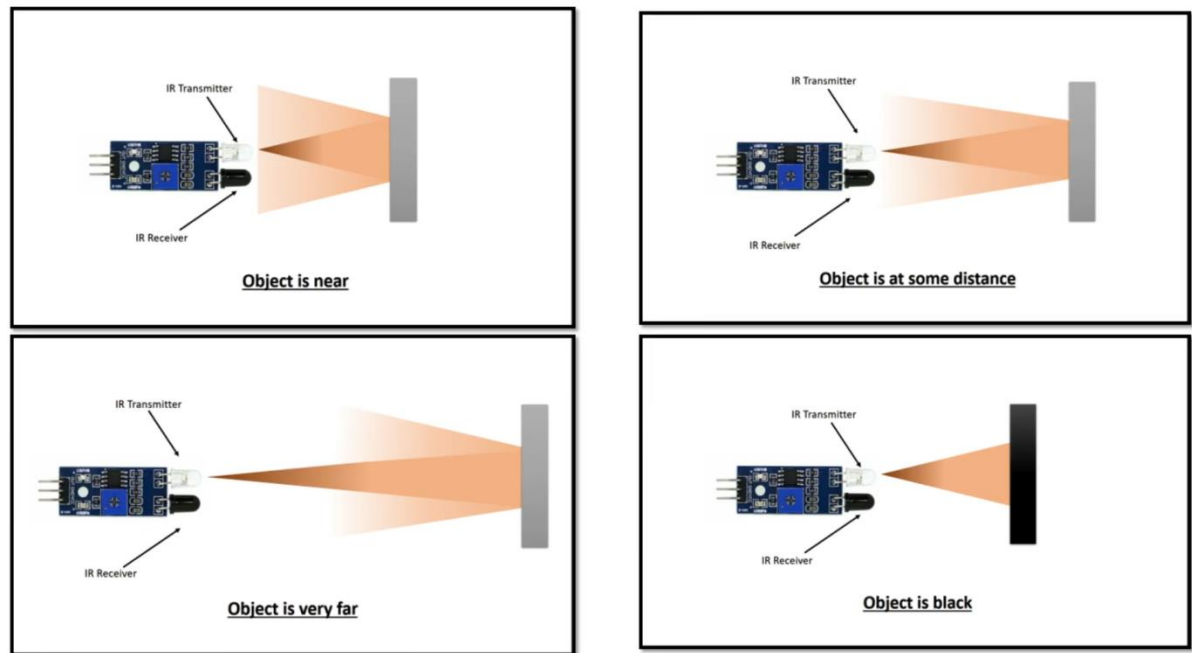


Figure: 4.4 Detailed description of IR sensor

The above figure gives as the function of the IR sensor. Shows the sensor range of detection and way of its detection

