A PROJECT REPORT ON

AUTONOMOUS STREET LIGHT CONTROL SYSTEM

In the partial fulfilment of the requirement for the degree of

Bachelor of Technology
In
Electrical Engineering

INSTITUTE OF ENGINEERING AND TECHNOLOGY, LUCKNOW

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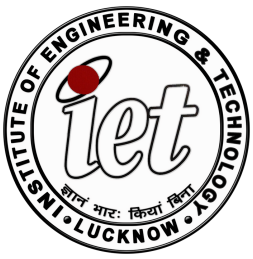

DEPARTMENT OF ELECTRICAL ENGINEERING

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CERTIFICATE

This is to certify that Project Report entitled ―AUTOMATIC STREET LIGHT CONTROL SYSTEM that is to submitted by DEVANG GANGWAR, AMAN BAJPAI ,MAYANK KUMAR AGRAWAL in partial fulfilment of the requirement for the award of the degree B.Tech in Department of ELECTRICAL ENGINEERING of Institute of Engineering and Technology is a record of the candidates own work carried out by them under their own supervision. The matter embodies in thesis is original and has not been submitted for the award of any other degree.

Dr. Nitin Anand Shrivastava
Course Coordinator KEE-354

Dr. Seethalekshmi K.
Head of Department

DECLARATION

I hereby declare that this submission is our own work and that, to the best of our knowledge and we belief, it contains no material previously published or written by another person nor material which to a substantial extend has been accepted for the award of any other degree or diploma of the university or other institute of the higher leaning except where due acknowledgement has been made in the text.

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Date:- 15March2022

ACKNOWLEDGEMENT

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We would like to thank Prof. BHARAT LAL for his efforts, who was always ready with a positive comment, whether it was an off-hand comment to encourage us or constructive piece of criticism.

We wish to thank our parents for their undivided support and interest who inspired us and encouraged us to go our own way, without whom we would be unable to complete our project, and finally to God who made all the things possible in such an efficient way…

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PROJECT OVERVIEW

The objective of the project is to provide automatic control and saves electrical energy street lamps. The lighting system which targets the energy and automatic operation on economical affordable for the streets and send information about the street lamp fault to the control room. Moreover, errors which occur due to manual elimination can also eliminate.

INTRODUCTION

In our country ,the corporation street light consumes more power when roads are desolate. However with the increasing importance for saving power and proper maintenance it leads to save the natural resources for the future. A smart street light system can reduce the power of corporation street light for desolate roads. Our project gives the solution to those problems. It uses sensors, modules, for implementing a system, and uses LDR(light dependent resistor)for sensing the weather conditions.

The system can identify the bright or dark environment using LDR. The weather is dark the system allows to ON the street lights, the weather is bright the system allows to OFF the street lights. Same this LDR operation is used to find the light fault detection and send to the control room using ESP8266 Wi-Fi module.

Here the intensity of street light is to be controlled by the microcontroller. Whenever PIR sense the motion of the vehicle ,the street light will glow as bright as normal, otherwise the street light will glow as dim

Circuit Diagram:

