SMART STREET LIGHT CONTROL SYSTEM

P.Koteswararao - AP19110020011
V.Aravind- AP19110020044
A.Sriya - AP190020058
G.Satwik - AP19110020067

Smart street light control system

Report submitted to the
SRM University - AP, Andhra Pradesh
for the completion of the UROP project
by

P.N.V.Koteswararao (AP19110020011)

V.Aravind (AP19110020044)

A.Sriya (AP19110020058)

G.Satwik (AP19110020067)

Under the guidance of
Dr./Prof. Sujith Kalluri

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SRM UNIVERSITY - AP, ANDHRA PRADESH
MAY 2022

CERTIFICATE OF APPROVAL

Certified that the project report entitled **SMART STREET LIGHT CONTROL SYSTEM**

submitted by

1. P.Koteswararao (AP19110020011)
2. V.Aravind (AP19110020044)
3. A.Sriya (AP19110020058)
4. G.Satwik (AP19110020067)

to the SRM University - AP, Andhra Pradesh, as completion of the Undergraduate Research Opportunity Programme has been accepted and that the student/s has/have successfully completed the project.

Supervisor,
Department of ECE

Date: 15-05-22.

Place: Amaravathi.

CONTENTS

List of Abbreviations

IR Sensor: Infrared sensor

HID Lights: High-intensity discharge lights

LED: Light-emitting diode

Abstract:

We aim to design a smart street light control system to minimize power consumption. Even if there is no traffic, street lights are left on all night. As a result, a great deal of energy is squandered, rather than being used properly.
Proper energy consumption methods should be implemented. In this proposal, The street lights are turned on only when there is any sort of movement and turned off automatically when there is sunlight.

Vehicle/pedestrian movement is detected using infrared sensors, and sunlight is detected using photodiodes. This reduces the amount of energy used.
The feedback is processed by an Arduino Uno microcontroller, which then switches on or off the street light. HID lights are used instead of LED lights since they are more ecologically friendly and cost less.
HID lights are used instead of LED lights since they are more ecologically friendly and cost less.

We are using Node MCU ESP 8266 and creating a website to monitor the whole system.

From the proposed method overall energy consumption can be reduced. Many such intelligent control systems must be developed with the increase in living standards and expansion of cities.

Introduction:

We are attempting to design an automatic smart street light control system that will turn on the street lights when there is vehicle or pedestrian movement and turn them off when the sun rises. As a result, a significant amount of energy would be saved.

The essential components of this design are an Arduino Uno microcontroller, an IR sensor, photodiodes, and LED lights. To make our design more affordable and environmentally sustainable, we are replacing HID lights with LED lights.

When there is the movement of vehicles the microcontroller receives feedback from IR sensors that detect vehicle movement. Sunlight is detected by the Photodiode. The microcontroller interprets the IR sensor's output and controls the street light accordingly.

For monitoring the entire system we are using Node MCU ESP 8266

Motivation:

Even when there are no vehicles or pedestrians, street lights are turned on all night. They utilize between 25% of the total energy utilized in the city. High-intensity discharge (HID) lights use more energy and are more expensive. An innovative street light control system's principal goal is to conserve or save electricity.

We use infrared sensors to monitor vehicle movement and photodiodes to detect sunlight in this concept. The street lights are only switched on when there is vehicle/pedestrian movement, and they have turned off automatically as the sun rises. This saves a significant amount of energy.

Literature Survey:

We have taken references from many papers but our main reference is from: https://ieeexplore.ieee.org/document/9012376.

We are using both IR sensors, NodeMCU, and photoresistors in our proposal, which differentiates our project from others.

NEAT DIAGRAMS AND EXPLANATION:

Street lights are turned on all night even when there is no vehicle/pedestrian movement. This wastes and consumes a lot of energy.

In this proposal, we are trying to design an automatic smart street light control system that will automatically turn on the street lights when there is vehicle/pedestrian movement and turn off when there is sunlight or no movement. As a result, a significant amount of energy would be saved.

We are using an Arduino Uno microcontroller, an IR sensor, Photodiodes, and LED lights in this proposal.

