



Automatic Room Light Controller

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ABSTRACT :

The project of “**Digital visitor counter**” is based on the interfacing of some components such as sensors, motors etc. with arduino microcontroller. This counter can count people in both directions. This circuit can be used to count the number of persons entering a hall/mall/home/office in the entrance gate and it can count the number of persons leaving the hall by decrementing the count at same gate or exit gate and it depends upon sensor placement in mall/hall. It can also be used at gates of parking areas and other public places.

This project is divided in four parts: sensors, controller, counter display and gate. The sensor would observe an interruption and provide an input to the controller which would run the counter increment or decrement depending on entering or exiting of the person. And counting is displayed on a 16x2 LCD through the controller.

KEYWORDS :

Embedded Software, Fault Analysis, Side Channel Analysis, sensors, led, Arduino, Relay, Signal, Analog, Digital, Input, Output, etc.

1. INTRODUCTION :

- Electricity is one of the most important resources in this century. We should conserve the electricity. But many times we come outside the room/hall and forget to turn off the lights/fan, thus the electricity is wasted.
- To overcome this we are going to implement a project called “Automatic room light controller with visitor counter”. This project has 2 modules. First module is “Visitor counter” and the other module is “Automatic room light controller”. Main concept behind this project

is to measure and display the number of persons entering in any room like seminar hall, conference room.

And when number of persons inside the room is zero, power supply inside the room can be cut using a relay interface.

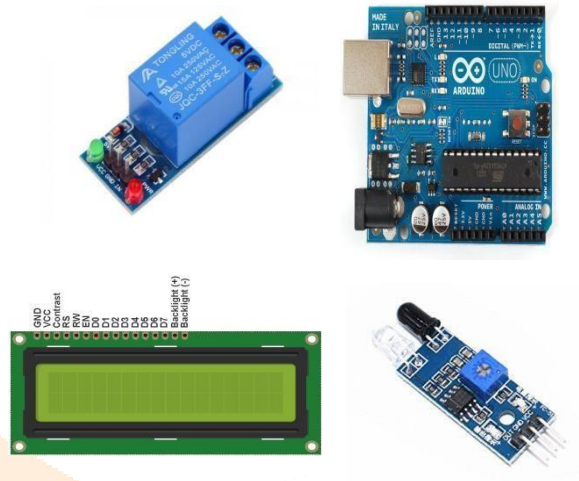
This will help to save electricity. LCD display placed outside the room displays number of person inside the room.

- Behind to make this project our main problem statement is:-

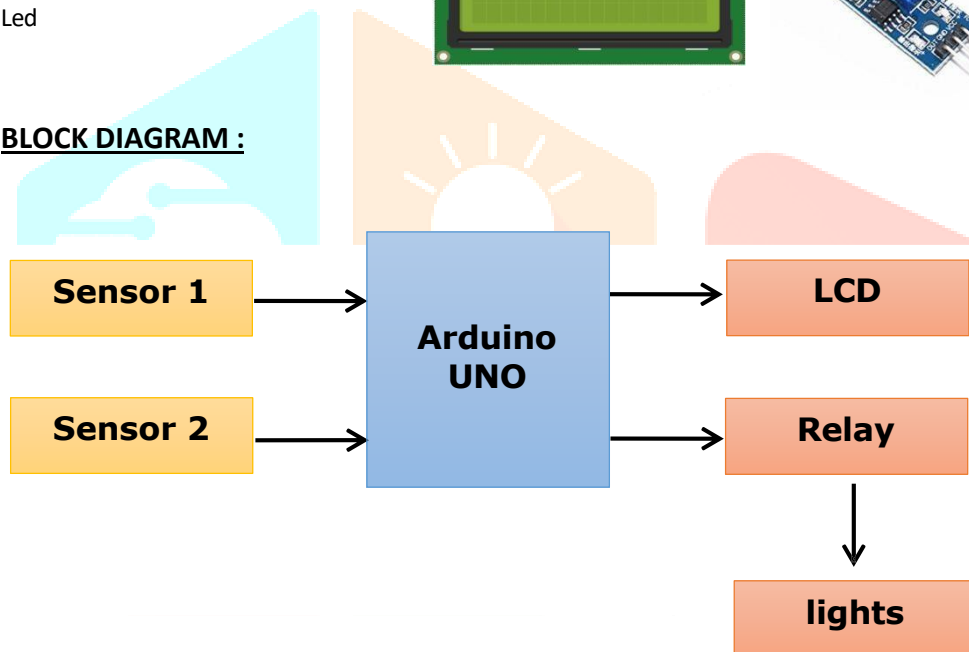
Wastage of electricity is one of the main problems which we are facing nowadays. In our home, school, colleges or industry we see that fan/lights are kept on even if there is nobody in the room or area/passage. This happens due to negligence or because we forgot to turn lights off or when we are in a hurry. To avoid all such situations we have designed this project called “Automatic room light controller with visitor counter”.

