

ABSTRACT

This project is composed to improve the utilization of assets in developed as well as developing nations. It presents a visitor counter with a programmed load regulator. In this computerized world, the utilization of innovation is extremely cutting-edge and we incline toward things to be done consequently with no human efforts. In this day and age, there is a vital requirement for programmed apparatuses. With the increment in the way of life, there is a desire to move quickly for creating circuits that would facilitate our lives from complexity to simplicity.

This project assists with diminishing human efforts. Likewise, it is extremely valuable to moderate assets. The venture work is to control a circuit that can detect the movement of individuals all through a room, office, lobby, and so forth. It is made to prevent pointless electric power waste in houses, workplaces, and factories. The Arduino nano and IR sensor are used for this work.

The IR sensors to recognize individuals entering and leaving and the room and monitors the room machines like light, fan and AC. The sensors are put on the single entryway access to detect the movement. The system counts both the entering and leaving guest of the assembly room or lobby or another place. Whenever any object goes through the IR Receiver's then the IR Rays falling on the recipients are obstructed and this obstruction is detected by the Arduino. Depending on the sensor's interference, the framework recognizes the passage and exit of the guest. The result of the two sensors signals is shipped off the Arduino and those signals work under the control of the programming code which is transferred to the ROM of the Arduino, which goes about as the central processing unit of the entire framework.

It is a dependable circuit that takes control over the control of the room loads as well as counting the quantity of individuals/guests in the room. This count will be extremely exact and it will beep a caution alarm if the quantity of individuals surpasses the breaking point. Dealing with the movement of individuals helps to maximize worker productivity, effectiveness, and saves time. The proposed model from this paper can monitor and control the room apparatuses respective of the individuals in the room moreover it can likewise momentarily include the quantity of individuals in a room. It has various applications in the field of consuming energy asset.

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INTRODUCTION

Micro-controller has found a wide variety of applications in present quick evolving world. The interest for the electronic gadgets which can control the room appliances has a great surge such that it very well may be executed in many real time applications like in hotels, living room, garage and so on.

Visitor counter with an automatic room load regulator has been developed. A visitor counter is basically a counting gadget for measurement of guests traffic entering and exciting a particular place. By utilizing this device in the room, it reduces the laborious works to search for the switch to light the room once you enter. Here we can use sensor and can know present number of individuals.

The fundamental motivation behind our framework is to save energy and the efforts required to turn on the lights. This is because there is a nonstop need for programmed machines with the increase in the standard of living.

The main objectives of the project are:

1. To make a controller-based model to count number of individuals visiting a particular room and accordingly regulator the room load.
2. To know the number of individuals, present in the room at any given point of time by using sensors.
3. To minimise the consumption of electricity.

LITERATURE SURVEY

<u>PAPER DETAILS</u>	<u>PUBLISHED YEAR</u>	<u>OBJECTIVES</u>
1. Analysis of the Control System for Electrical Energy Consumption Bidirectional Based Visitor Counter by Sumerta Yasa, et al.	Nov 2 nd 2018	Reported on indoor light control automatic and security system based on a two-way visitor counter system
2. Visitor Counter with Automatic Room Light Controller by Jabire, A. H, Suleiman H, Noku A. A, Adamu P.U, Tsoken, Agidike	Sept 28 th 2021	Reported that automatic room light control can be carried out based on two-way visitors
3. Automatic Room Monitoring with Visitor Counter by Jothibasu M, Aakash B, Shanju Ebanesh K, Gokul Vinayak L.	May 2019	Reports that the control of room lighting and other equipment can be automatically performed based on the two-way visitor counter
4. Bidirectional Visitor Counter with Automatic Room Light Controller and Arduino as the master controller by Subhankar Chattoraj, Aditya Chakraborty.	July 2016	Stated that automatic room light control can be carried out based on the calculation of two-way visitors and Arduino as the main controller
5. Automated Room Light Controller with Visitor Counter by Gaurav Waradkar, Hitesh Ramina, Vinay Maitry, Parth Das, Tejasvi Ansurkar, Asha Rawat	March 2016	Reported that based on the presence in the room lighting lamps and fans can be controlled