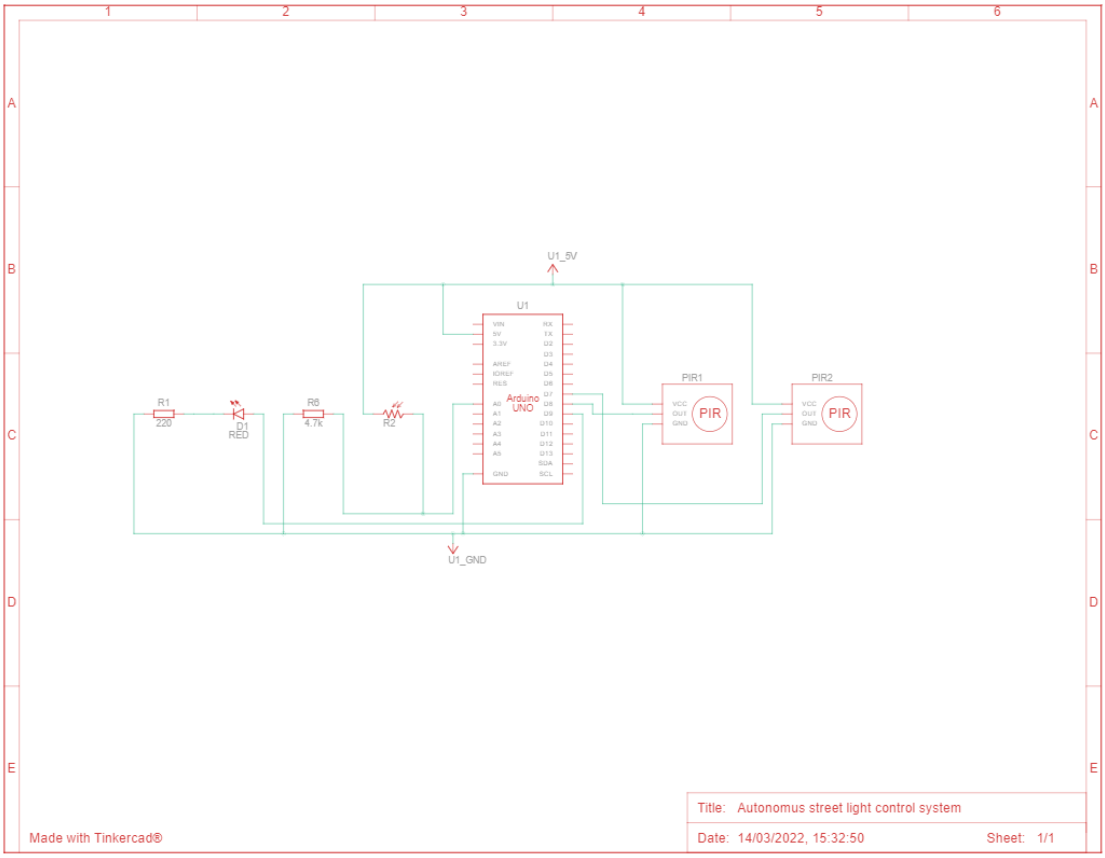


Fig-1 Circuit Diagram

Simulation Diagram:

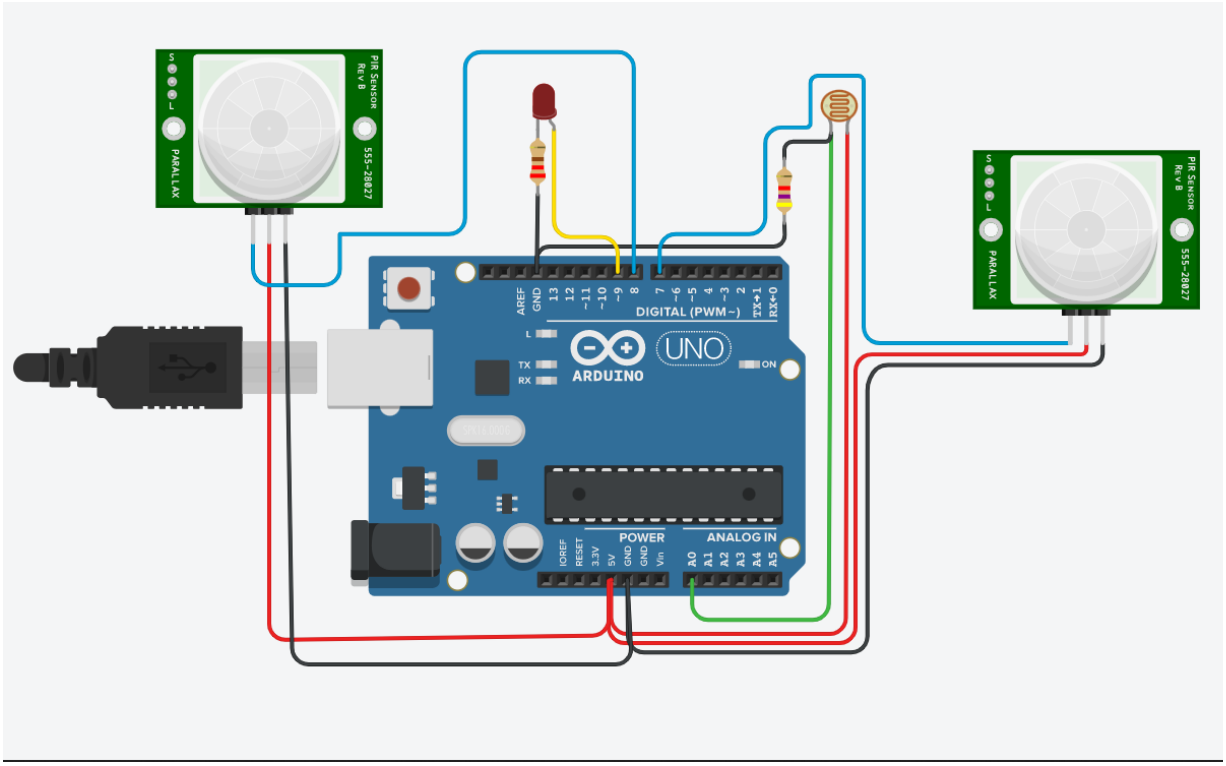


Fig-2 Simulation Diagram

Basic Block Diagram:

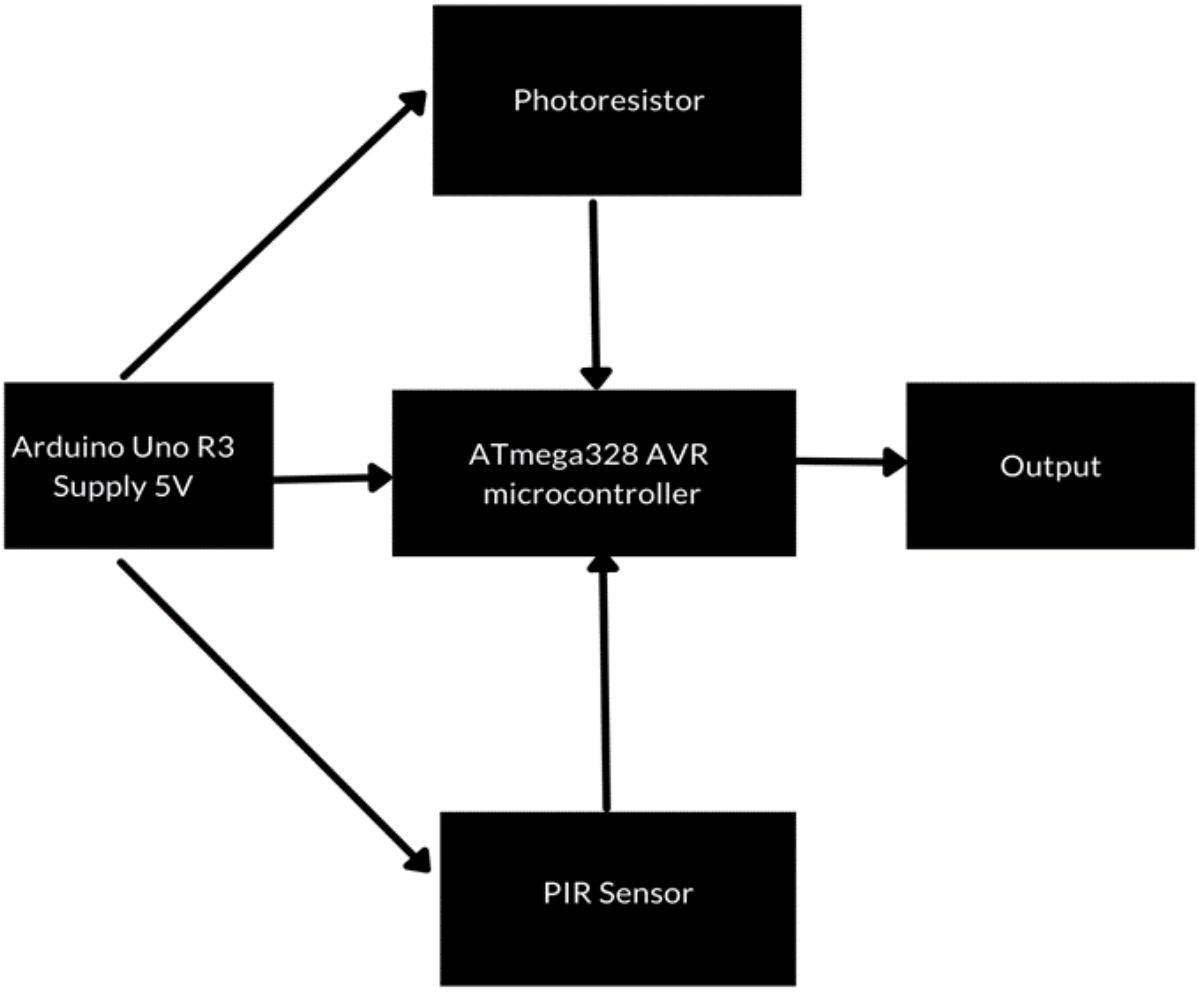


Fig-3 Block Diagram

Circuit Description:

There are three main components used in our circuits:

1. Arduino UNO R3
2. PIR sensor
3. Photoresistor

The complete details of all above components you will get later in this module.