➤ **Arduino UNO**

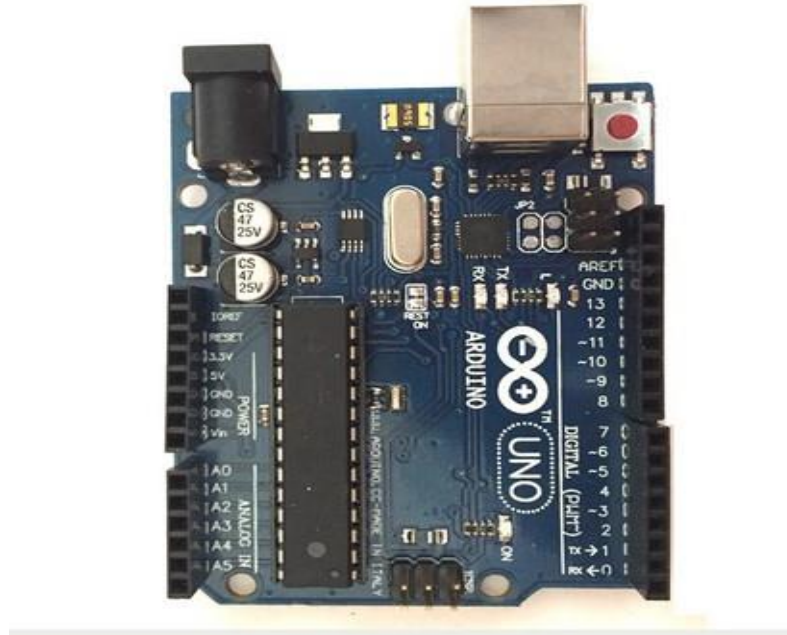


Figure No : 4.6 – Arduino

Arduino Uno [1] is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

5. Implementation

```
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 2, 1, 0, 4, 5, 6, 7, 3, POSITIVE);

#define MAX_LIMIT 10 //Maximum number of persons allowed in the hall or room

#define irPin1 8 //IR Sensor 1

#define irPin2 7 //IR sensor 2

#define led 9 //led pin

#define relay 3 //relay module

int count=0;

boolean state1 = true;

boolean state2 = false;

int i=1;

int j=1;

//Function to Display the count on LCD

void displayCount(int num){

char str[6]; //To hold count to be displayed

int i, rem, l = 0, n;

/*Convert integer (count) to string for displaying on LCD*/

n = num;

while (n != 0){

    l++;

    n /= 10;

}
```

```

for (i = 0; i < l; i++){

    rem = num % 10;

    num = num / 10;

    str[l-(i+1)] = rem + '0';

}

str[l] = '\0'; //Put NULL character to end the string

/*If count in room or hall is less than maximum limit of the hall or room,
then display the message on LCD to print Number of persons in room */

if(count<=0)

{

    lcd.clear();

    digitalWrite(relay, HIGH);

    lcd.setCursor(0,0);

    lcd.print("No Visitors  ");

}

if(count >0 && count < MAX_LIMIT){

    digitalWrite(relay, LOW);

    lcd.clear();

    lcd.setCursor(0,0);

    lcd.print("No. of Persons");

    lcd.setCursor(0,1);

    lcd.print("in Room: ");

}

```

```

/*If number of persons in room is equal to MAX_LIMIT of the room,
then display the message as Room Full */

if(count==MAX_LIMIT){

    digitalWrite(relay, LOW);

    lcd.clear();

    lcd.setCursor(0,0);

    lcd.print("Room Full ");

    lcd.setCursor(0,1);

    lcd.print("No.of Persons:");

}

/*If number of persons in room is greater than MAX_LIMIT,
then display the message as Over Crowded Room and also turn on LED*/

if(count>MAX_LIMIT){

    digitalWrite(relay, LOW);

    digitalWrite(led, HIGH); //LED made ON

    lcd.clear();

    lcd.setCursor(0,0);

    lcd.print("Over CrowdedRoom");

    lcd.setCursor(0,1);

    lcd.print("No.of Persons:");

}

else{ //If count is less than or equal to MAX_LIMIT, the turnoff LED

    digitalWrite(led, LOW);

```

```

}

//Display the count on LCD

lcd.print(str);

}

//Setup function for initial setup

void setup(){

//IR sensor pins are made as input pins

pinMode(irPin1, INPUT);

pinMode(irPin2, INPUT);

pinMode(relay, OUTPUT);

digitalWrite(relay, HIGH);

//LED pin is made as output pin

pinMode(led, OUTPUT);

// LED made ON for small duration to indicate start of the counting

digitalWrite(led,HIGH);

delay(1000);

digitalWrite(led,LOW);

delay(50);

//Initial Message on LCD

lcd.begin(16,2);

lcd.print("Visitor Counter");

delay(2000);

lcd.clear();

```

```

    lcd.setCursor(0,0);

    lcd.print("Suriya_Sudharsan");

    lcd.setCursor(0,1);

    lcd.print("II-CSE-C");

    delay(2000);

    lcd.clear();

    lcd.setCursor(0,0);

    lcd.print("NO VISITORS");
}

//Loop function

void loop(){

    if (digitalRead(irPin1)==LOW && i==1 && state1==true && state2==false){

        i++;

        delay(500);

        state1 = false;

        state2 = true;

    }

    if (digitalRead(irPin2)==LOW && i==2 && state1==false && state2==true){

        i = 1 ;

        count=count+1;

        delay(500);

        displayCount(count);

        state1 = true;