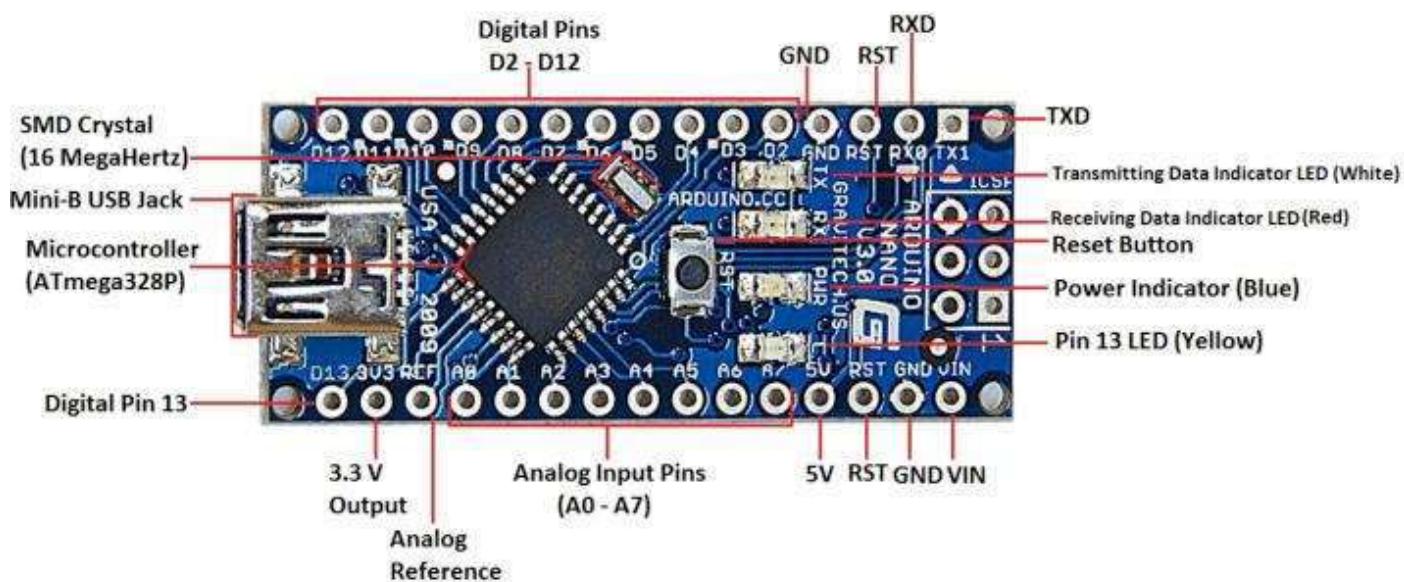
COMPONENTS DESCRIPTION

Components used for our project are:

1. Arduino Nano
2. IR Sensors
3. LCD
4. Buzzer
5. Relay Switch
6. Bread Board
7. Jumper Wires

ARDUINO NANO

Figure 1



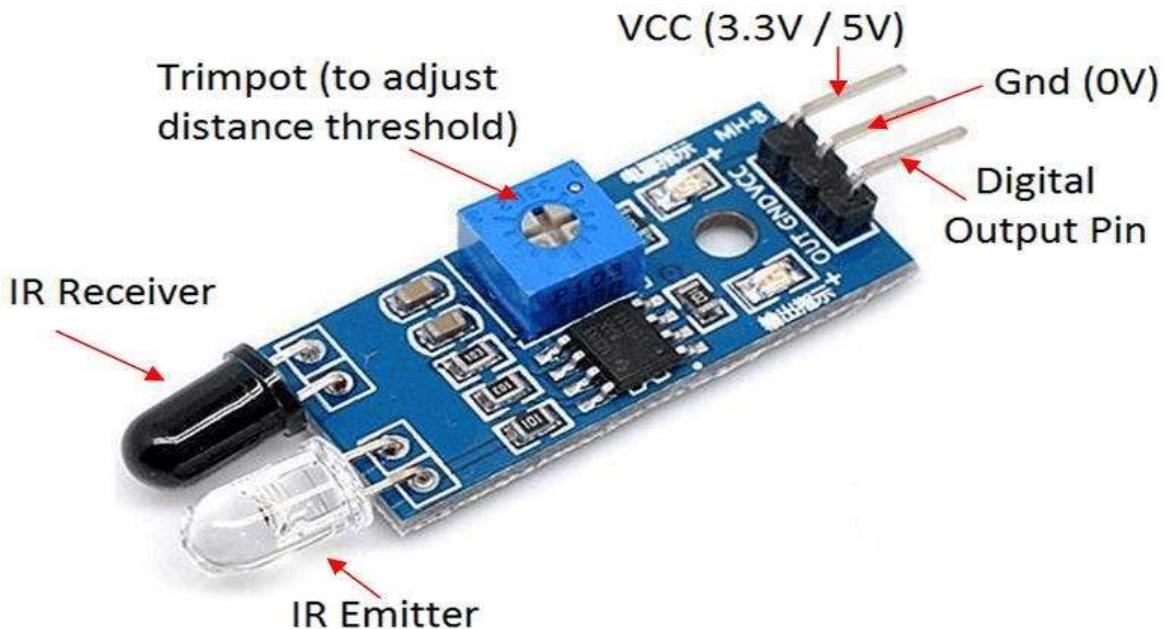
The microcontroller utilizing in Nano board offers serial communication. This can be accessible at digital pins like TX, and RX. The Arduino programming includes a serial monitor to permit simple text-based data to send and get from the board. The Arduino Nano is a small, complete, and breadboard-friendly board in view of the ATmega328P released in 2008.

It offers the same availability and specs of the Arduino Uno board in a more modest structure factor. The Arduino Nano is outfitted with 30 male I/O headers, in a DIP30-like design, which can be customized utilizing the Arduino Software integrated development environment (IDE), which is normal to all Arduino boards and running both online and offline. The board can be powered through a B-type mini-USB cable or from a 9-volt battery.