Circuit Details

In this circuit we use mainly three components name are given above.

The Arduino UNO R3 is basically a microcontroller-based device. We use PIR sensor which works on properties of infrared waves. We use photoresistor this can change its resistor value according to light intensity available to it.

In our Project Autonomous Street Lights Control System Our Photoresistor detects the presence of light and it control our LED according to Light presence.

It off our light if intensity is greater than 850 nits. In the time of night, it always gives signal to our LED and now our LED is depending on PIR sensor. Now we talk about PIR sensor when intensity is lesser than 850 nits than our LED

Is totally depends on PIR sensor, if our PIR sensor detects any motion, obstacle, then it directly gives message to our LED and make it ON.

So, we can say that if our intensity is less than 850 nits and our PIR sensor detects some obstacles than this is the only condition to turn ON our LED.

Our Signal Monitor gives us two reading one for our Photoresistor and one for our PIR sensor. Our Serial monitor will also give the graph of the values which we will give to our photoresistor and our PIR sensor. We set frequency of our serial monitor is 9600 and the delayed of 500 milliseconds means it will give us value with 500 milliseconds delay.

And this is the way by which we can make our street light system or many other systems completely autonomous with very low cost.

List of Components:

Following is the list of Components that are necessary to perform this project.

Sr. No.	Name of Component	Quantity
1.	Arduino UNO R3	1
2.	Passive Infrared Sensor	2
3.	LED's	Few
4.	Resistor (220 Ohm)	1
5.	Resistor (4.7 Kilo-Ohm)	1
6.	Photoresistor	1
7.	5Volt Regulated Supply	1

Description of Components:

1. Arduino UNO

Fig-1 arduino UNO

The Arduino UNO is an open source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. 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 pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-Volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "UNO" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The UNO board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes pre-programmed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

While the UNO communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Technical Specification:

- Microcontroller Microchip ATmega328P
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 can provide PWM output)
- PWM Pins: 6 (Pin # 3, 5, 6, 9, 10 and 11)
- UART: 1
- I2C: 1
- SPI: 1
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 gm
- ICSP Header: Yes
- Power Sources: DC Power Jack & USB Port

