Heaven's Light Is Our Guide

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

Course No.: ETE 2200

Course Title: Electronic Project Design and Development

A Project Report On:

Automatic Room Light Controller with Bidirectional Visitor Counter

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CERTIFICATE

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I deeply express sincere thanks to the Head of Department, Associate Professor Dr. Md. Kamal Hossain for encouraging and allowing me to present the project on the topic “Automatic Room Light Controller with Bidirectional Visitor Counter”

I take this opportunity to thank all teachers who contributed their valuable advice and helped to complete this project successfully.

Finally, I would like to thank my whole class and most of all to my parents who have inspired me to face all the challenges and win all hurdles in life.

Thank you all.

1704046 Syed Mumit Baksh

Abstract

The main purpose of this project is to make a controller-based model to count number of persons visiting particular room and accordingly light up the room using IR sensors. This project Automatic Room Light Controller with Bidirectional Visitor Counter using ATmega328P is a reliable circuit. It takes over the task of controlling the room lights as well counting the number of persons in the room very accurately. When someone enters in the room, the counter is incremented by one and the light is switched ON and when anyone leaves the room, the counter is decremented by one. The light will be only switched OFF when no one is present in the room. The total persons in the room is also displayed on the LCD Display. The ATmega328P does the above job. It receives signals from the sensors and the signal is operated under the control of the software which is stored in the ROM. ATmega328P continuously monitors the Infrared Receivers. When any object passes through the IR Receivers then the IR Rays falling on the receiver are obstructed, this obstruction is sensed by the Microcontroller. This project adds simplicity to our lifestyle.

Table of Components

Chapter-1

Introduction

1.1

Introduction: Today's world is full of busyness. For being so busy most of the time, we don't have enough time to look at here and there. Now-a-days not only for busyness but also for being lazy most of the people leave the room without turning the light OFF. As a result, a lot of energy get wasted. Not only that, sometimes it occurs a massive accident. Moreover, the electricity bill goes up. Not only at home but also in public places, offices, educational institutions it happens. So, in recent times, we want automation in our day to day life because of our busyness and to be able to save the energy. We want automation in every place to save time, energy and to avoid creating any massive accident. The people want this to reduce human efforts. The automation process actually reduces human effort. The automatic room light controller with bidirectional controller is a very reliable circuit that takes over the task of controlling the light of the room as well as counting the persons present in the room accurately. The automatic room light is ON when there is any person in the room and is switched OFF when there is no person present in the room. This system helps us to save energy when the light is ON when there is no person in the room. The IR sensors used in the automation detects the human beings. As a result, the microcontroller does the rest. It receives signals from the sensors and the signal is operated under the control of the software which is stored in the ROM. When the IR sensor detects that a person is going inside the room, the microcontroller turns the light ON and when the person is leaving the room, the microcontroller turns the light OFF. There is a LCD display that acts as a counter and the number of persons present in the room are shown in it. As each person starts to get inside the room, the counter increments by one and when each person starts to get outside the room, the counter decrements by one and as soon as the counter shows zero value, the light is turned off by the microcontroller as zero value means there is nobody present in the room. Thus, the system gets user friendly.

1.2

Application: As this project is of low cost and easy to use, so we can use this circuit in our houses, schools, colleges, offices etc. This will lessen human efforts, save the energy, reduce the electricity bill and moreover avoid any kind of accidents. Moreover, we can use this project for counting purposes as it acts as a great medium for counting purposes.

Chapter-2

Description & Circuit Operation

2.1

Apparatus: The components that we used for this project are:

i. ATmega328P,
ii. 16*2 LCD Display,
iii. Arduino UNO,
iv. A Relay Module,
v. 16 MHz Crystal Oscillator,
vi. IR Sensor (2 pieces),
vii. Ceramic Capacitor (22pF -2 pieces),
viii. 0.5 Watt LED Bulb,
ix. 10kohm Potentiometer (1 piece),
x. Connecting Wires,
xi. Power Supply.

2.2

Description:

a) ATmega328P: ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on AVR RISC architecture. It is the most popular of all AVR controllers as it is used in ARDUINO boards. It has 28 pins.In this project,it controls the light after the IR sensor detects human beings.

Fig 2.2(a) : ATmega328P

Features:

ATmega328 - Simplified Features	
CPU	8-bit AVR
Number of Pins	28
Operating Voltage (V)	+1.8 V TO +5.5V
Number of programmable I/O lines	23
Communication Interface	Master/Slave SPI Serial Interface(17,18,19 PINS) [Can be used for programming this controller] Programmable Serial USART(2,3 PINS) [Can be used for programming this controller] Two-wire Serial Interface(27,28 PINS)[Can be used to connect peripheral devices like Servos, sensors and memory devices]
JTAG Interface	Not available
ADC Module	6channels, 10-bit resolution ADC
Timer Module	Two 8-bit counters with Separate Prescaler and compare mode, One 16-bit counter with Separate Prescaler,compare mode and capture mode.
Analog Comparators	1(12,13 PINS)
DAC Module	Nil
Operating Temperature	-40°C to +105°C(+105 being absolute maximum, -40 being absolute minimum)