A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328 additionally support I2C and SPI communication. The Arduino programming incorporates a Wire library to improve on utilization of the I2C bus.

IR SENSORS

Figure 2



An IR sensor is an electronic device that emits IR rays in order to sense some aspects around us. It consists of an emitter and detector at its end and as well as associated circuitry. It can also measure the temperature of an object and also detect movement. The black coloured knob is the transmitter while the white one is the receiver. The emitter is simply an IR LED and the detector is simply an IR photodiode that responds to IR light of the same wavelength as that emitted by the IR LED. When IR rays falls on the photodiode, its resistance and output voltage change according to the intensity of the illuminated IR light. This is the main principle of working of the IR sensor. The radiations are invisible to our eyes, which can be detected by an IR sensor. It has three pins to connect the ground, VCC and send out signal.

Working of IR sensors:

When forward biased, the IR transmitter comprises of a LED of a solid-state gallium arsenide gadget that discharges a beam of radiant flux, in a specially built recombination location sandwiched between the P and N-kind materials, electrons from the N-region will recombine with additional holes from the P-substances while the junction is forward biased. The gadget emits IR rays with a typical peak of 0.9 m, which perfectly matches the response of a silicon photodiode, which acts as an IR receiver. The IR receiver is comprised of solid-state silicon

photodiode, it is a two-terminal semiconductor P-N junction gadget, and it is designed to operate in reverse biased mode. The working guideline of a semiconductor photodiode is that when a reverse biased P-N junction is illuminated, the current varies linearly with the light flux. The device consists of a P-N connection installed in clear plastic. Radiation is allowed to fall upon one surface across the junction, the remaining sides of the plastic are painted dark. Utilizing IR LED is that infrared beams are not apparent to natural eyes, and other sources in the environment do not easily trigger them.

Principles behind working of IR sensors:

1. Planck's law states that "*The density of the spectrum of electromagnetic radiation emitted by a black body in thermal equilibrium at temperature 'T', when there is no net flow of matter or energy between object and its environment*".
2. Stefan-Boltzmann's law states that "*At all wavelengths, the total energy emitted by a black body is directly proportional to the fourth power of temperature*".
3. Wien's displacement law states that "*The radiation curve of a black body for different temperatures will reach its peak at a wavelength that is inversely proportional to temperature*".

LIQUID CRYSTAL DISPLAY [LCD]

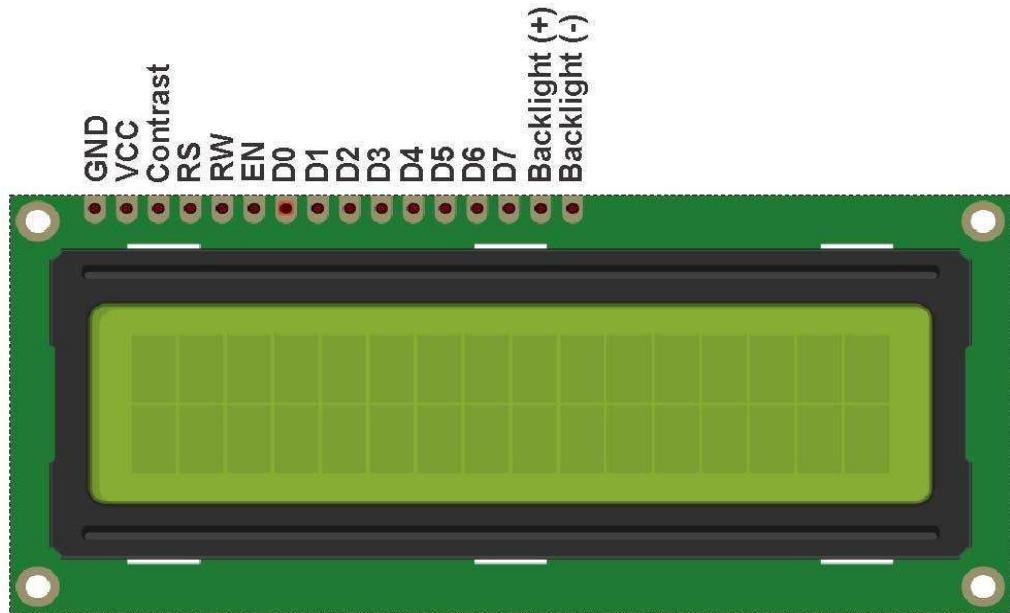


Figure 3

LCD which stands for liquid crystal display is a module that shows information by using liquid crystals as a material to display data in the form of writing.

LCD board of dimension 16x2 where it can display of 32 characters in two lines each one of 16 characters. It has 16 outer openings for connections.

These openings can be associated with the bread board with the help of male-to-male breakable pins.

These modules are preferred over seven segments and other multi segment LEDs. The reasons being:

- i. LCDs are cost-effective.
- ii. Effortlessly programmable.
- iii. Have no limitation of displaying unique custom characters, animations and so on.

