STREET LIGHT MONITORING SYSTEM USING IOT

A Minor Project Report Submitted To

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Towards Partial Fulfilment for the Award Of

Bachelor of Technology

In

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Session: 2023-2024

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DECLARATION

This is to certify that the project report "Street light monitoring system using IOT" submitted by **Raj Yadav (0863EC201022), Sandhya Kashyap (0863EC201029), Salma Bano (0863EC201028), Shraddha Shrivansh (0863EC201032)** to the Prestige Institute of Engineering Management and Research, Indore in partial fulfillment or the award of the degree of B. Tech in Electronics and Communication Engineering is a *bona fide* record of project work carried out by him/her under my/our supervision. The contents of this report, in full or in parts, have not been submitted to any other Institution or University for the award of any degree or diploma.

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Place: Indore

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DISSERTATION APPROVAL SHEET

This is to certify that the dissertation entitled "STREET LIGHT MONITORING SYSTEM USING IOT " submitted by RAJ YADAV, SANDHYA KASHYAP, SALMA BANO, AND SHRADDHA SHRIVANSH to the Prestige Institute of Engineering, Management, and Research, Indore (M.P.) is approved as fulfillment for the award of the degree of "Bachelor of Technology in Electronics and Communication Engineering" by Rajiv Gandhi ProudhyogikiVishwavidyalaya, Bhopal, (M.P.).

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CERTIFICATE

This is certified that the project entitled **"STREET LIGHT MONITORING SYSTEM USING IOT"** submitted by RAJ YADAV, SANDHYA KASHYAP, SALMA BANO, AND SHRADDHA SHRIVANSH is a satisfactory account of the bona fide work done under our supervision and is recommended towards partial fulfillment for the award of the degree Bachelor of Technology in Electronics and Communication to Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.)

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- **Name of the students:-**
  - Raj Yadav
  - Sandhya Kashyap
  - Salma Bano
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ABSTRACT

The project aims to develop a system that will lead to energy conservation and by doing so, we would be able to lighten a few more homes. The proposed work is accomplished by using a Node MCU ESP8266 and sensors that will control the electricity based on the night and object detection. Meanwhile, a counter is set that will count the number of objects passed through the road. The beauty of the proposed work is that the wastage of unused electricity can be reduced, and the lifetime of the streetlights gets enhanced because the lights do not stay ON during the whole night and also helps in my crease safety measurements. In Automatic Street Light Controlling and Monitoring, we are using NodeMCU ESP8266 a Wi-Fi-enabled microcontroller that is used to connect the devices to the Internet of Things IoT. It is connected to sensors and devices which send information to the monitoring center. For this, we use the Blynk app which control and monitors the IOT. It is a real-time monitoring system that controls the intensity and power consumption of the automatic street light. The effectiveness of the system also increases. We get notifications and access at any time regarding any event are confident that the proposed idea will be beneficial in the future applications of microcontrollers and sensors. The purpose of this work is to describe the Street light monitoring system using IOT, a first approach to accomplish the demand for a flexible lighting control system.

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1. INTRODUCTION

Street light monitoring system using IoT is a technology-driven solution that aims to improve the efficiency and sustainability of urban lighting systems. The system consists of an array of IoT sensors and devices that are installed on streetlights to monitor and control their performance.

The system works by collecting real-time data on the street lights' operational status, such as whether they are on or off, their brightness level, and their energy consumption. This data is then transmitted wirelessly to a central cloud-based platform, where it can be analyzed and used to optimize the street lighting system.

The IoT sensors used in the system are typically equipped with advanced technologies such as GPS, accelerometers, and ambient light sensors, which allow them to monitor the street lights' performance accurately. The data collected by the sensors can be used to detect faults, identify areas where lights are not working correctly, and even predict when a street light might fail.

The benefits of a street light monitoring system using IoT are significant. It can help reduce energy consumption, lower maintenance costs, and improve safety by ensuring that street lights always work correctly. Additionally, it can provide city planners and administrators with valuable insights into how the urban lighting system is performing, which can be used to optimize it further.

2. OBJECTIVE OF THE PROJECT :

The main objective of a street light monitoring system using IoT is to improve the efficiency, sustainability, and safety of urban lighting systems. Some specific objectives of this system include:

1. **Energy conservation**: The system aims to reduce energy consumption by monitoring and controlling the operation of street lights in real time. It helps to avoid the wastage of energy by turning off the lights during the daytime or when there is no activity on the road.

2. **Cost reduction**: By optimizing the street lighting system, the system can help to lower maintenance costs and reduce the need for manual inspections and repairs.

3. **Fault detection and maintenance**: The system helps to detect faults in the street lighting system quickly and accurately, allowing maintenance teams to take corrective action promptly.

4. **Improve safety**: The system can ensure that all street lights are functioning correctly, providing adequate illumination on roads and pathways, which helps to improve safety for pedestrians and drivers.

5. **Analytics and insights**: The system provides valuable data and insights that can be used to optimize the urban lighting system further. It can help city planners and administrators to make informed decisions about lighting infrastructure, energy management, and maintenance.