ATmega328 - Simplified Features	
PWM channels	6
External Oscillator	0-4MHz @ 1.8V to 5.5V 0-10MHz @ 2.7V to 5.5V 0-20MHz @ 4.5V to 5.5V
Internal Oscillator	8MHz Calibrated Internal Oscillator
Program Memory Type	Flash
Program Memory or Flash memory	32Kbytes[10000 write/erase cycles]
CPU Speed	1MIPS for 1MHz
RAM	2Kbytes Internal SRAM
EEPROM	1Kbytes EEPROM
Watchdog Timer	Programmable Watchdog Timer with Separate On-chipOscillator
Program Lock	Yes
Power Save Modes	Six Modes[Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby]

[Reference: https://components101.com/microcontrollers/atmega328p-pinout-features-datasheet]

Pinout:

Pin No.	Pin name	Description	Secondary Function
1	PC6 (RESET)	Pin6 of PORTC	Pin by default is used as RESET pin. PC6 can only be used as I/O pin when RSTDISBL Fuse is programmed.
2	PD0 (RXD)	Pin0 of PORTD	RXD (Data Input Pin for USART) USART Serial Communication Interface[Can be used for programming]
3	PD1 (TXD)	Pin1 of PORTD	TXD (Data Output Pin for USART) USART Serial Communication Interface[Can be used for programming] INT2(External Interrupt 2 Input)
4	PD2 (INT0)	Pin2 of PORTD	External Interrupt source 0
5	PD3 (INT1/OC2B)	Pin3 of PORTD	External Interrupt source1 OC2B(PWM - Timer/Counter2 Output Compare Match B Output)
6	PD4 (XCK/T0)	Pin4 of PORTD	T0(Timer0 External Counter Input) XCK (USART External Clock I/O)
7	VCC		Connected to positive voltage
8	GND		Connected to ground
9	PB6 (XTAL1/TOSC1)	Pin6 of PORTB	XTAL1 (Chip Clock Oscillator pin 1 or External clock input) TOSC1 (Timer Oscillator pin 1)
10	PB7 (XTAL2/TOSC2)	Pin7 of PORTB	XTAL2 (Chip Clock Oscillator pin 2) TOSC2 (Timer Oscillator pin 2)

Pin No.	Pin name	Description	Secondary Function
11	PD5 (T1/OC0B)	Pin5 of PORTD	T1(Timer1 External Counter Input) OC0B(PWM - Timer/Counter0 Output Compare Match B Output)
12	PD6 (AIN0/OC0A)	Pin6 of PORTD	AIN0(Analog Comparator Positive I/P) OC0A(PWM - Timer/Counter0 Output Compare Match A Output)
13	PD7 (AIN1)	Pin7 of PORTD	AIN1(Analog Comparator Negative I/P)
14	PB0 (ICP1/CLKO)	Pin0 of PORTB	ICP1(Timer/Counter1 Input Capture Pin) CLKO (Divided System Clock. The divided system clock can be output on the PB0 pin)
15	PB1 (OC1A)	Pin1 of PORTB	OC1A(Timer/Counter1Output Compare Match A Output)
16	PB2 (SS/OC1B)	Pin2 of PORTB	SS (SPI Slave Select Input). This pin is low when controller acts as slave. [Serial Peripheral Interface (SPI) for programming] OC1B(Timer/Counter1Output Compare Match B Output)
17	PB3 (MOSI/OC2A)	Pin3 of PORTB	MOSI (Master Output Slave Input). When controller acts as slave, the data is received by this pin. [Serial Peripheral Interface (SPI) for programming] OC2 (Timer/Counter2 Output Compare Match Output)
18	PB4 (MISO)	Pin4 of PORTB	MISO (Master Input Slave Output). When controller acts as slave, the data is sent to master by this controller through this pin. [Serial Peripheral Interface (SPI) for programming]
19	PB5 (SCK)	Pin5 of PORTB	SCK (SPI Bus Serial Clock). This is the clock shared between this controller and other system for accurate data transfer. [Serial Peripheral Interface (SPI) for programming]

Pin No.	Pin name	Description	Secondary Function
20	AVCC		Power for Internal ADC Converter
21	AREF		Analog Reference Pin for ADC
22	GND		GROUND
23	PC0 (ADC0)	Pin0 of PORTC	ADC0 (ADC Input Channel 0)
24	PC1 (ADC1)	Pin1 of PORTC	ADC1 (ADC Input Channel 1)
25	PC2 (ADC2)	Pin2 of PORTC	ADC2 (ADC Input Channel 2)
26	PC3 (ADC3)	Pin3 of PORTC	ADC3 (ADC Input Channel 3)
27	PC4 (ADC4/SDA)	Pin4 of PORTC	ADC4 (ADC Input Channel 4) SDA (Two-wire Serial Bus Data Input/output Line)
28	PC5 (ADC5/SCL)	Pin5 of PORTC	ADC5 (ADC Input Channel 5) SCL (Two-wire Serial Bus Clock Line)

[Reference: https://components101.com/microcontrollers/atmega328p-pinout-features-datasheet]

b) LCD Display: LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. It has 16 columns and 2 rows and that's why it is called 16*2 LCD display. There are also 8*1,16*1 LCD displays but most of us use 16*2 LCD display. A 16*2 LCD display will have (16*2)=32 characters and each character will have (5*8)=40 pixels. This LCD has two registers, namely,comm-

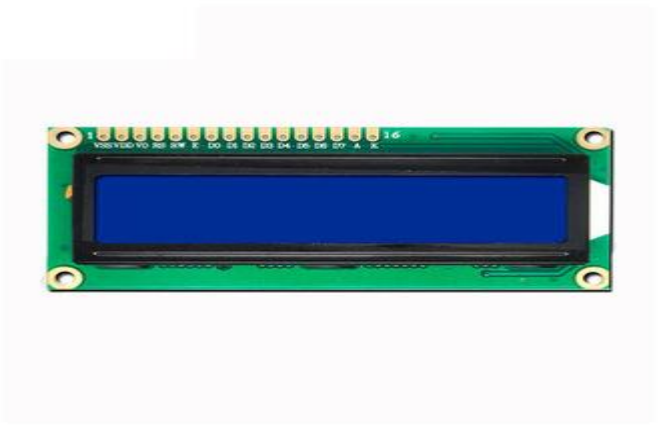

Fig 2.2(b): 16*2 LCD Display

and Data. Here we use 16*2 LCD display to make it act as a counter and to display the number of visitors.