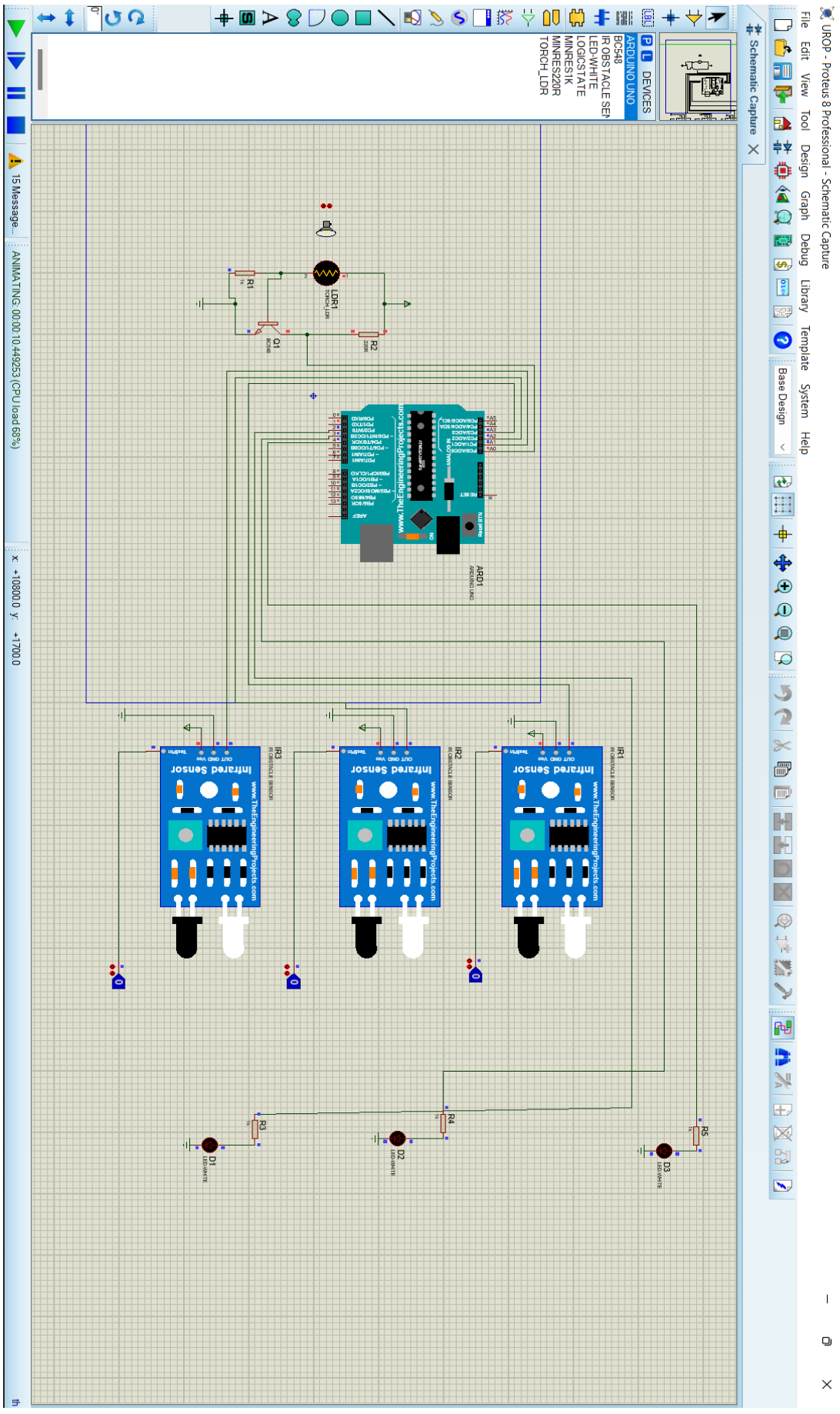
HID lights are replaced by LED lights to make our project environment-friendly and pocket friendly.

IR sensors detect vehicle movement and photodiodes detect the sunlight and give feedback to the microcontroller. The microcontroller processes the feedback and controls the street light accordingly.