3. LITERATURE SURVEY

a) "Smart street lighting system based on IoT" by **H. A. ElGindy et al**. This paper presents a detailed analysis of a smart street lighting system that uses IoT-based sensors and devices to optimize energy consumption, reduce maintenance costs, and improve road safety.

b) "An IoT-Based Intelligent Street Lighting System for Smart Cities" by **A. Al-Fuqaha et al**. This paper proposes an intelligent street lighting system that utilizes IoT sensors and devices to detect faults, adjust lighting levels, and provide real-time information on energy consumption.

c) "Smart Street Lighting System using IoT" by **V. R. Waghmare et al**. This paper describes a smart street lighting system that uses IoT-based sensors and devices to detect vehicle and pedestrian movement, adjust lighting levels accordingly, and provide real-time data on energy consumption and maintenance requirements.

d) "Design and Implementation of IoT Based Smart Street Light Monitoring and Control System" by **K. R. Kavitha et al.** This paper presents a smart street lighting system that uses IoT sensors and devices to monitor and control the operation of street lights, adjust lighting levels, and provide real-time data on energy consumption and maintenance requirements.

e) "IoT-Based Smart Street Lighting System for Smart Cities" by **K. R. Kavitha et al.** This paper proposes an IoT-based smart street lighting system that uses sensors and devices to detect faults, optimize energy consumption, and improve road safety.

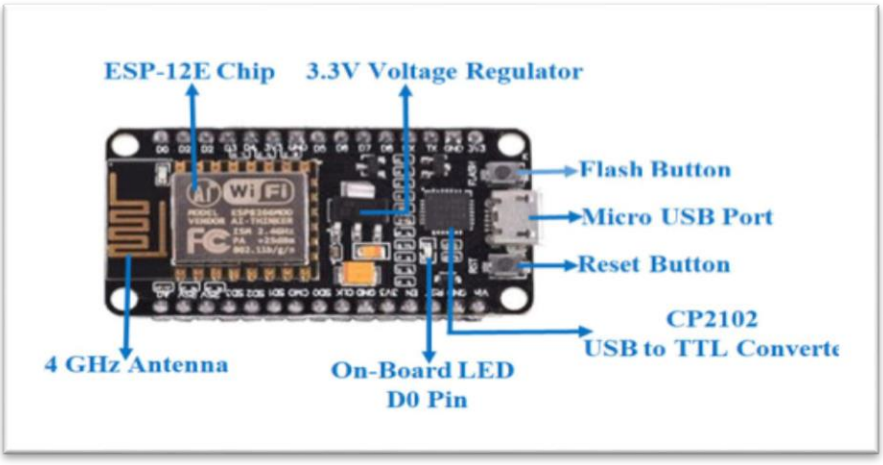
These papers demonstrate the potential of street light monitoring systems using IoT to improve the efficiency, sustainability, and safety of urban lighting systems. The use of IoT-based sensors and devices enables real-time monitoring and control of street lights, allowing for more precise adjustment of lighting levels and better management of energy consumption and maintenance requirements.

4. THE PROPOSED SYSTEM AND HARDWARE USED

S.No	Component's		Quantity
1.	NodeMCU	ESP8266	**1 pcs**
2.	LED		**4 pcs**
3.	Register	220 ohm, 1 ohm	**1 pcs , 4 pcs**
4.	IR Sensor		**4 pcs**
5.	LDR		**1 pcs**

1.1 Node MCU ESP8266:–

NodeMCU ESP8266 is a low-cost, open-source, WiFi-enabled microcontroller board based on the ESP8266 chip. It was designed to enable easy and fast prototyping of IoT (Internet of Things) projects. The NodeMCU ESP8266 board includes a 32-bit Tensilica L106 microcontroller, WiFi connectivity, and a variety of input/output (I/O) pins, including General Purpose Input/Output (GPIO) pins, analog-to-digital converter (ADC) pins, and more. The board also includes a USB interface for programming and power supply. The NodeMCU ESP8266 board is widely used in DIY electronics, IoT projects, and prototyping due to its low cost, versatility, and use.