Features:

i. Operating Voltage is 4.7V to 5.3V.
ii. Current consumption is 1mA without backlight.
iii. Alphanumeric LCD display module, meaning can display alphabets and numbers.
iv. Consists of two rows and each row can print 16 characters.
v. Each character is built by a 5×8 pixel box.
vi. Can work on both 8-bit and 4-bit mode.
vii. It can also display any custom generated characters.
viii. Available in Green and Blue Backlight.

[Reference: https://components101.com/16x2-lcd-pinout-datasheet]

Pinout:

Pin No:	Pin Name:	Description
1	Vss (Ground)	Ground pin connected to system ground
2	Vdd (+5 Volt)	Powers the LCD with +5V (4.7V – 5.3V)
3	VE (Contrast V)	Decides the contrast level of display. Grounded to get maximum contrast.
4	Register Select	Connected to Microcontroller to shift between command/data register
5	Read/Write	Used to read or write data. Normally grounded to write data to LCD
6	Enable	Connected to Microcontroller. Pin and toggled between 1 and 0 for data acknowledgement
7	D0	Data pins 0 to 7 forms a 8-bit data line. They can be connected to Microcontroller to send 8-bit data.These LCD's can also operate on 4-bit mode in such case Data pin 4,5,6 and 7 will be left free.
8	D1	Data Pin 1
9	D2	Data Pin 2
10	D3	Data Pin 3
11	D4	Data Pin 4
12	D5	Data Pin 5
13	D6	Data Pin 6

Pin No:	Pin Name:	Description
14	D7	Data Pin 7
15	A	Backlight LED pin positive terminal
16	K	Backlight LED pin negative terminal

[Reference: https://components101.com/16x2-lcd-pinout-datasheet]

c) **Arduino UNO:** Arduino is an open source device that designs and single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino board designs use a variety of microprocessors and controllers. The boards are 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 boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers.