2. COMPONENT LIST :

- Relay (5v)
- Arduino UNO
- Resisters
- IR Sensor module (2)
- 16x2 LCD display
- Bread Board
- Connecting Wires
- Led



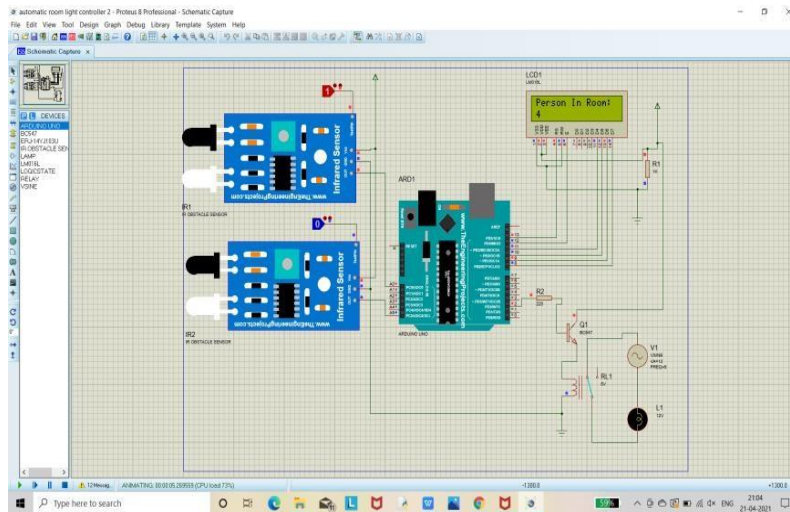
3. BLOCK DIAGRAM :



3.1 Explanation of Block diagram :-

- There are we using two sensors which gives input output signal To the Arduino.
- In Arduino we insert program for processing on input signal.
- When input comes in Arduino, Arduino processes on it and gives output signal to LCD as well as Relay.
- When input signal is goes toward the relay that time relay well be open or close and passes or stop the output signal towards the lights.
- When that signal is high that time relay will close the circuit and led will be glow, and when the output signal is low that time led will off.

4. CIRCUIT DIAGRAM :



4.1 Circuit Diagram Explanation :

1. Sensor Section :-

In this section we have used two IR sensor modules which contain IR diodes, potentiometer, Comparator (Op-Amp) and LED's. Potentiometer is used for setting reference voltage at comparator's one terminal and IR sensors sense the object or person and provide a change in voltage at comparator's second terminal. Then comparator compares both voltages and generates a digital signal at output. Here in this circuit we have used two comparators for two sensors. LM358 is used as comparator. LM358 has inbuilt two low noise Op-amp.

2. Control Section :-

Arduino UNO is used for controlling whole the process of this visitor counter project. The outputs of comparators are connected to digital pin number 14 and 19 of Arduino. Arduino read these signals and send commands to relay driver circuit to drive the relay for light bulb controlling. If you find any difficulty in working with relay, check out this tutorial on [arduino relay control](#) to learn more about operating relay with Arduino.

3. Digital Section :-

Arduino UNO is used for controlling whole the process of this visitor counter project. The outputs of comparators are connected to digital pin number 14 and 19 of Arduino. Arduino read these signals and send commands to relay driver circuit to drive the relay for light bulb controlling. If you find any difficulty in working with relay, check out this tutorial on [arduino relay control](#) to learn more about operating relay with Arduino.

4. Relay Driver section:

Relay driver section consist a BC547 transistor and a 5 volt relay for controlling the light bulb. Transistor is used to drive the relay because Arduino does not supply enough voltage and current to drive relay. So we added a relay driver circuit to get enough voltage and current for relay. Arduino sends commands to this relay driver transistor and then light bulb will turn on/off accordingly.