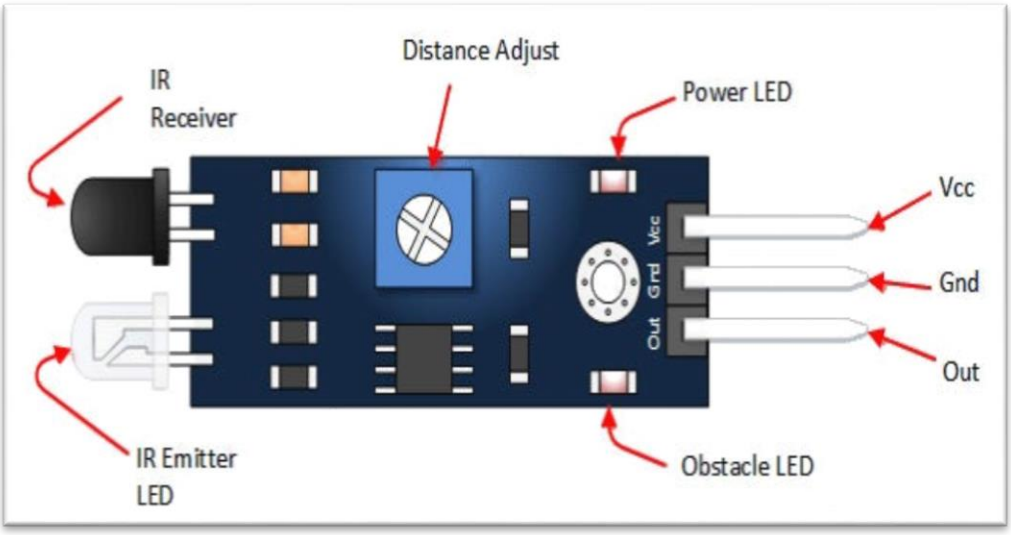


1.2 IR Sensor:-

An IR (infrared) sensor is a type of electronic device that is used to detect infrared radiation in its surrounding environment. Infrared radiation is a form of electromagnetic radiation that has a longer wavelength than visible light but shorter than microwaves. IR sensors detect this radiation and convert it into an electrical signal, which can be used to trigger an action, such as turning on a light or opening a door.

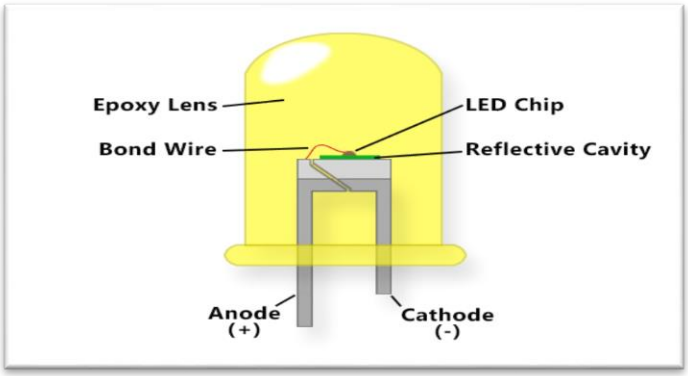
There are two main types of IR sensors: passive and active. **Passive IR sensors** detect the heat signature of an object or person and can be used for motion detection, such as in security systems. **Active IR sensors** emit their own infrared radiation and measure the reflection to detect the presence of an object. Active IR sensors are commonly used in proximity sensors, such as those found in smartphones to detect when the phone is held to the ear.

IR sensors are used in a wide range of applications, including remote controls, security systems, automation systems, and industrial process control. They are relatively inexpensive and reliable and can be found in many consumer electronics products.



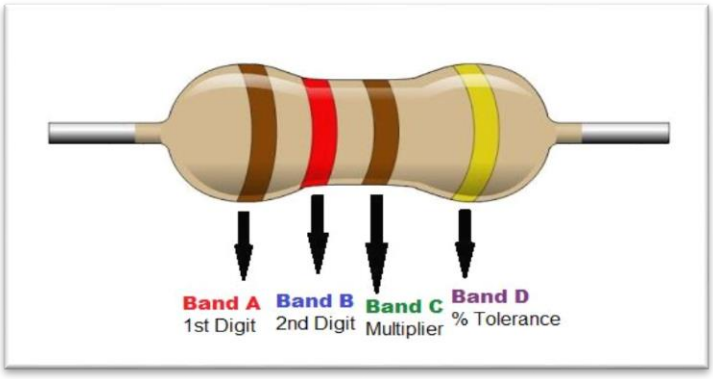
1.3 LEDs:–

LED stands for Light Emitting Diode. It is a semiconductor device that emits light when an electric current is passed through to an LED, electrons in the semiconductor material recombine with electron holes, releasing energy in the form of photons (light). LEDs are highly efficient and consume much less energy than incandescent bulbs, making them popular for a wide range of applications, including lighting, displays, and indicators. They are available in a variety of colors and can be combined to create a wide range of hues..



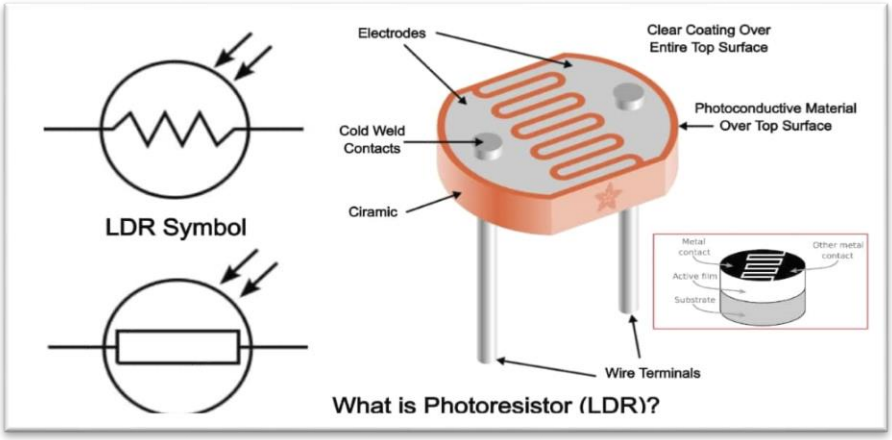
1.4 Resistors:–

A resistor is a passive electronic component, used with other electronic components such as LEDs and sensors to prevent or limit the flow of electrons through them as illustrated in. It works on the principle of Ohm's law which prevents the overflow of voltage.