Functions of each pin:

1. GND: 0V DC power supply.
2. VCC: Power supply positive.
3. Contrast: To contrast the writing on the LCD.
4. RS or Register Select includes
 - i. High: For sending data.
 - ii. Low: Sends instructions.
5. R/W or Read/Write includes
 - i. High: Send data.
 - ii. Low: Sends instructions.
6. E (enabled): To control to LCD when value is Low.
7. D0-D7: Data Bus 0 to 7.
8. Backlight +: Connected to VCC to turn on the backlight.
9. Backlight -: connected to GND for turn on the backlight.

RELAY SWITCH

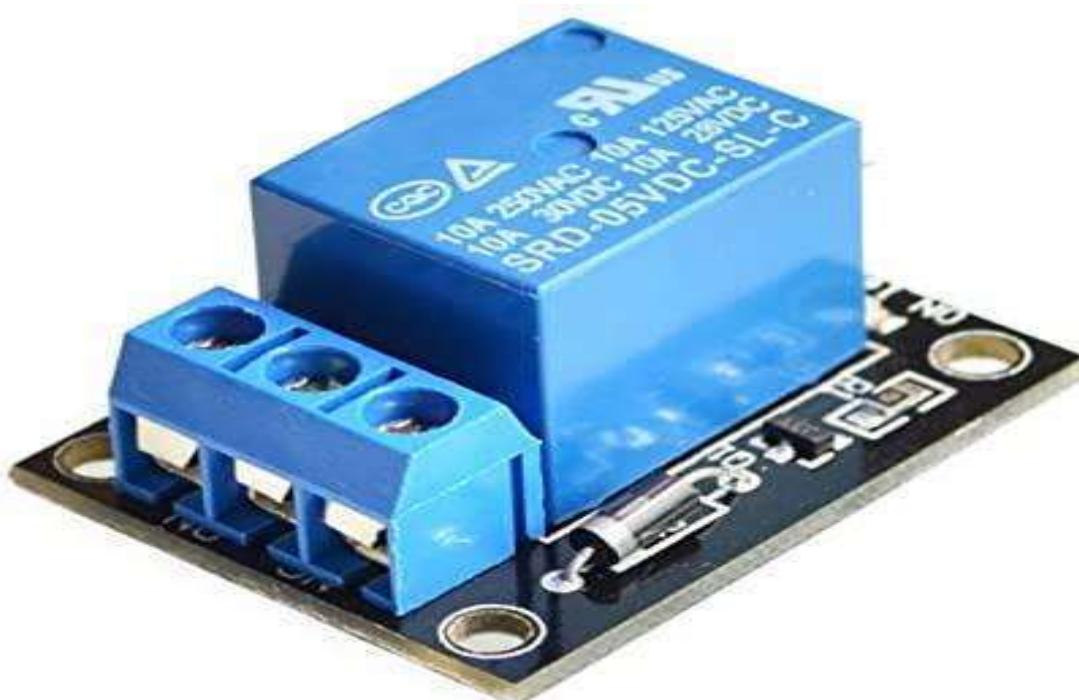


Figure 4

Relay module is a magnetically operated switch which shuts the outer circuit based on signal received from the Arduino board. The relay seeks voltage from the source to induce a magnetic field which draws in a metal strip and shuts the external circuit without a moment's delay it receives the signal from the Arduino.

Relays use electromagnetic principle to move the switch so that a small electric current can conduct electricity at a higher voltage. Basically, the function of the relay module is an electrical switch. It works automatically based on a given logical command.

There are three externals pins available in the relay module to associate with the external circuit. The middle pin is always the ground, the positive line of the external circuit can be to the either of the two pins based on the normally open and normally shut.

Functions of relay are:

1. Carry out the logic functions of the microcontroller.
2. Controlling high voltages exclusively by utilizing a low voltage.
3. Limiting the occurrence of voltage drop.
4. Allowing use of time delay function.
5. Safeguarding other components from overvoltage causes a short circuit.
6. Improves the circuit to make it more concise.