```



```
    state2 = false;

}

if (digitalRead(irPin2)==LOW && j==1 && state1==true && state2==false ){

    j = 2 ;

    delay(500);

    state1 = false;

    state2 = true;

}

if (digitalRead(irPin1)==LOW && j==2 && state1==false && state2==true ){

    count=count-1;

    delay(500);

    displayCount(count);

    j = 1;

    state1 = true;

    state2 = false;

}

}
```

6. Results

The system is designed, when any object crosses both the sensor and the direction of crossing will provide us the increment or decrement of the count in the room. Depending on the count the fan will turn on or turn off and if over crowded the led light will indicate that the room is full and over crowded. It can fixed at the doors where one for enter (in front of door) and another for exit (after the door). So their range won't be disturbed.

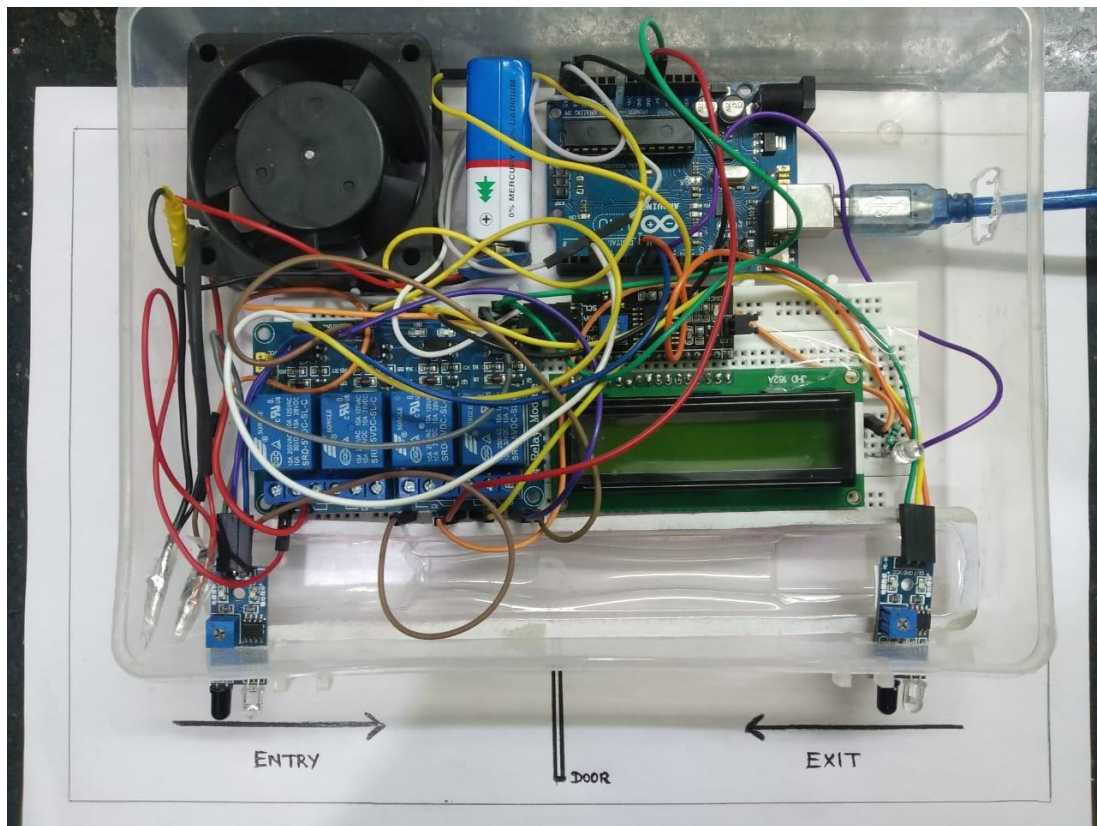


Figure: 6.1 Screenshot of System design

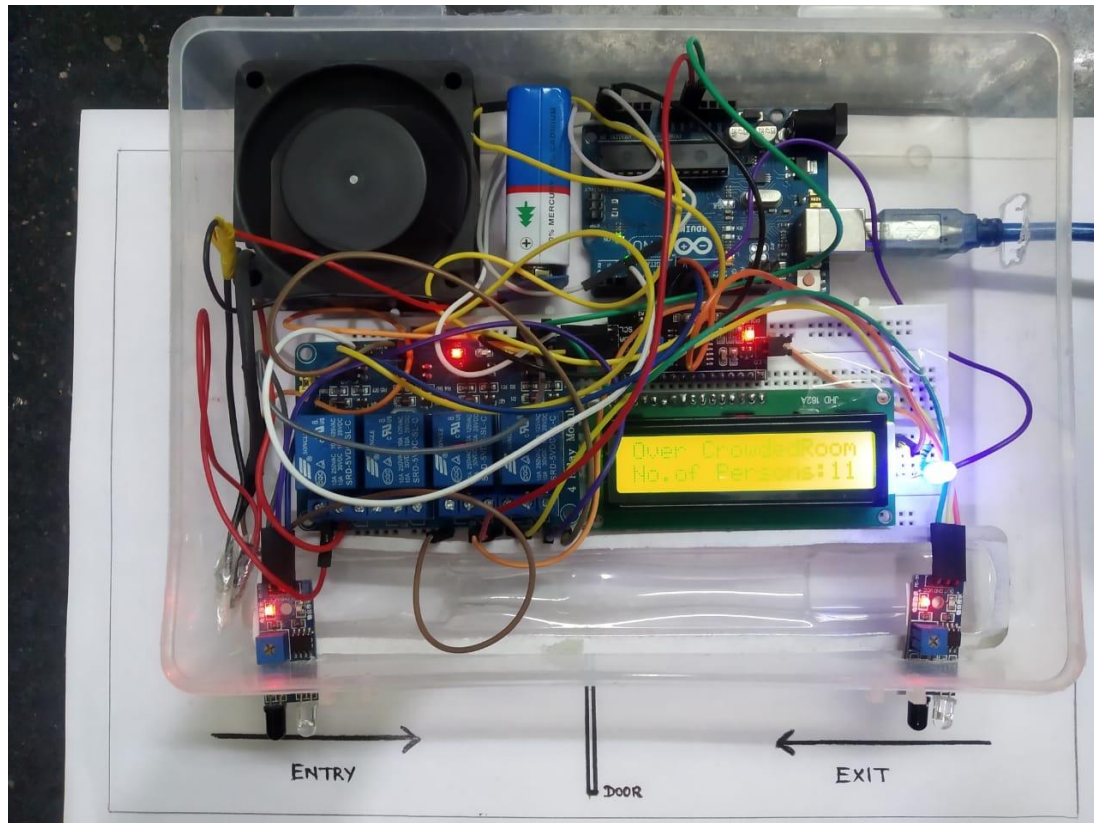


Figure: 6.2 Screenshot of working model

7. Conclusion

After this project, we conclude that unnecessary usage of fans and lights can be avoided. When somebody enters into the room then the counter will be incremented accordingly the Fans in the room will be switched ON and when any one leaves the room then the counter will be decremented. The light will be only switched OFF when the room is vacant. The number of the Fans will be ON according to the total number of persons inside the room and the count will be displayed. We can get the count of people in the room. It will be used in various situation like covid pandemic situation, meeting hall, etc. It is upgradable for further future purpose.

References

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2. <https://mytectutor.com/how-to-connect-16x2-i2c-lcd-display-with-arduino/>
3. <https://lastminuteengineers.com/one-channel-relay-module-arduino-tutorial/#:~:text=Start%20by%20connecting%20VCC%20pin,you're%20attempting%20to%20control.>
4. <https://how2electronics.com/bidirectional-visitor-counter-with-automatic-light-control-using-arduino/>