1.5 LDR:-

LDR (Light Dependent Resistor) as the name states is a special type of resistor that works on the photoconductivity principle means that resistance changes according to the intensity of light. Its resistance decreases with an increase in the intensity of light. It is often used as a light sensor, light meter, Automatic street light, and in areas where we need to have light sensitivity. It is also called a Light Sensor.



5. Blynk App:-

Blynk is a mobile app that allows users to easily build IoT (Internet of Things) projects without needing to write any code. It is designed to work with a wide range of microcontrollers and sensors, including the NodeMCU ESP8266 board used in street light monitoring systems. Blynk app provides a graphical interface for users to control and monitor their IoT projects, making it easy to customize and modify the behavior of their devices .

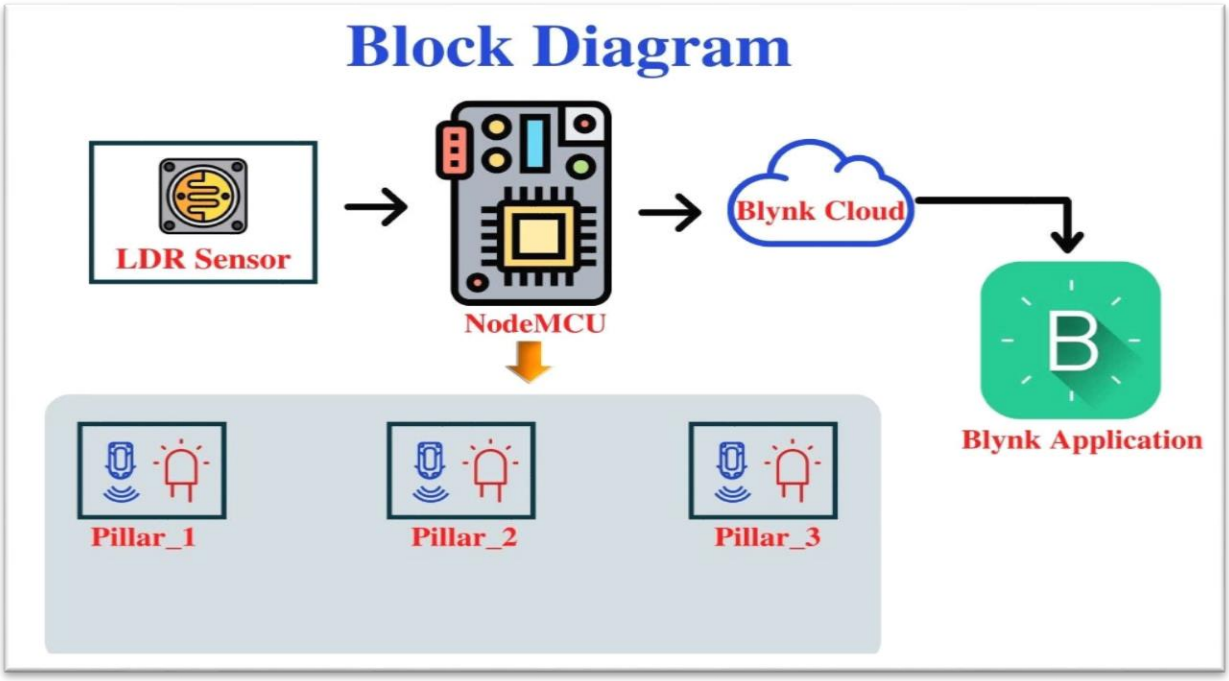
In a street light monitoring system using IoT, the Blynk app can be used to remotely monitor and control the street lights. The NodeMCU ESP8266 board can be programmed to collect data from sensors that monitor the ambient light level and traffic patterns.

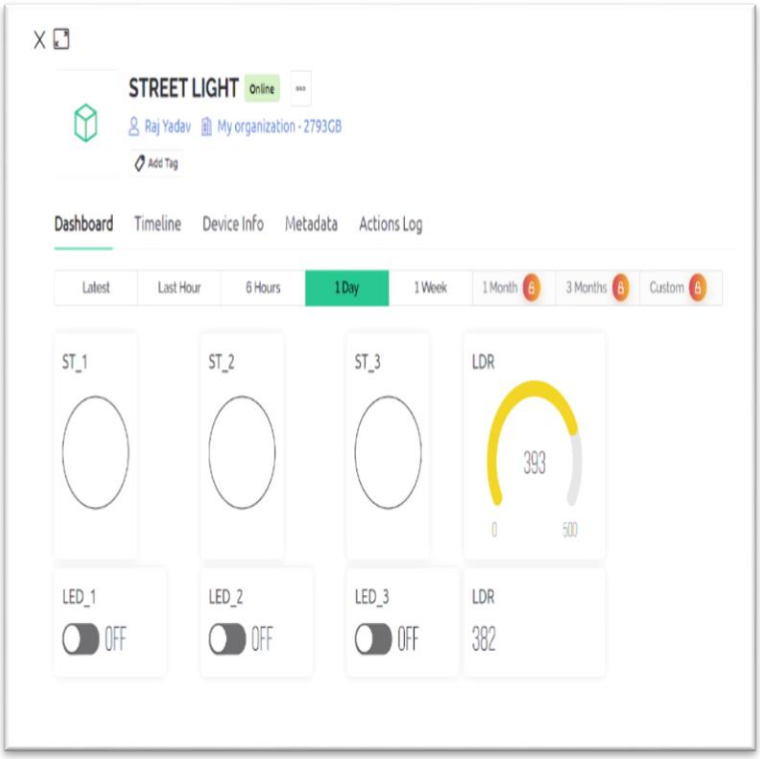
This data can then be sent to the Blynk app, which displays the information in real time and allows the user to adjust the brightness of the street lights based on the data.