BREAD BOARD

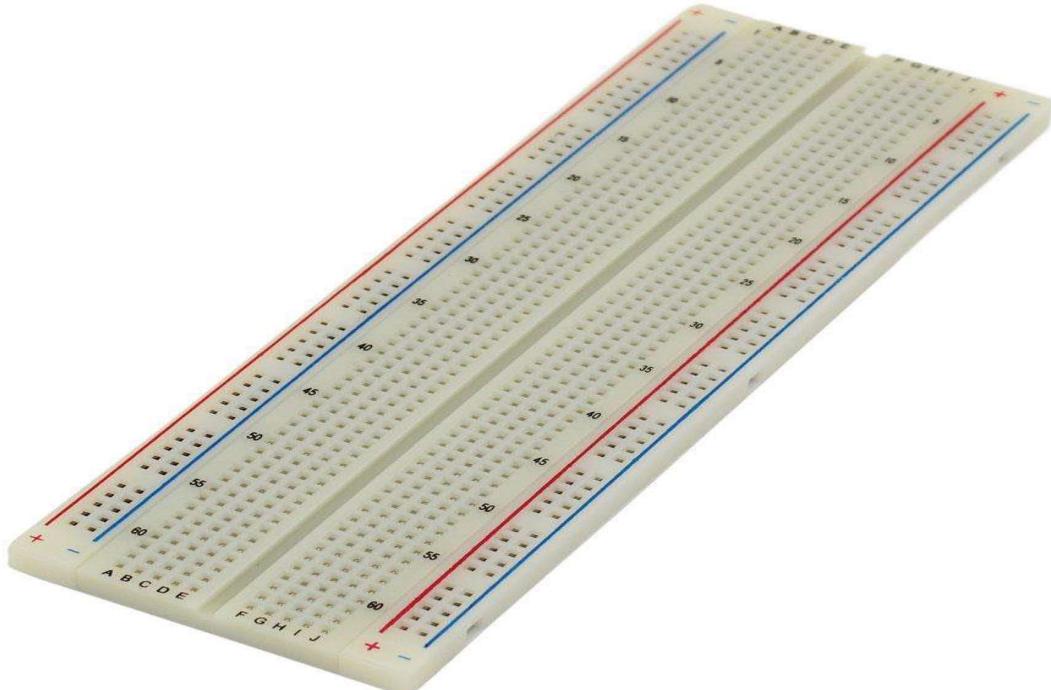


Figure 5

A breadboard, or protoboard, is a construction base for prototyping of electronics. In the 1970s the solderless breadboard otherwise called plugboard opened up and nowadays the term "breadboard" is usually used to refer to these.

Because the solderless breadboard doesn't need soldering, it is reusable. This makes it easy to use for creating temporary models and experimenting with circuit plans. Therefore, solderless breadboards are also popular with students and in technological education. Seasoned breadboard types did not have this property.

A stripboard and similar prototyping PCB's, which are utilized to build semi-permanent soldered models, cannot easily be reused. A variety of electronic systems may be prototyped by utilizing breadboards, from little simple and computerized circuits.

JUMPER WIRES

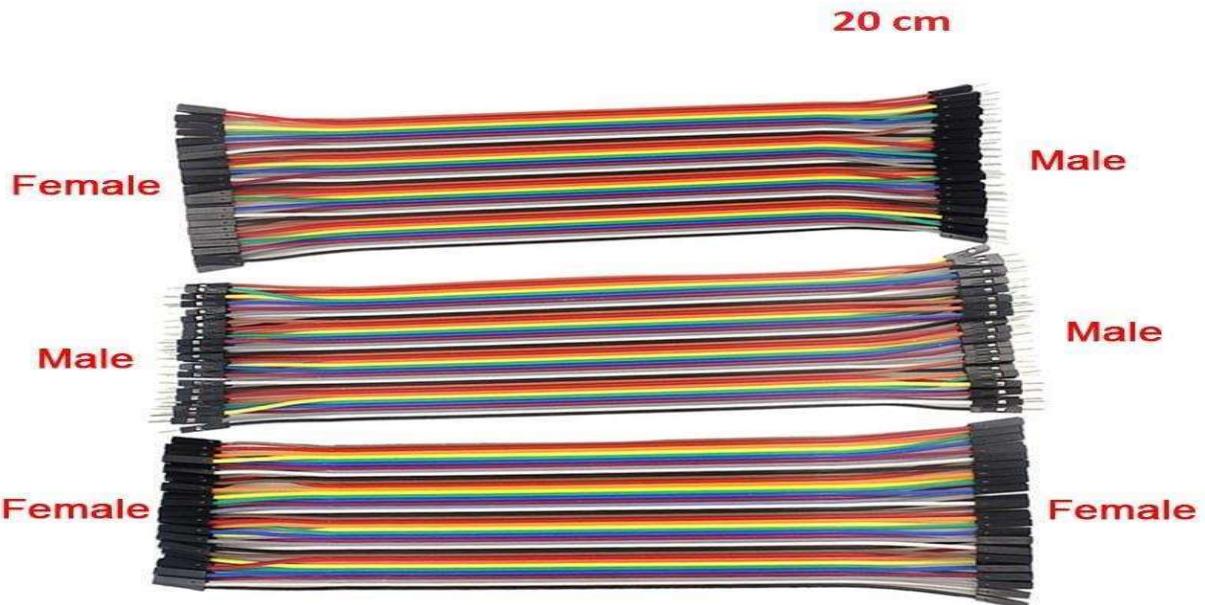


Figure 6

A jump wire also known as jumper, jumper wire, DuPont wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is ordinarily used to interconnect the parts to the breadboard or other model or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by embedding their "end connectors" into the openings given in a breadboard, the header connector of a circuit board, or a piece of test equipment.

❖ Types of Jumper wires are:

- 1) Male-Male
- 2) Female-Female
- 3) Female-Male.