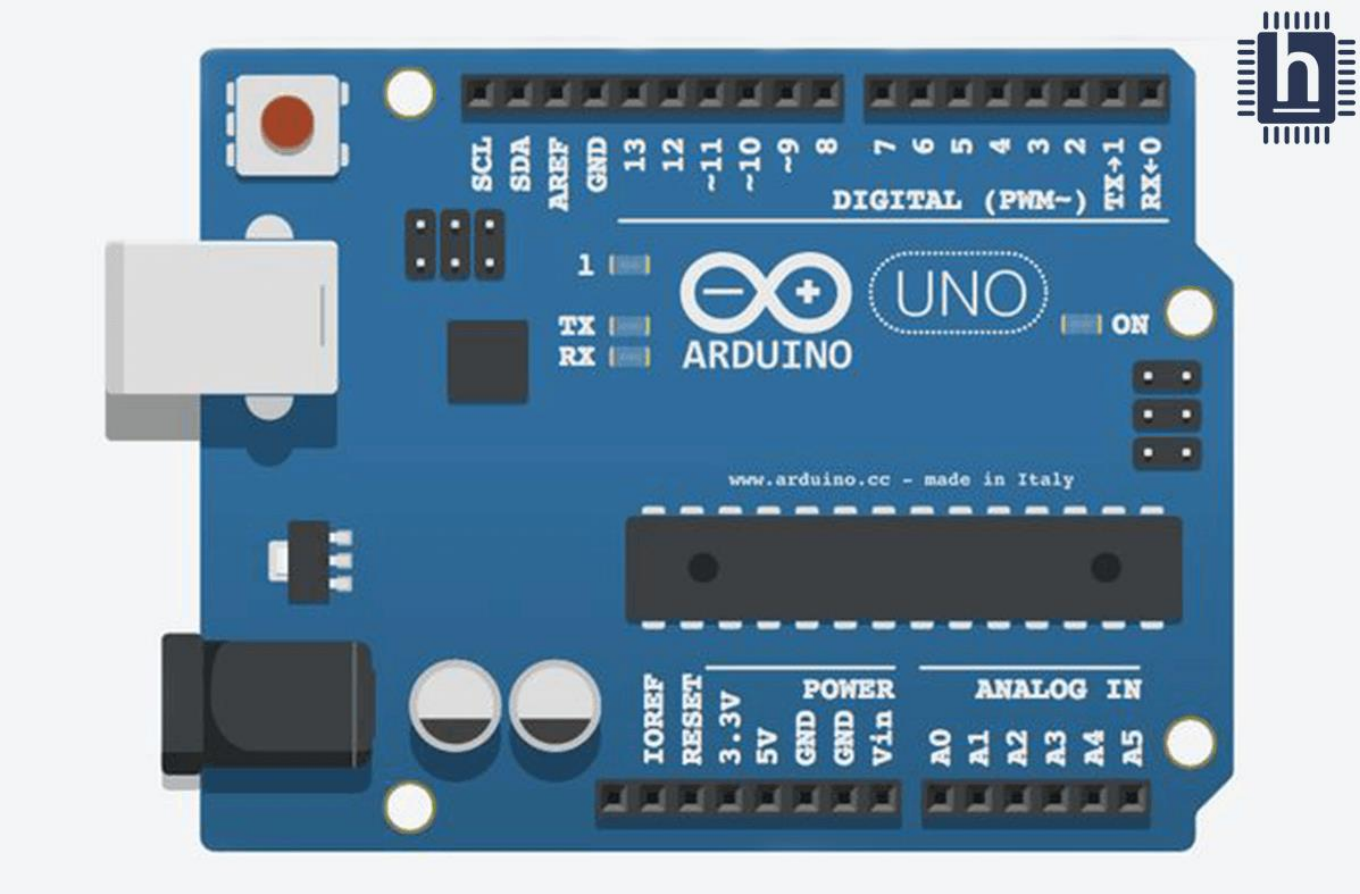

Fig 2.2(c): Arduino UNO

Features:

Product Specification	
Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm

[Reference : https://store.arduino.cc/usa/arduino-uno-rev3]

d) Relay Module: Relays are the switches which aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit. Relays consist of three pins normally open pin, normally closed pin, common pin and coil. When coil powered on magnetic field is generated, the contact is connected to each other. When the relay contact is open (NO), the relay isn't energized with the open contact.

Fig 2.2(d): Relay Module

Features:

- Contact current 10A and 250V AC or 30V DC.
- Each channel has indication LED.
- Coil voltage 12V per channel.
- Input signal 3-5 V for each channel.
- Kit operating voltage 5-12 V.
- Three pins for normally open and closed for each channel.

[Reference: https://curtocircuito.com.br/datasheet/modulo/rele-1canal.pdf]

e) IR Sensor: An Infrared Radiation is an electronic device that is used to measure and detect infrared radiation in its surrounding environment. IR is invisible to human eye. There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors consist of two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (such as in robots). Passive infrared (PIR) sensors only detect infrared radiation and do not emit it from an LED. PIR sensors are most commonly used in motion-based detection, such as in-home security systems.

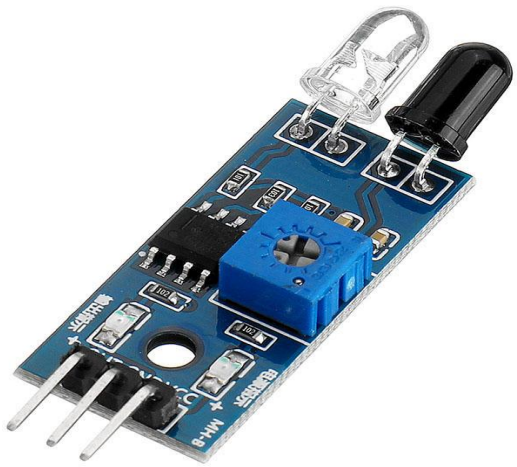

Fig 2.2(e): IR Sensor

Features:

- 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.

[Reference: https://components101.com/sensors/ir-sensor-module]

Pinout:

Pin Name	Description
VCC	Power Supply Input
GND	Power Supply Ground
OUT	Active High Output

[Reference: https://components101.com/sensors/ir-sensor-module]

f) 16MHz Crystal Oscillator: Crystal Oscillator is an Electronics Oscillator circuit which uses the mechanical resonance of a vibrating crystal of piezoelectric material to generate an electrical signal with an accurate frequency. It also has automatic amplitude control and frequency drift is also very low due to change in temperature. Crystal Oscillators are only suitable for high-frequency application. It is used in frequency synthesizers, Military and Aerospace, radio and tv transmitters etc.

Fig 2.2(f): 16.000 MHz Crystal Oscillator

Features:

- 18pF of Load Capacitance.
- Frequency Tolerance(ƺf/f) range is ± 30ppm.
- Frequency Temperature Stability range is ±50ppm.
- Resonance Resistance 40ohms (max).
- Oscillation mode: Fundamental mode.
- Shunt Capacitance less than 7pF.
- Drive Level less than 100µW.
- Operating Temperature Range: -20 to + 70°C.
- Operable Temperature Range: -25 to + 85°C.
- Storage Temperature Range: -55 to + 125°C.
- Insulation Resistance: 500 M ohms.

[Reference: https://components101.com/misc/crystal-oscillator]

g) **Ceramic Capacitor:** A ceramic capacitor is a fixed-value capacitor where the ceramic material acts as the dielectric. It is constructed of two or more alternating layers of ceramic and a metal layer acting as the electrodes. Ceramic Capacitors have no polarity. So, they can be connected in any direction. They are breadboard friendly. They are used in filter circuits, resonant circuits.They are also used for removing noise from a circuit.

Fig 2.2(g): Ceramic Capacitor (22 pF)

Features:

- Capacitor Type – Ceramic.
- Has a high range of capacitance value starting from 10pF to 3.3uF.
- Has a high range of voltage value starting from 16V to 450V.
- Can withstand a maximum of 105°C temperature.