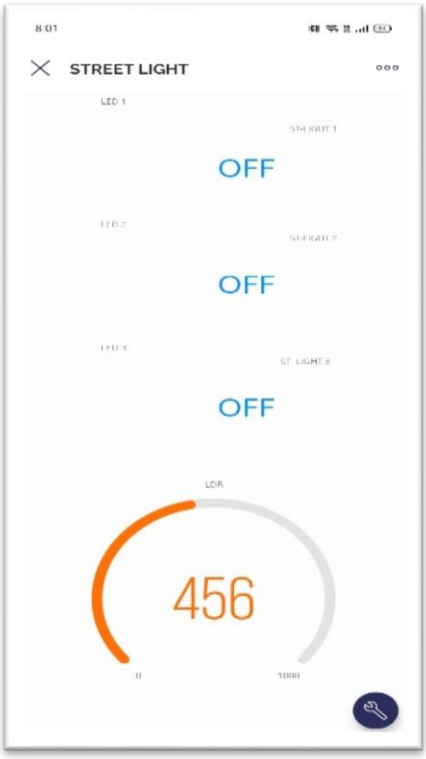
Using the Blynk app, the user can also receive notifications when the street lights malfunction or require maintenance.

This helps to ensure that the street lights are always functioning optimally and provides an easy way to identify and fix any issues that may arise.

Overall, the Blynk app provides an easy-to-use and intuitive interface for monitoring and controlling IoT devices, making it a useful tool for street light monitoring systems and other IoT projects.

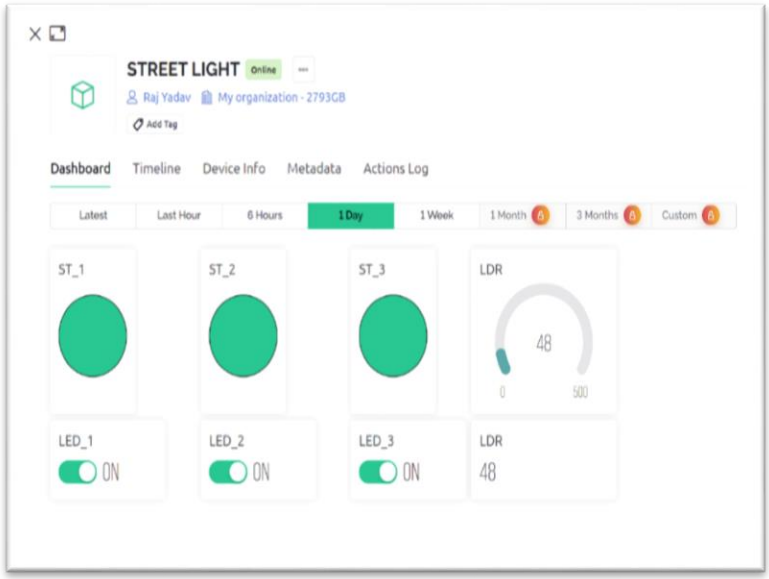


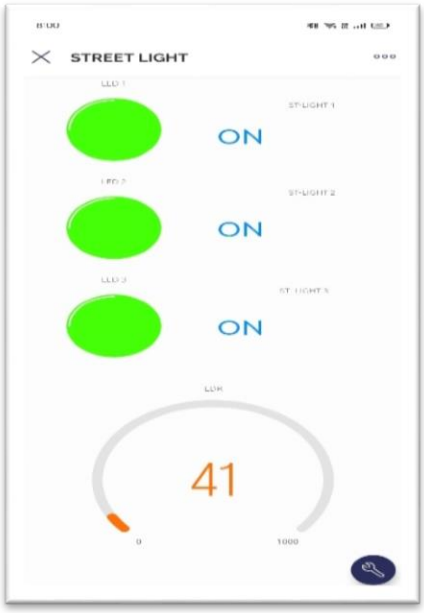




Web Dashboard **Mobile Dashboard**

a. When day time lights OFF and lrd resistance is high.