BUZZER



Figure 7

The electric buzzer was created in 1831 by Joseph Henry. A buzzer or beeper is a sound flagging gadget. Which may be mechanical, electromechanical and piezoelectric.

Typical uses of buzzers and beepers include caution gadgets, timers, clocks and confirmation of user input such as a mouse snap or keystroke.

BLOCK DIAGRAM

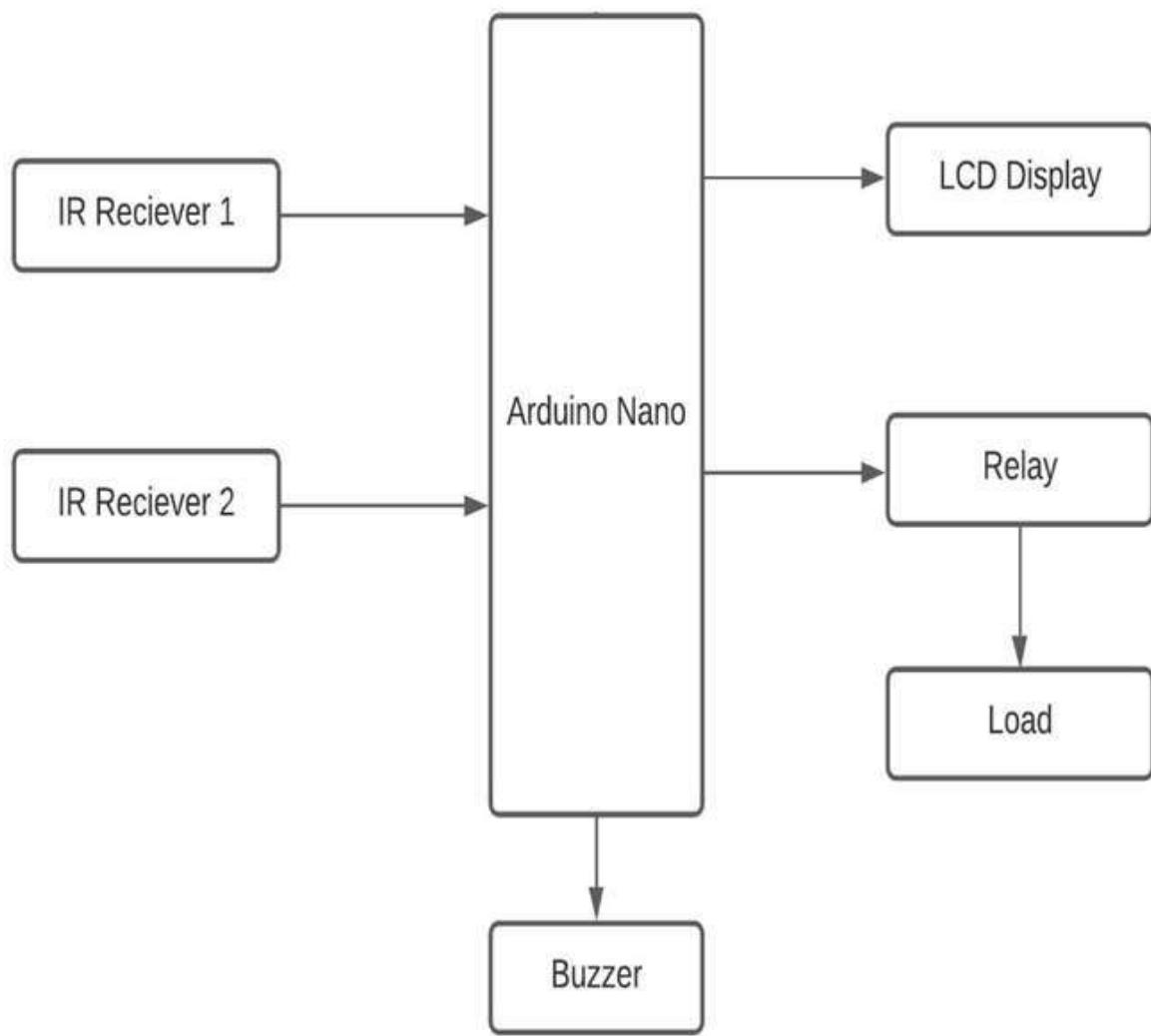


Figure 8

CIRCUIT DIAGRAM

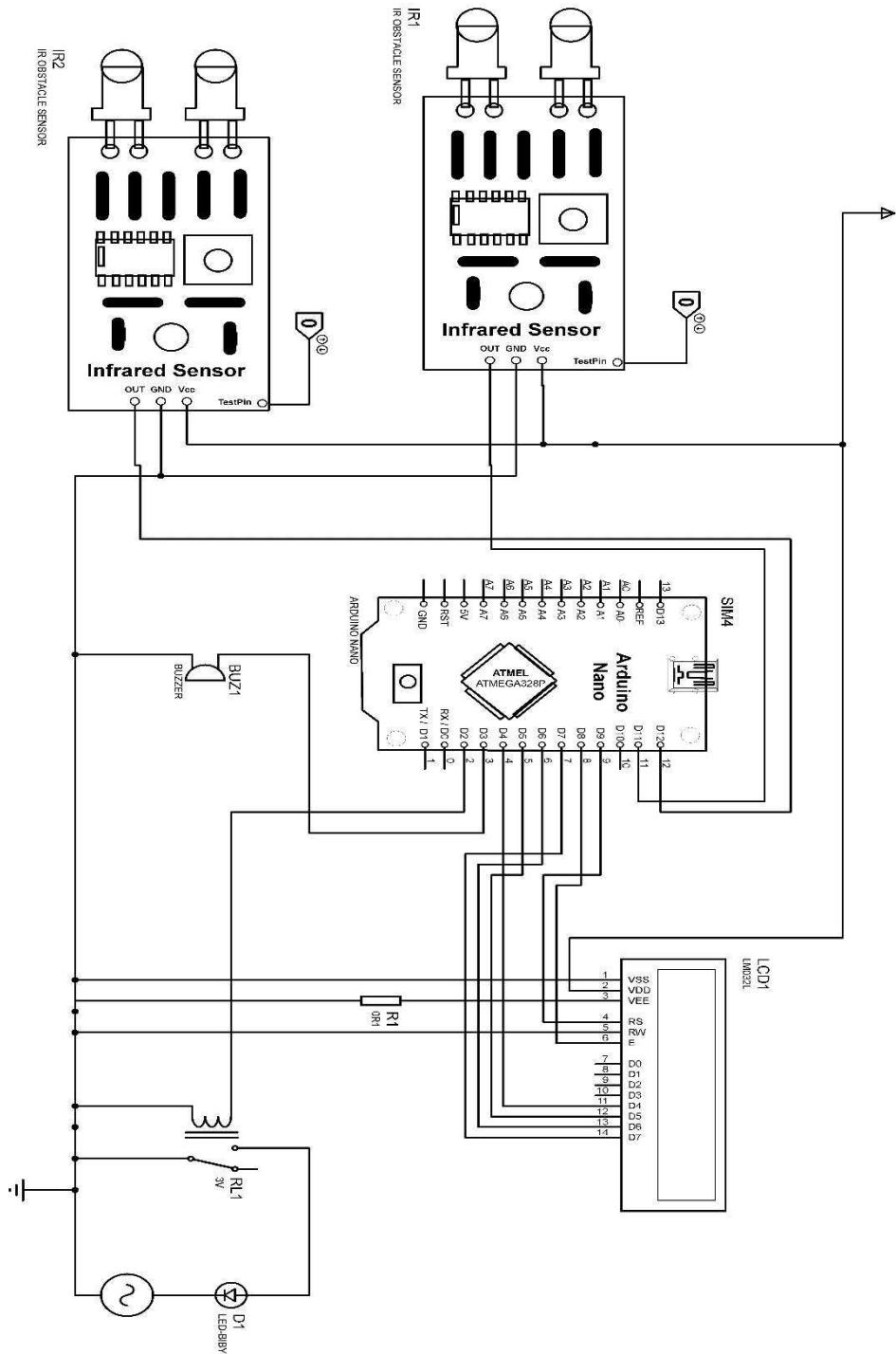


Figure 9

METHODOLOGY

The methodology in this project involves the software and hardware implementation.

The software implementation includes:

1. Definition of the task.
2. Designing the system.
3. Writing a program.
4. Testing & debugging the program.

The hardware implementation includes:

1. Designing of the logical control unit.
2. Designing of the microcontroller unit.
3. Designing of the display unit.
4. Integrating the power supply, microcontroller, logical control and the display units together.
5. Combining the whole design.

LIST OF FIGURES

<i>Figure No</i>	<i>Name</i>
1.1	Arduino Board
1.2	IR Sensors
1.3	LCD
1.4	Relay Switch
1.5	Bread Board
1.6	Jumper Wires
1.7	Buzzer
2.1	Block diagram
2.2	Circuit Diagram

WORKING

The overall mechanism of this project is based on infrared wave interference. It should be installed on one side of the door frame. There are 2 IR sensors one is placed outside the door frame and one is placed inside the door frame. They are placed in such a way that both the sensors can detect the individual consecutively.

The logic behind the working of the counting process is simple, when a person enters the room, he/she crosses the sensor outside the frame first and then cross the sensor inside the frame during this condition the counter is incremented. When a person leaves the room, he/she crosses the sensor inside the frame and then cross the sensor outside the frame during this condition the counter is decremented. Increment in the sense, an individual enters the room whereas decrement denotes the individual leaving the room.

We should make sure that both the sensors shouldn't simultaneously detected the signals, so the sensors should be placed apart from each other but be restricted to the entrance region.

The LCD board gets refreshed at every time as the time delay kept is very small in few milliseconds so that the count display shouldn't be lagged at any instance.