2. Passive Infrared Sensor (PIR):

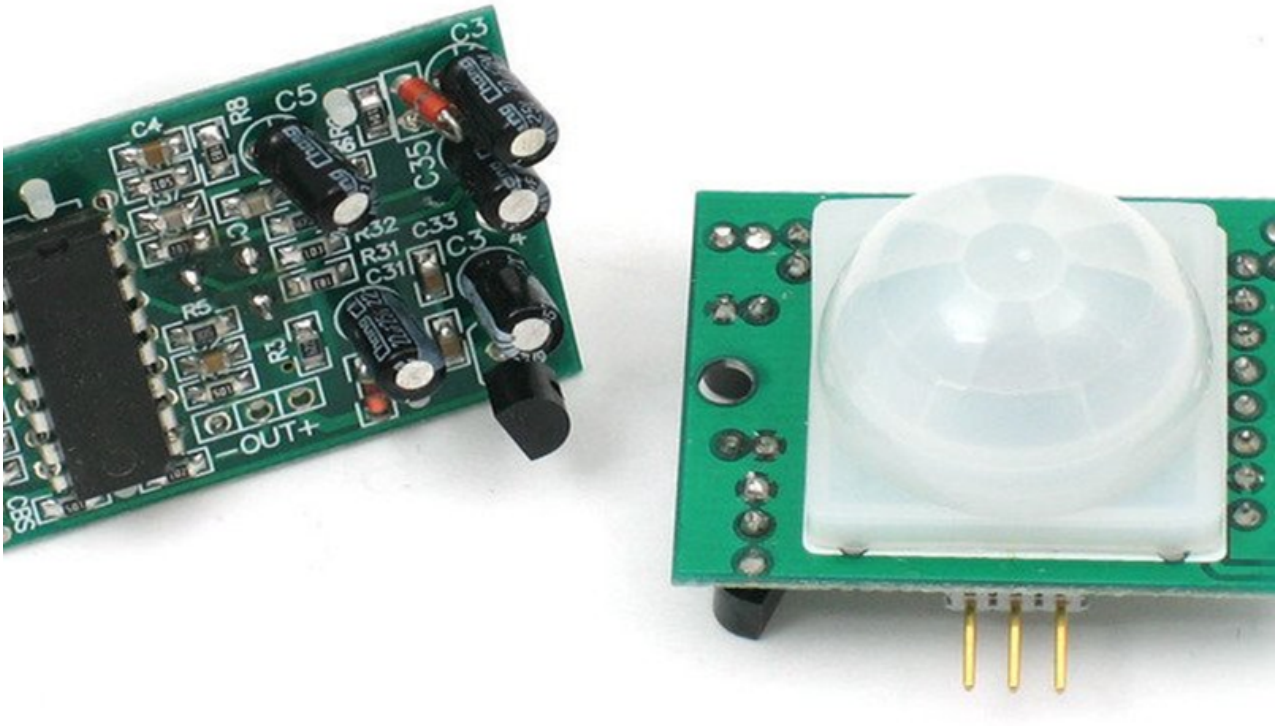


Fig-2 PIR Sensor

A passive infrared sensor is an electronic sensor that measures infrared light radiating from objects. PIR sensors mostly used in PIR-based motion detectors. Also, it used in security alarms and automatic lighting applications. The below image shows a typical pin configuration of the PIR sensor, which is quite simple to understand the pinouts. The PIR sensor consist of 3 pins,

- Pin1 corresponds to the drain terminal of the device, which connected to the positive supply 5V DC.
- Pin2 corresponds to the source terminal of the device, which connects to the ground terminal via a 100K or 47K resistor. The Pin2 is the output pin of the sensor. The pin 2 of the sensor carries the detected IR signal to an amplifier from the
- Pin3 of the sensor connected to the ground

Generally, PIR sensor can detect animal/human movement in a requirement range. PIR is made of a pyro-electric sensor, which is able to detect different levels of infrared radiation. The detector itself does not emit any energy but passively receives it.

It detects infrared radiation from the environment. Once there is infrared radiation from the human body particle with temperature, focusing on the optical system causes the pyro-electric device to generate a sudden electrical signal.

Simply, when a human body or any animal passes by, then it intercepts the first slot of the PIR sensor. This causes a positive differential change between the two bisects. When a human body leaves the sensing area, the sensor generates a negative differential change between the two bisects.

Range of PIR sensor:

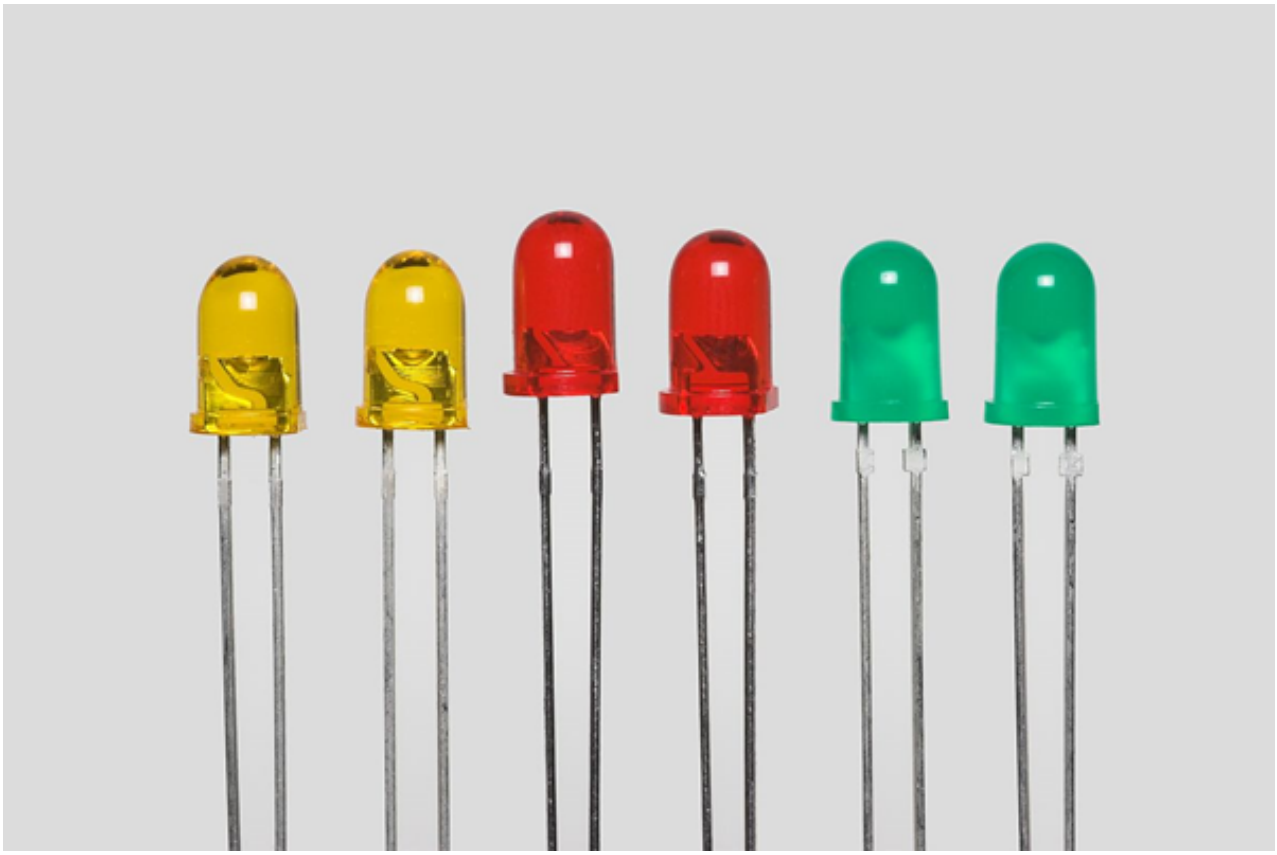
• Indoor passive infrared: Detection distances range from 25 cm to 20 m.
• Indoor curtain type: The detection distance ranges from 25 cm to 20 m.
• Outdoor passive infrared: The detection distance ranges from 10 meters to 150 meters.
• Outdoor passive infrared curtain detector: distance from 10 meters to 150 meters

PIR Motion Sensor Applications include:

• Lighting Controls.
• Thermostats And HVAC Systems.
• Smart Home And IoT.
• IP Cameras And Surveillance Systems.
• Digital Signage And More.

3. LED:

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting light in the process. LED's allow the current to flow in the forward direction and blocks the current in the reverse direction.



Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.

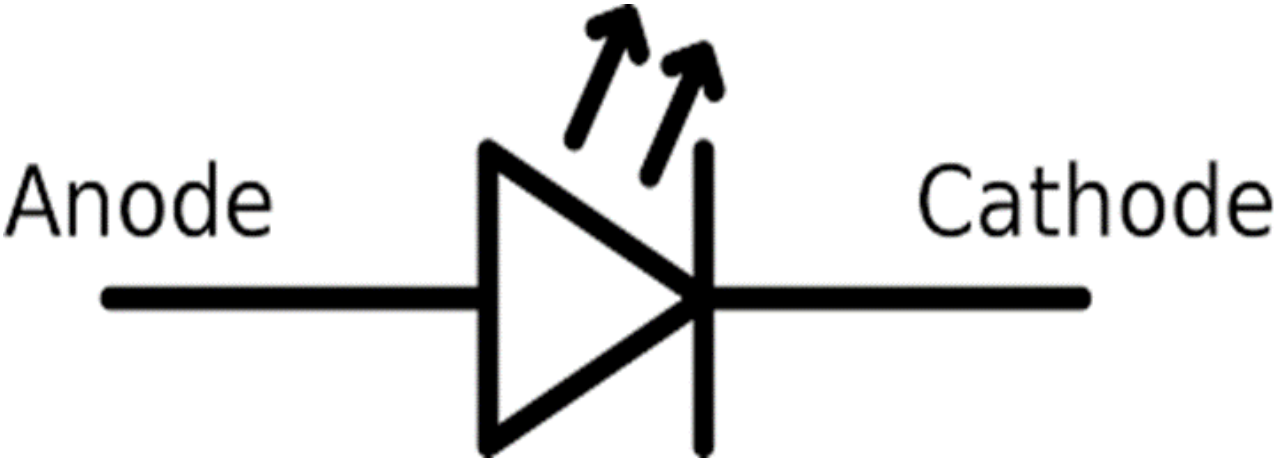


Fig-4 LED Symbole

Advantages of LED-

- LED's consume less power, and they require low operational voltage.
- No warm-up time is needed for LED's.
- The emitted light is monochromatic.
- They exhibit long life and ruggedness.