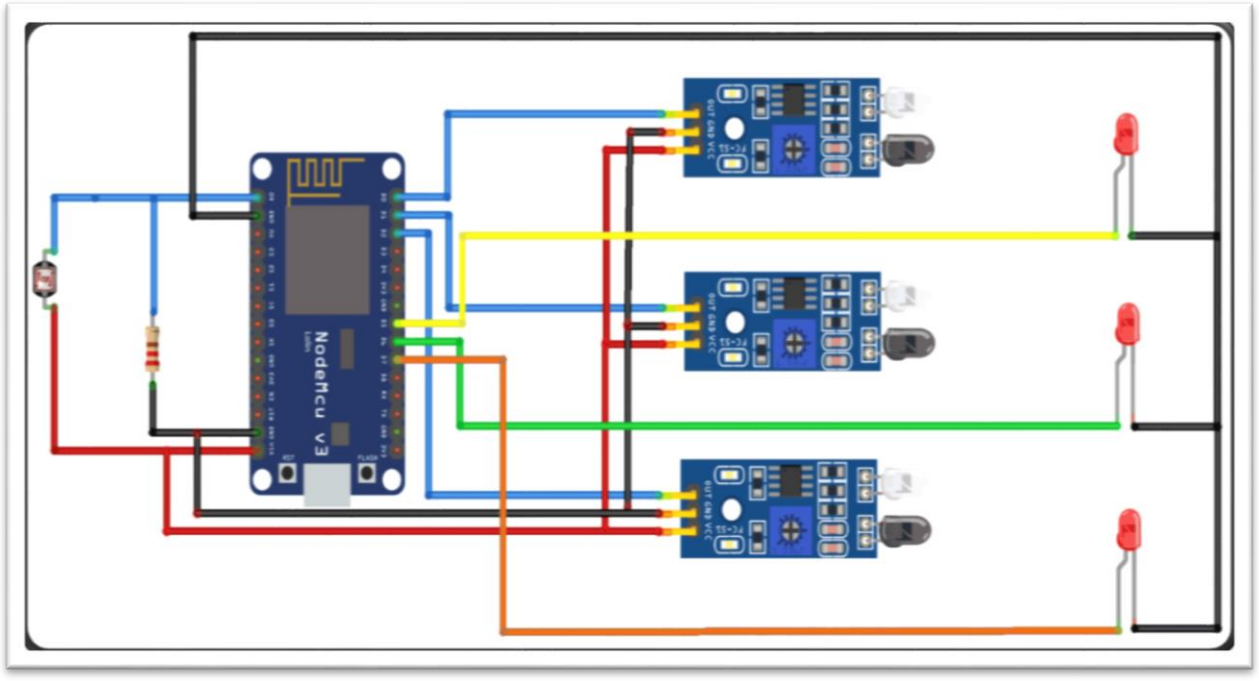




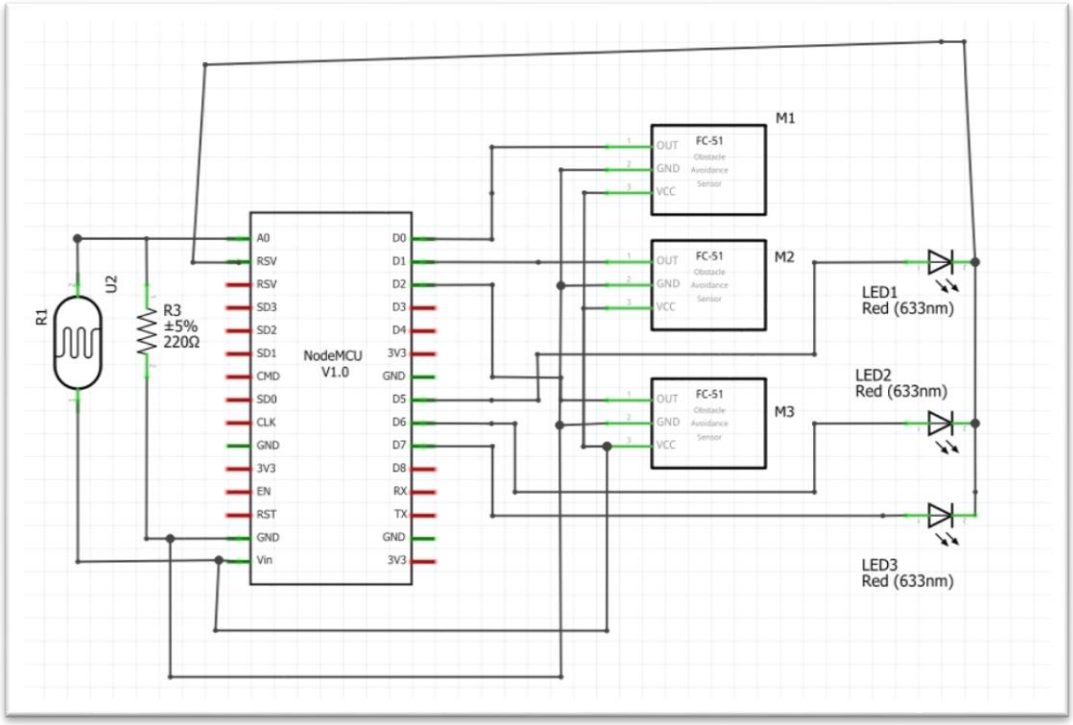
Web Dashboard **Mobile Dashboard**

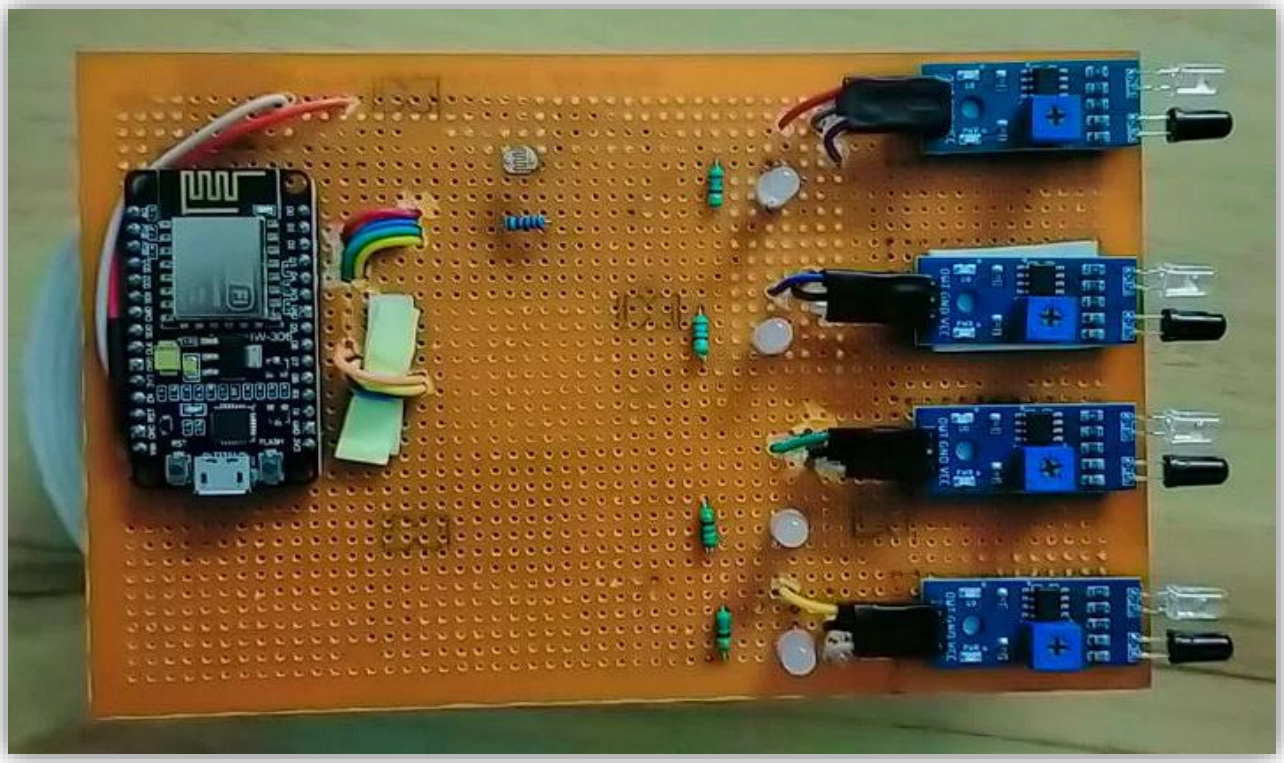
b. When night time lights ON and lrd resistance is low

6. Circuit Diagram:–



7. Schematic Diagram :-





8. WORKING:-

A street light monitoring system using IoT typically consists of a network of sensors and devices that communicate with each other wirelessly and a cloud-based server that processes and stores the data. The system is designed to monitor the status of the street lights, collect data on the ambient light levels, and adjust the brightness of the lights accordingly.

The basic working of a street light monitoring system using IoT can be explained in the following steps:

1. **Installation of sensors:** Sensors are installed on each street light pole to detect the ambient light levels and traffic patterns. These sensors may include light sensors, motion sensors, and temperature sensors.

2. **Data collection and transmission:** The sensors collect data on the ambient light levels and traffic patterns and transmit it wirelessly to a central server. The data is typically transmitted using a wireless communication protocol such as Wi-Fi, Bluetooth, or LoRa.

3. **Data processing**: The data is processed and analyzed on the cloud-based server using data analytics tools. The server can perform tasks such as identifying faulty street lights, predicting maintenance requirements, and adjusting the brightness levels of the lights based on the ambient light levels and traffic patterns.

4. **Remote control:** The system can be remotely controlled using a mobile app or a web-based interface. The users can monitor the status of the street lights in real-time, receive alerts when light malfunctions, and adjust the brightness levels of the lights based on their preferences.

5. **Maintenance and updates:** The system can be maintained and updated remotely, without the need for physical intervention. The users can remotely perform tasks such as updating the firmware of the sensors and devices, diagnosing issues, and scheduling maintenance activities.