Lights and fans can be associated to the relay such that they get started working at once the relay switch gets shut. The opening and shutting of the relay are controlled by the Arduino board. If the count of the people in the room is equivalent to zero then the relay switch is in open mode. The relay gets shut immediately when the counter is raised by 1.

To avoid of over crowd the algorithm is written in such way that if the count precedes the limit set by the user, then the buzzer is turned 'ON'. Indicating an alarm. The code is designed in such a way that even if the count goes less than zero the LDC still displays zero because the population can never be in a negative count.

ARDUINO CODE

```
#include<LiquidCrystal.h>

LiquidCrystal lcd (9,8,4,5,6,7);

#define Relay 2
#define Buzz 3
#define IR1 11
#define IR2 12

int count=0;
String seq=" ";
int D;

void disp ()
{
    lcd.clear ();
    lcd.setCursor (0,0);
    lcd.print ("No. of People");
    delay (100);
    lcd.setCursor (0,1);
    lcd.print(count);
    delay (1000);
}

void dispOvercrowd ()
{
    lcd.setCursor (0,1);
    lcd.print(count);
    delay (550);
}

void IN ()
{
    count++;
    disp ();
}
```

```
}

void OUT ()
{
    count--;
    if(count<=0)
    {
        count=0;
    }
    disp ();
}

void overcrowd (){
    digitalWrite (Buzz, HIGH);
    lcd. clear ();
    lcd. setCursor (0,0);
    lcd.print("Overcrowd");
    delay (550);
    dispOvercrowd ();
}

void setup ()
{
    Serial.begin(9600);
    Serial.clear();
    lcd. begin (16,2);
    delay (500);
    Serial.print("Automatic Load Shutdown & Counter");
    lcd.print ("Mini Project");
    lcd. setCursor (0,1);
    delay (500);
    lcd.print ("Batch 2");
    delay (1500);
    lcd. clear ();
    lcd.print ("Automatic Load");
    lcd. setCursor (0,1);
```

```

delay (500);

lcd.print ("Shutdown & Counter");

delay (2000);

pinMode (IR1, INPUT);

pinMode (IR2, INPUT);

pinMode (Relay, OUTPUT);

Serial.println(seq);

}

void loop ()

{
    if (digitalRead (IR1) ==LOW&&seq. charAt (0)! ='1')

    {
        seq+='1';

    }

    else if (digitalRead (IR2) ==LOW&&seq. charAt (0)! ='2')

    {
        seq+='2';

    }

D=seq.toInt();

Serial.println(seq);

if(D==12)

{

IN ();

D=0;

seq="";

}

else if(D==21)

{

```

```

OUT ();
D=0;
seq="";
}

if(count<=0)
{
lcd. clear ();
digitalWrite (Relay, HIGH);
lcd. clear ();
lcd. setCursor (0,0);
lcd.print ("Room is Empty");
lcd. setCursor (0,1);
lcd.print ("Load is OFF");
delay (1000);
}
else
{
digitalWrite (Relay, LOW);
delay (500);
}
if(count>5)
overcrowd ();
else
{
digitalWrite (Buzz, LOW);
}
if(seq=="11" || seq=="22" || seq=="122" || seq=="112" || seq=="211" || seq=="221")
{
seq=" ";
}

```

ADVANTAGES

1. It restricts the consumption of electricity.
2. It decreases the human efforts for counting number of people in a room manually.
3. It gives the accurate count value.
4. The loads are totally automated.
5. It decreases the effort of searching for switch board of the room if a new person enters the room.
6. It helps us to restricts the number of people in the room with the help of the buzzer.

APPLICATIONS

❖ It is used in places like:

- I. Hotels
- II. Movie theatres
- III. Library
- IV. Metro Stations
- V. Lift
- VI. Malls
- VII. Class Rooms
- VIII. Auditorium
- IX. Convention Halls
- X. Showrooms
- XI. Parking

FUTURE SCOPE

1. Voice alarm can be added to indicate that the room is full and more people can't enter the room.
2. Camera can be added to capture real time image and can be used as security purpose.
3. It can also be used as attendance monitor.
4. Motion detected can be added to control the loads only at a particular place.
5. Temperature detectors can be added to control the speed of the fan or the temperature of the AC.

CONCLUSION

Based on the above written content we can conclude by saying that the project explains how to use a microcontroller to power a visitor counter and the room load. It works on the idea that if an individual enters the room the loads are turned on and when there is no one in the room the loads are turned off.

It can be used in developing countries to transform homes to smart homes.

To eradicate the old practice of counting the number of individual one by one, this system can be implemented which can keep an eye on the count of the number of people in the room.

In the small-scale energy conservation might be seen as small quantity, whereas in the large-scale business area like malls, schools, hospitals it is large quantity as the energy is wasted at a high quantity. Using this system can solve this problem of the waste of electricity.

It is a system to control Room, Classroom, Auditorium or Hall lights as well to count the number of persons entering the room.

This system is an effective addition for security systems.

It may be implemented at sensitive buildings and offices, in addition to visitor counting, automatic room load controller produces amazing efficiency to control the room appliances for energy deficient in under developed countries.

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