Applications of LED's:

Applications and Uses of LED's can be seen in-

- TV Backlighting
- Smartphone Backlighting
- LED displays
- Automotive Lighting
- Dimming of lights

4. Resistor:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

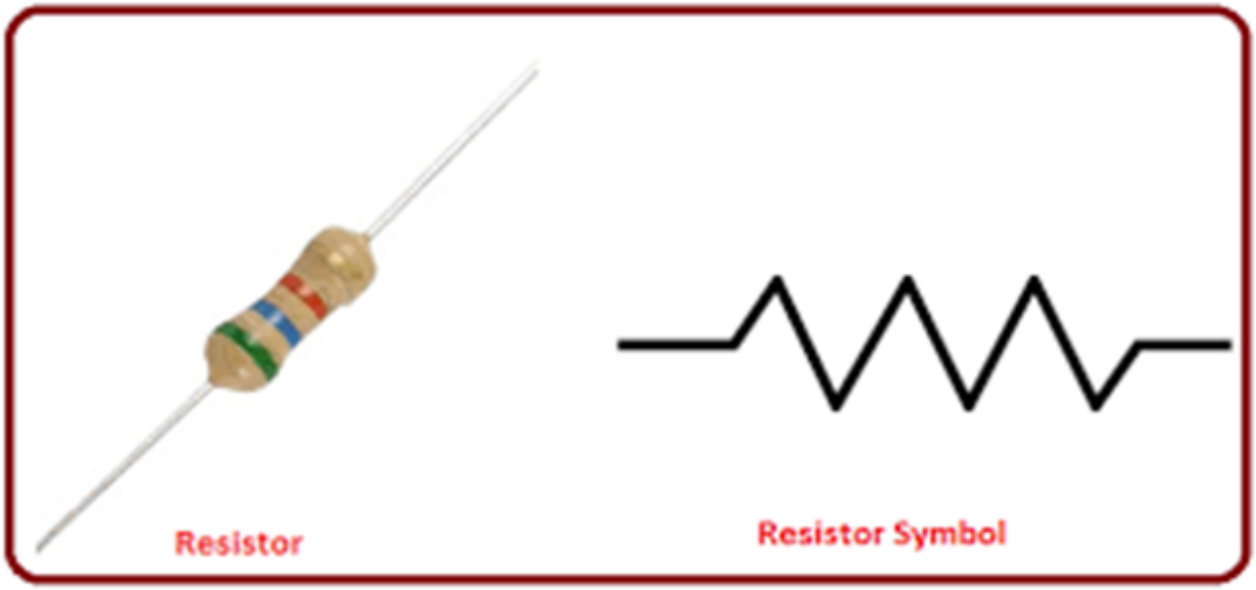


Fig-5 Resistor

5. Photoresistor:

Photoresistors are light sensitive resistors whose resistance decreases as the intensity of light they are exposed to increases.

Photoresistors, also known as light dependent resistors (LDR), are light sensitive devices most often used to indicate the presence or absence of light, or to measure the light intensity. In the dark, their resistance is very high, sometimes up to 1 MΩ, but when the LDR sensor is exposed to light, the resistance drops dramatically, even down to a few ohms, depending on the light intensity. LDR's have a sensitivity that varies with the wavelength of the light applied and are nonlinear devices. They are used in many applications, but this light sensing function is often performed by other devices such as photodiodes and phototransistors. Some countries have banned LDR's made of lead or cadmium over environmental safety concerns

Fig-6 Photoresistor

Applications of Photoresistor:

Photoresistors are used in-

- Light Sensors
- Audio Compressor

Arduino Code:

```
// C++ code

// initiallise Photo sensor value to 0
int sensorValue = 0;

//intialise value for PIR sensor and photoresistor

int PIRPin=7;
int PIRPin2 = 8;

int isObstacle=LOW;
int PIR_val=0;

int PIR_val2=0;

// All setup for INPUT and OUTPUT value

void setup()
{
  //setup for Photo sensor

  pinMode(A0, INPUT);
  Serial.begin(9600);
  pinMode(9, OUTPUT);

  //Setup for PIR sensor

  pinMode(PIRPin, INPUT);
  pinMode(PIRPin2, INPUT);
  Serial.begin(9600);
}
```

```
// Now we give command according to our giving condition

void loop()
{
  // read the value from the photo sensor

  sensorValue = analogRead(A0);

  //read value from PIR sensor
  PIR_val=digitalRead(PIRPin);

  PIR_val2=digitalRead(PIRPin2);

  // print the photo sensor reading so you know its range

//Give command to Serial Monitor

  Serial.print(sensorValue);
  Serial.print(",");

  //print the PIR sensor 1 reading
  Serial.println(PIR_val);

//print the value of PIR sensor 2

  Serial.print(",");
  Serial.println(PIR_val2);
```

```
 // Giving Condition to LED according to

 //Intensitiy detect by Photodiode and value obtain from PIR sensor
 if(sensorValue<800&&PIR_val==1)
 {
  if(PIR_val==1)
  {
  digitalWrite(9,HIGH);        // command to turn on LED
  Serial.println("!!!Obstacle!!!!");
  delay(1000);
  }
 }
 if(sensorValue<800&&PIR_val==1&&PIR_val2==0)
 {
  digitalWrite(9,HIGH);         // command to turn on LED
  Serial.println("!!!Obstacle!!!!");
  delay(1000);
 }

 if(sensorValue<800&&PIR_val2==1)
 {
  digitalWrite(9,LOW);         // command to turn off LED
  }
 if(sensorValue>800&&PIR_val2==0)
 {
  digitalWrite(9,LOW);
 }

 delay(500);

}


// End of Prograamme
// Thank You
```

Testing:

As we know that our project is based on fully autonomous street light control system which have many applications in practical life.

So, for testing first we will give supply of 5volt 2ampere to our Arduino Uno R3, it is basically an open-source software or hardware and have very useful work in many places, it also consists a removable microcontroller which performs many operations.

Now our Arduino get supply of 5volt 2ampere now we transfer supply from our Arduino to our Photoresistor or our PIR sensor which is also equivalent to 5-volt supply.

First, we talk about our Photoresistor it has two terminals one terminal we connect with 5-volt supply from Arduino and other terminal we connect to Ground pin of Arduino it also connects with a resistor of 4.7 Kilo Ohm to control the supply of current.

Now we talk about our PIR (Passive Infrared Sensor) it has three pins with it first pin is named as signal it takes signal from surrounding and give some input to our system. Our signal pin is connected to Digital pin number 7 of Arduino.

Now we talk about second pin which is named as power pin it takes supply of 5-volt supply from Arduino and the last pin of PIR sensor is ground pin we attach this pin to ground of our Arduino.

Now it's time to tell you about our final and last component named as LED (Light Emitting Diode). Our LED have two terminals one is named as ground terminal and it is connected to ground of Arduino and one terminal is positive terminal it is connected to our Arduino digital pin number 7.

Now our testing is completely done and it's time for results, because it's very important to know what we get as output from our project.

Results:

In the form of result we get as usual result which we want.

When we have our intensity greater than 800 than our LED will never glow because intensity greater than 800 is enough to see anything clearly.

When intensity of surrounding is less than 800 than command of LED goes in hand of PIR sensor. When our PIR sensor detect any obstacles around it then it gives us a message of obstacle and also it gives a signal to our LED to glow, and by this way our LED is glow automatically whenever it is needed.

In result we complete our all-required conditions successfully. When we want to turn ON our street light (currently we use a single LED in place of street light) then it will ON on the required condition.

Hence our project is complete successfully.

Applications, Advantages and Disadvantages of the Project:

Applications:

- •This Project can used for a city to make smart.
- Also this Project leads the automation in street lights.
- We can also use this project in many place like our house, industry, and many other places to make them smart and also for saving electricity.

Advantages:

- This project can help us to control the wastage of Electricity
- It reduces your electricity cost
- Our project is easy to use
- The automatic street light system is eco-friendly and hence helps in reducing the carbon footprint.

Disadvantages:

- •High Cost of installation as compared to conventional street lights
- Risk of vandalism and theft
- At the instant when the lightening occurs, and that time If we cross the PIR sensor then our street lights doesn't ON.

Reference:

- Analog Electronics 1st year Book
- Robotics Club IET Lucknow
- Basic Arduino Programming Tinker cad

Useful Links:

- https://www.youtube.com/watch?v=zJ-LqeX_fLU
- https://www.tinkercad.com/
- https://www.rs-online.com/designspark/basics-of-arduino-uno