5. PROJECT CODE:**i) Defining library :**

First we have included library for LCD and defined pin for the same. And also defined input output pin for sensors and relay.


```
#include<LiquidCrystal.h>
LiquidCrystal lcd(13,12,11,10,9,8);
#define in 14
#define out 19
#define relay 2
```

ii) Initialized LCD :

Then given direction to input output pin and initialized LCD in setup loop.



```
void setup()
{
  lcd.begin(16,2);
  lcd.print("Visitor Counter");
  delay(2000);
  pinMode(in, INPUT);
  pinMode(out, INPUT);
  pinMode(relay, OUTPUT);
  lcd.clear();
```



```
  lcd.print("Person In Room:");
  lcd.setCursor(0,1);
  lcd.print(count);
}
```

iii) Input output processing loop :

In loop function we read sensors input and increment or decrement the counting depending upon enter or exit operation. And also check for zero condition. Zero condition means no one in the room. If zero condition is true then arduino turn off the bulb by deactivating the relay through transistor.

```
void loop()
{
  if(digitalRead(in))
    IN();
  if(digitalRead(out))
    OUT();

  if(count<=0)
  {
    lcd.clear();
    digitalWrite(relay, LOW);
    lcd.clear();
    lcd.print("Nobody In Room");
```

```

    lcd.setCursor(0,1);
    lcd.print("Light Is Off");
    delay(200);
}

```

Output conditions :

And if zero condition is false then arduino turns on the light. Here is two functions for enter and exit.

```

void IN()
{
    count++;
    if(count>=10)
    {
        count=10;
    }
    lcd.clear();
    lcd.print("Person In Room:");
    lcd.setCursor(0,1);
    lcd.print(count);
    delay(1000);
}

void OUT()
{
    count--;
    if(count<=0)
    {
        count=0;
    }
    lcd.clear();
    lcd.print("Person In Room:");
    lcd.setCursor(0,1);
    lcd.print(count);
    delay(1000);
}

```

6. ADVANTAGES :

- The main advantage of this project is that it helps in energy conservation. Because when there is nobody inside the room then lights are automatically turned off.
- The light will not glow if no person is present inside the room.
- The light will on only when the person enters the room.
- Displays the number of persons present inside the room.
- Human efforts to count the number of persons are eliminated. Since this project does the automatic person counting with the help of two sensors installed on the door frame.
- It is low cost and Easy to use.
- Convenience - Turning on the lights will be as easy as walking inside the room. No need to search for the switch on the wall. The lighting system will automatically turn off the lights when it does not sense any movement for a certain period of time.



7. **DISADVANTAGES :**

- The circuit requires different path for both entrance and exit way for the proper way of working.
- It is used only when one person cuts the rays of the sensor hence cannot be used when two or more persons cross the door simultaneously.
- When anybody is inside the room and we need to switch off the power then we've to do it manually. So, in this case we fail to automatically control the light.

8. **APLLICATION :**

- Digital Visitor Counter can be used in various rooms like seminar hall, conference hall where the capacity of the room is limited and should not be exceeded. The project will display an actual number of persons inside the room.
- “Automatic Room light Controller with Visitor Counter” can be used in classrooms, study rooms in colleges.
- Automatic Room light Controller project can also be used in our home because many times we come out of our bedroom or any other room and we forgot to turn off the room light.
- The Bidirectional person counter project can be used in Cinema halls, multiplex, malls as well as in temples to count the number of a person entering inside. So that these places should not get overcrowded to avoid congestion
- It can also be used as home automation system to ensure energy saving by switching on the loads and fans only when needed.

9. **FUTURE SCOPE :**

- By using this circuit and proper power supply we can implement various applications.
- By modifying this circuit and using two relays we can achieve a task of opening and closing the door.
- Voice alarm may be added to indelicate room is full and person can't enter in the room.
- We can send this data to a remote location using a mobile or internet.

10. **CONCLUSION :**

- The theme of this project when merged with certain established technologies can be quite effective in number of countries like Germany, France and Japan, etc. which control the train.
- Thus project helps us to control the lights of a room automatically , counts the number of persons or visitors entering and leaving the room.

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