[Reference: https://components101.com/ceramic-capacitor-pinout-parameters-datasheet]

h) Potentiometer(10kohm): A potentiometer (also known as a pot or potmeter) is defined as a 3 terminal variable resistor in which the resistance is manually varied to control the flow of electric current. A potentiometer acts as an adjustable voltage divider. It has 3 terminals. The middle one is the variable end. It is used in voltage and current circuits, tuning and control circuits etc.

Fig 2.2(h): Potentiometer(10kohm)

Features:

- Type: Rotary a.k.a Radio POT
- Available in different resistance values like 500Ω, 1K, 2K, 5K, 10K, 22K, 47K, 50K, 100K, 220K, 470K, 500K, 1 M.
- Power Rating: 0.3W
- Maximum Input Voltage: 200Vdc
- Rotational Life: 2000K cycles

[Reference: https://components101.com/potentiometer]

Pinout:

Pin No.	Pin Name	Description
1	Fixed End	This end is connected to one end of the resistive track
2	Variable End	This end is connected to the wiper, to provide variable voltage
3	Fixed End	This end is connected to another end of the resistive track

[Reference: https://components101.com/potentiometer]

i) LED Bulb: An LED lamp or LED light bulb is an electric light for use in light fixtures that produces light using one or more light-emitting diodes (LEDs). LED lamps have a lifespan many times longer than equivalent incandescent lamps, and are significantly more efficient than most fluorescent lamps, with some manufacturers (Cree and others) claiming LED chips with a luminous efficacy of up to 303 lumens per watt. LEDs run on direct current (DC), whereas mains current is alternating current (AC) and usually at much higher voltage than the LED can accept. LED lamps can contain a circuit for converting the mains AC into DC at the correct voltage. These circuits contain rectifiers,

capacitors, and may have other active electronic components, which may also permit the lamp to be dimmed.

Fig 2.2(i): LED Bulb(0.5 Watt)

Features:

- Super clear glass shell high quality LED,
- True wattage,
- Voltage range 85-265V,
- Long life,
- Save at least 75% energy.

[Reference: https://en.wikipedia.org/wiki/LED_lamp]

2.3

Circuit Diagram:

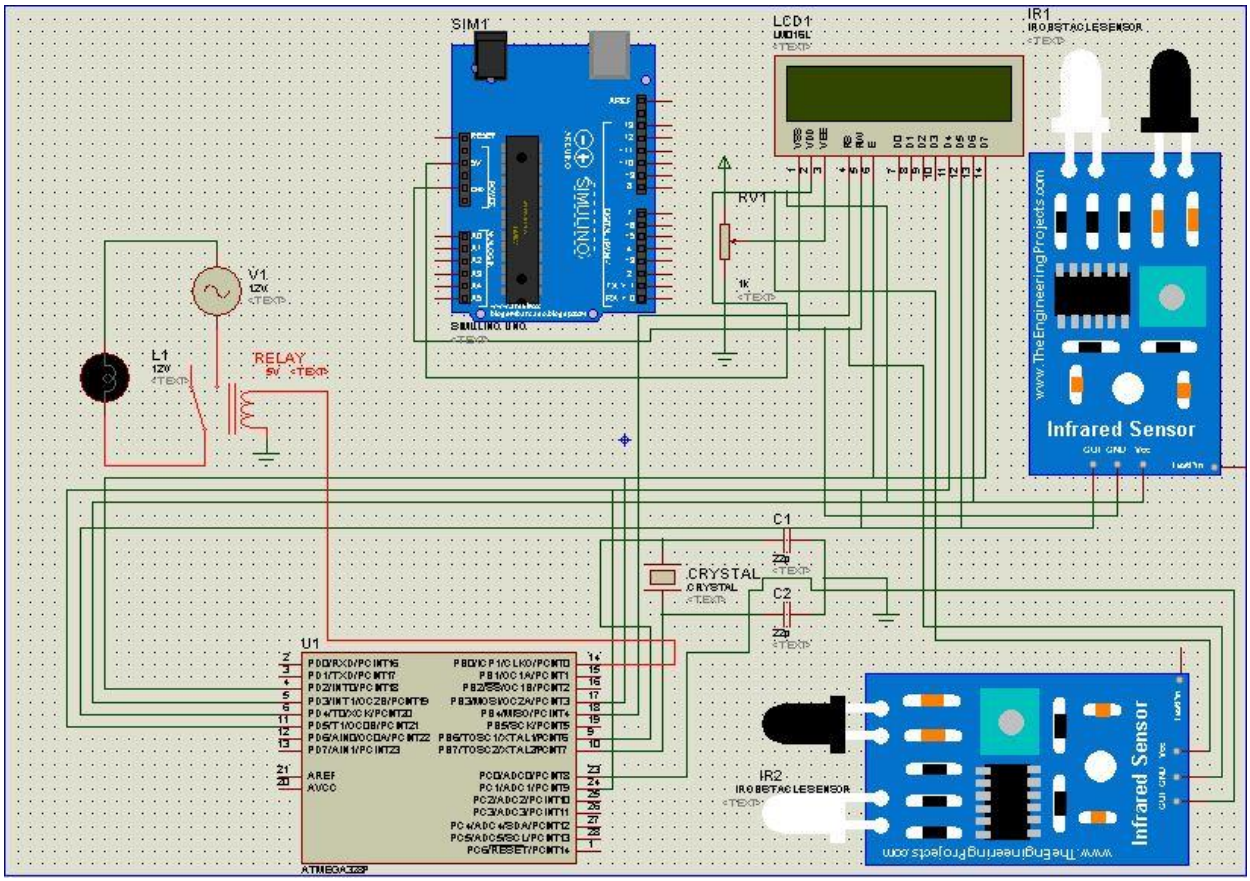

Fig 2.3: Circuit Diagram of Automatic Light Controller with Bidirectional Visitor Counter