9. CODE:–

```
#define BLYNK_TEMPLATE_ID "TMPL0j2kriWt"

#define BLYNK_TEMPLATE_NAME "STREET LIGHT MONITORING SYSTEM USING IOT"

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>


// WiFi credentials

char auth[] = "5jQsNQLRkr8OMrWsM_QA94GSjvJ9JqaZ";

char ssid[] = "OPPO A5 2020";

char pass[] = "rajyadav29";


int IR_Sensor1 = D0;

int LED_1 = D5;


int IR_Sensor2 = D1;

int LED_2 = D6;


int IR_Sensor3 = D2;

int LED_3 = D7;
```

```
int IR_Sensor4 = D3;
int LED_4 = D8;

int ldr = A0;
int val = 0;

BlynkTimer timer;
void setup() {
  Serial.begin(9600);

  Blynk.begin (auth, ssid, pass);
  pinMode(IR_Sensor1, INPUT);
  pinMode(LED_1, OUTPUT);

  pinMode(IR_Sensor2, INPUT);
  pinMode(LED_2, OUTPUT);

  pinMode(IR_Sensor3, INPUT);
  pinMode(LED_3, OUTPUT);
```

```
  pinMode(IR_Sensor4, INPUT);
  pinMode(LED_4, OUTPUT);
  pinMode(A0, INPUT);
  //timer.setInterval (1000L, lightStatus);
}
void loop() {
  int S1 = digitalRead(IR_Sensor1);
  int S2 = digitalRead(IR_Sensor2);
  int S3 = digitalRead(IR_Sensor3);
  int S4 = digitalRead(IR_Sensor4);

  val = analogRead(A0);
  Blynk.virtualWrite(V4, val);

  Serial.println(val);
  Serial.println(S1);
  Serial.println(S2);
  Serial.println(S3);
  Serial.println(S4);
  if (val < 100)
```

```
{
 if (S1 == 1)
 {
  digitalWrite(LED_1, LOW);
  Blynk.virtualWrite(V0, 0);
  Blynk.virtualWrite(V5, "OFF");
 }
 else
 {
  digitalWrite(LED_1, 1);
  Blynk.virtualWrite(V0, 1);
  Blynk.virtualWrite(V5, "ON");
 }
 if (S2 == 1)
 {
  digitalWrite(LED_2, LOW);
  Blynk.virtualWrite(V1, 0);
  Blynk.virtualWrite(V6, "OFF");
 }
```

```
else {
  digitalWrite(LED_2, 1);
  Blynk.virtualWrite(V1, 1);
  Blynk.virtualWrite(V6, "ON");
}
 if (S3 == 1)   {
  digitalWrite(LED_3, LOW);
  Blynk.virtualWrite(V2, 0);
  Blynk.virtualWrite(V7, "OFF");
}
else {
  digitalWrite(LED_3, 1);
  Blynk.virtualWrite(V2, 1);
  Blynk.virtualWrite(V7, "ON");
}
if (S4 == 1)  {
  digitalWrite(LED_4, LOW);
  Blynk.virtualWrite(V3, 0);
  Blynk.virtualWrite(V8, "OFF");
}
```

```
    else
    {
      digitalWrite(LED_4, 1);
      Blynk.virtualWrite(V3, 1);
      Blynk.virtualWrite(V8, "ON");
    }
  }
  else
   {
    digitalWrite(LED_1, LOW);
    digitalWrite(LED_2, LOW);
    digitalWrite(LED_3, LOW);
    digitalWrite(LED_4, LOW);
   }
  delay(100);
  Blynk.run();
}
```

10. RESULTS :-

The result of a street light monitoring system using IoT can be significant in terms of energy savings, cost savings, and improved safety and security. Some of the key results that can be achieved through the implementation of a street light monitoring system using IoT are:

1. **Energy savings:** By monitoring the ambient light levels and traffic patterns, the system can adjust the brightness levels of the street lights to optimize energy consumption. This can result in significant energy savings and a reduction in greenhouse gas emissions.

2. **Cost savings:** By identifying faulty street lights and predicting maintenance requirements, the system can reduce maintenance costs and prevent unnecessary repairs. This can result in cost savings for the municipalities and other organizations that maintain street lights.

3. **Improved safety and security:** By monitoring the status of the street lights and adjusting the brightness levels based on the ambient light levels and traffic patterns, the system can enhance the safety and security of the streets. This can help to prevent accidents, reduce crime, and improve the overall quality of life in the area.

4. **Real-time monitoring and control:** The system provides real-time monitoring and control of the street lights, allowing the users to adjust the brightness levels, receive alerts when a light malfunctions, and perform remote maintenance activities. This can help to improve the efficiency and effectiveness of the street light management process.

11. CONCLUSION:-

In conclusion, a street light monitoring system using IoT can provide significant benefits in terms of energy savings, cost savings, and improved safety and security. The system uses sensors and devices to monitor the ambient light levels and traffic patterns, adjust the brightness levels of the street lights, and provide real-time monitoring and control of the system.

The use of IoT technology allows for remote monitoring and control of the system, reducing the need for physical intervention and improving the efficiency and effectiveness of the street light management process. The system can help to optimize the energy consumption of street lights, reduce maintenance costs, and enhance the safety and security of the streets.

The Blynk app can be used as an intuitive and easy-to-use interface for monitoring and controlling the street light monitoring system. The NodeMCU ESP8266 board can be used to collect data from sensors and send it to the Blynk app for real-time monitoring and control.

Overall, a street light monitoring system using IoT is a valuable tool for municipalities, organizations, and communities that are looking to optimize their energy consumption, reduce costs, and enhance the safety and security of their streets.

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