2.4

Circuit Operation:

This project can be divided into two parts. IR sensors and microcontroller. There are two IR sensors used in this project. The sensors must be placed on the either side of the door or the entrance of the room. The sensor placed on the outside of the room is sensor 2 and the sensor placed on the inside of the room is sensor 1. When a person tries to enter into the room, the sensor 2 detects the person and then the sensor 1. This action indicates the microcontroller that someone is entering into the room and the light is switched ON and the value in the visitor counter becomes 1 from 0. If there are more visitors, the microcontroller will turn the light ON and the value in the visitor counter will be incremented accordingly. If anyone tries to leave the room, the sensor 1(inside of the room) will detect the person and then the sensor 2(outside of the room). This will indicate the microcontroller but the light will be turned ON and the value in the visitor counter will be decremented by one. Thus, the more visitors will leave, the more the value in the visitor counter will be decremented accordingly. But the light will not be turned OFF until the visitor counter value becomes 0.

That means the microcontroller will turn the light OFF, when nobody is present in the room. That's how the above circuit (Fig 2.3) works.

Chapter-3

Designing & Implementation

3.1

Designing & Implementation Process: The project was made on bread board and ran successfully after a couple of modifications.

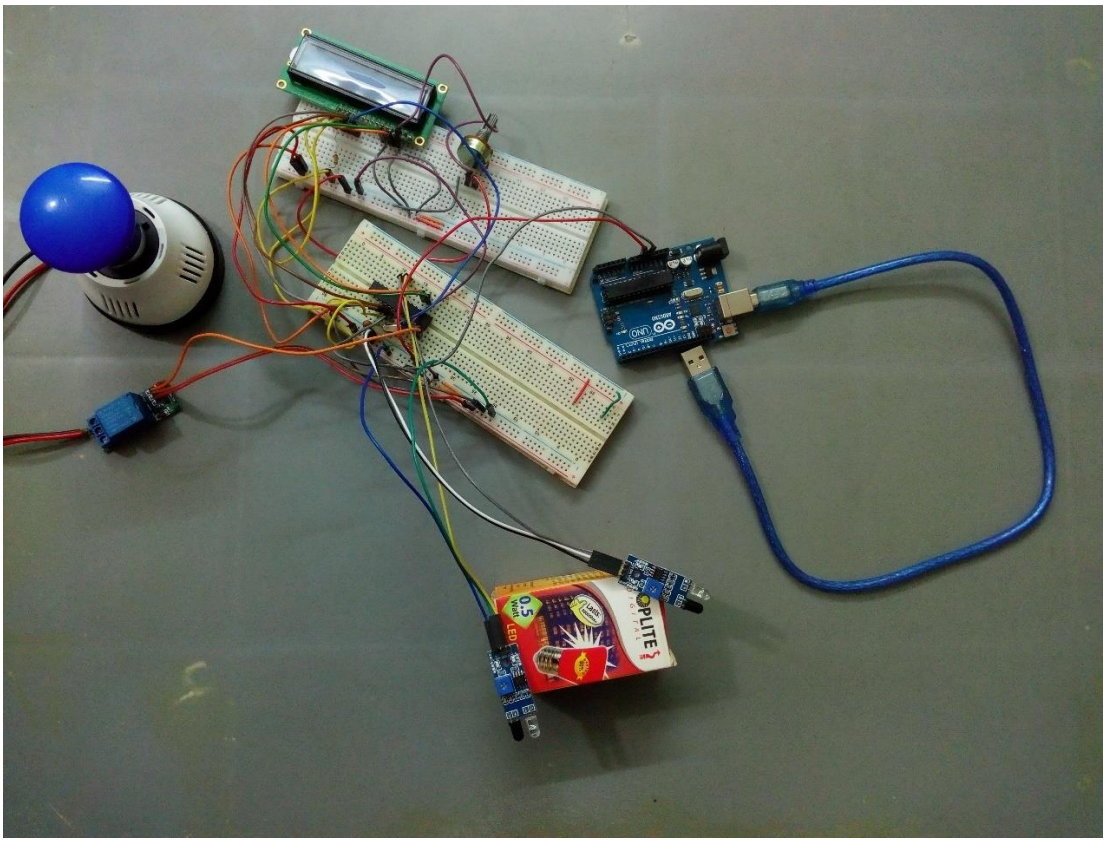

Fig 3.1: The circuit diagram of automatic light controller with bidirectional visitor counter

Then we designed the PCB using Proteus software from the schematic design. And it was like this:

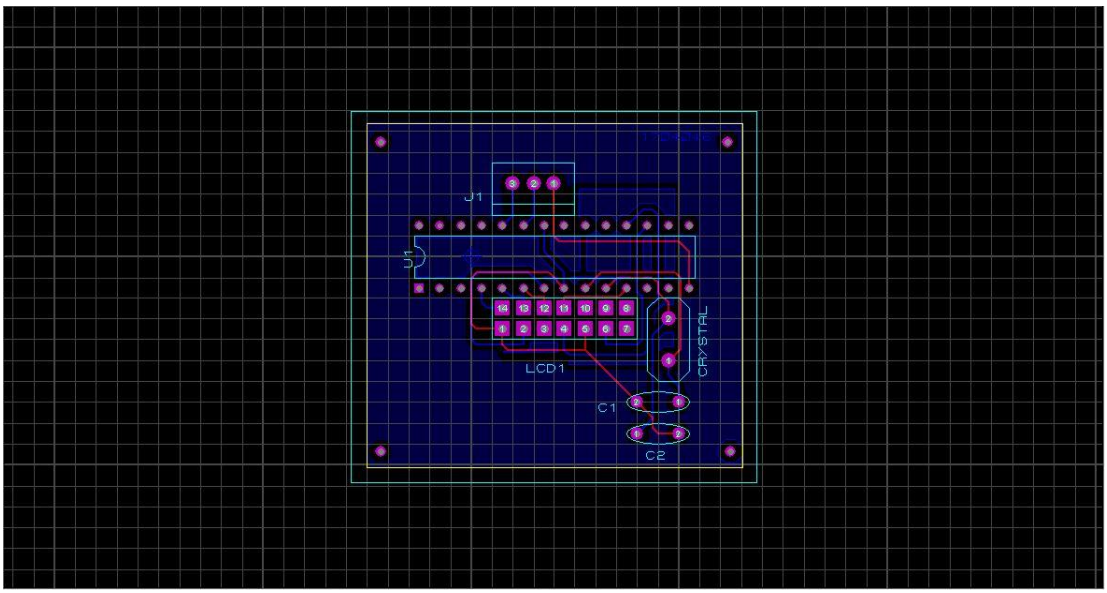

Fig 3.2: The PCB Designing from Schematic Design

Then after designing the PCB from the schematic design, the final PCB design for printing was like this:

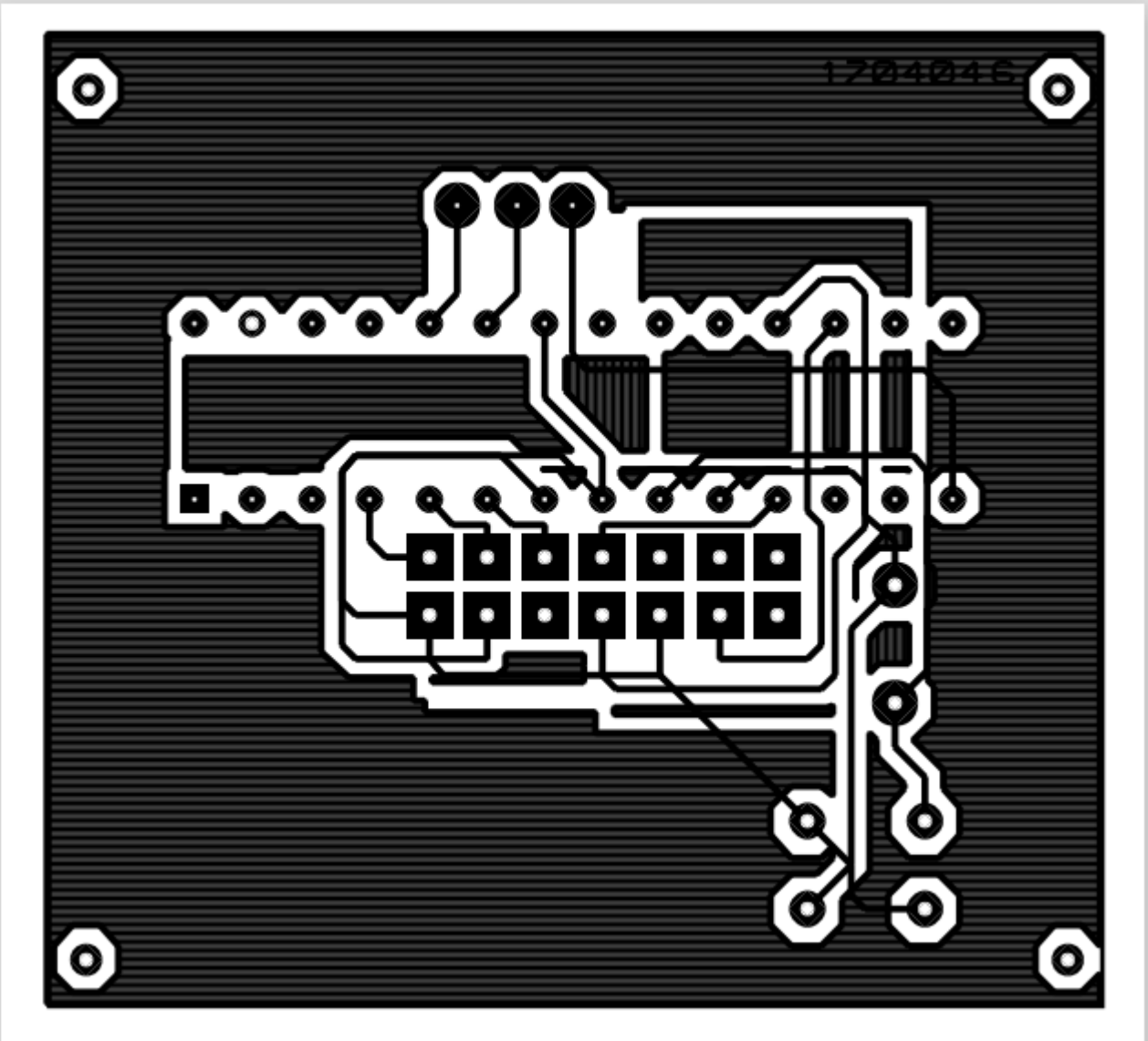

Fig 3.3: The PCB Design for automatic light controller with bidirectional visitor counter

Thus, our designing & implementation processes were completed.

Chapter-4
Result & Discussion

4.1

Result & Discussion: The main purpose of this project is to develop an automatic control system for lighting which is cost efficient and more reliable. The cost of this project is much cheaper than different automatic control system for lighting available in market. This project overcome positioning problem of IR based control system. Moreover, the system still has limitation like, it works only when one person cuts the rays of the sensor at a time hence cannot be used when two or more persons cross the door simultaneously. We can solve this problem by adding an additional camera sensor. Also, if anyone is present in the room and wants to turn the light off without leaving the room, then he has to turn the light off manually. Above all, this project reduces the wastage of electrical energy which was the main purpose of the project. Besides the lighting control, this project can be used as counting purposes like product counting by using its counting algorithm. Therefore, we can say that this project fulfills its objectives and it can be implemented practically.

4.2

Disadvantages:

i. It is used only when one single person cuts the rays of the sensor at a time hence it cannot be used when two persons cross simultaneously.
ii. If anyone is present in the room and wants to turn the light off without leaving the room, then he has to turn the light off manually.

4.3

Future Plan:

i. By using the circuit and proper power supply, various applications such as fans, tube light etc can be implemented.
ii. We can achieve a task of opening and closing the door by modifying the circuit and using two relays.
iii. Since it is used only when one single person cuts the rays of the sensor at a time and cannot be used when two persons cross simultaneously, by adding an additional camera sensor we can solve the problem.
iv. We also can achieve a task of turning the light off when anyone wants to, without leaving the room by modifying the circuit.

4.4

Conclusion: The main purpose of this project is to lessen human efforts, save energy, reduce electricity bill, avoid any kind of accident. So, in developing countries like Bangladesh, it will be really helpful to lessen our efforts and save energy. Moreover, this circuit is of low cost than any other automatic control system available in the market. So, people can afford this very easily. Moreover, we can implement various applications such as fans, tube light etc by modifying this circuit.

4.5

References:

[1] Anjali Sinha, Arpita Singh, Deepa Singh, Parul Singh, Anil Maurya and Mahesh Kumar Singh, "Automatic Room Light Controller with Visitor Counter", International Journal on Emerging Technologies, Vol 8 Issue 1, pp. 172-175, 2017.

[2] Md. Saddam Hossain, Helal-An-Nahiyan, "Automatic Control System for Lighting of a Single Door Room with Bidirectional People Counter", International Conference on Mechanical, Industrial and Energy Engineering, Vol 1 Issue 1, pp. 1-4, 26-27 December, 2014.

[3] https://components101.com

[4] https://en.wikipedia.org/wiki/LED_lamp

[5] https://www.youtube.com/watch?v=l9jf6Ndyo18&t=10s

4.6

Appendix:

Code:

```
// include the library code:
#include <LiquidCrystal.h>
// initialize the library with the numbers of the interface pins
#define IR1 A1
#define IR2 A0
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
unsigned int visin = 0, visout = 0;
unsigned int flh1,flh2;
unsigned long valY, valX;


void counter_algorithm()
{
  valY = analogRead(IR1);  valX = analogRead(IR2);
  Serial.print("SENS1:");  Serial.print(valX);
  Serial.print(",SENS2:"); Serial.println(valY);


  if(flh1==0)
  {
```

```
 if(valY<500)    // IR value, adjust/change as per your sensor's logic
 {
  flh1=1;
  flh2=0;

 }
 else if(valX<500)   // IR value, adjust/change as per your sensor's logic
 {
  flh1=1;
  flh2=1;
 }
}

if(flh1==1)
{
 if(flh2==1)
 {
  if(valY<500)    // IR value, adjust/change as per your sensor's logic
  {
   flh1=0;
   if(visin<999)
   {
    visin++;
   }
   //led_on_off();

   while(valY<500) // IR value, adjust/change as per your sensor's logic
   {
    valY = analogRead(IR1);
   }
```

```
      lcd.setCursor(0, 0);
      lcd.print("Count : ");
      lcd.print(visin);
     }
   }

  if(flh2==0)
  {
   if(valX<500)  // IR value, adjust/change as per your sensor's logic
   {
    flh1=0;
    if(visin>0)
    {
     visin--;
    }
    //led_on_off();

   while(valX<500) // IR value, adjust/change as per your sensor's logic
   {
    valX = analogRead(IR2);
   }
   lcd.setCursor(0, 0);
   lcd.print("Count : ");
   lcd.print(visin);
   }
  }
 }
}
```

```
void setup() {
  Serial.begin(9600);
  // set up the LCD's number of columns and rows:
  pinMode(IR1, INPUT_PULLUP);  pinMode(IR2, INPUT_PULLUP); pinMode(8, OUTPUT);
  lcd.begin(16, 2);
  // Print a message to the LCD.
  lcd.print(" Bidirectional  ");//Bidirectional Visitor Counter
  lcd.setCursor(0, 1);
  lcd.print("Visitor Counter ");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Count : ");
  lcd.print(visin);
}

void loop()
{
  counter_algorithm();
  if(visin>0) {
    digitalWrite(8, LOW);
  }
  else {
    digitalWrite(8, HIGH);
  }}
```