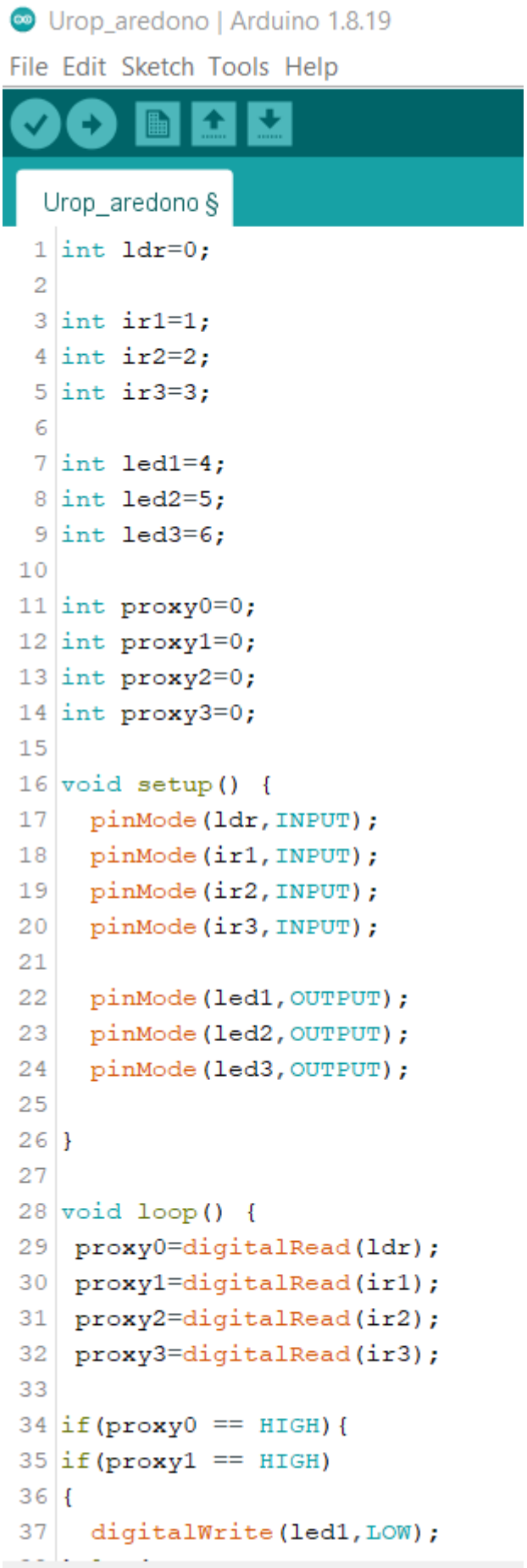
For monitoring the entire system we are using Node MCU ESP 8266 and are creating a website to make the whole system accessible.

Using Arduino Uno:

Circuit



Coding

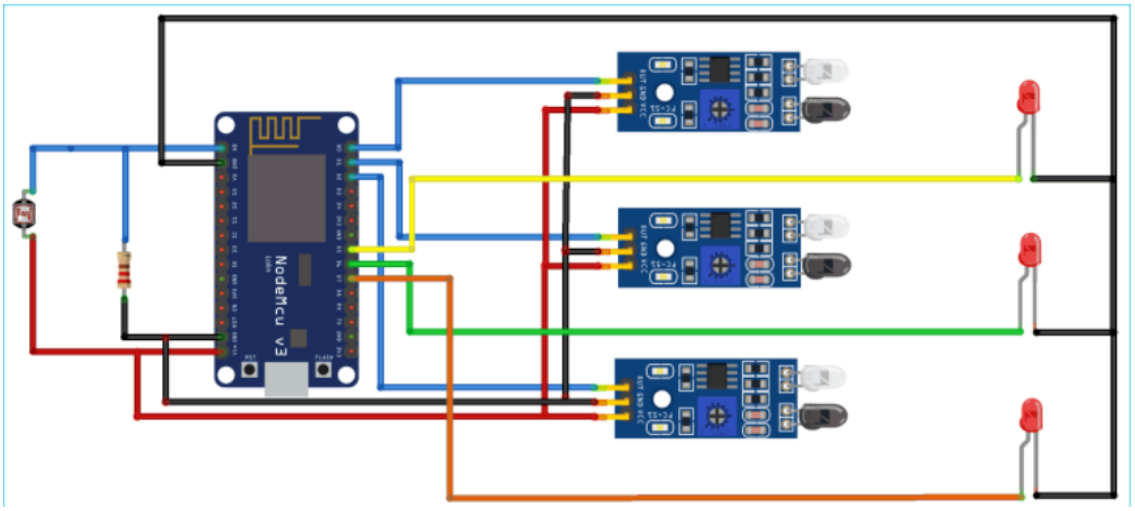



```
int ldr=0;

int ir1=1;
int ir2=2;
int ir3=3;

int led1=4;
int led2=5;
int led3=6;

int proxy0=0;
int proxy1=0;
int proxy2=0;
int proxy3=0;

void setup() {
  pinMode(ldr,INPUT);
  pinMode(ir1,INPUT);
  pinMode(ir2,INPUT);
  pinMode(ir3,INPUT);

  pinMode(led1,OUTPUT);
  pinMode(led2,OUTPUT);
  pinMode(led3,OUTPUT);

}

void loop() {
 proxy0=digitalRead(ldr);
 proxy1=digitalRead(ir1);
 proxy2=digitalRead(ir2);
 proxy3=digitalRead(ir3);

if(proxy0 == HIGH){
if(proxy1 == HIGH)
{
  digitalWrite(led1,LOW);
```

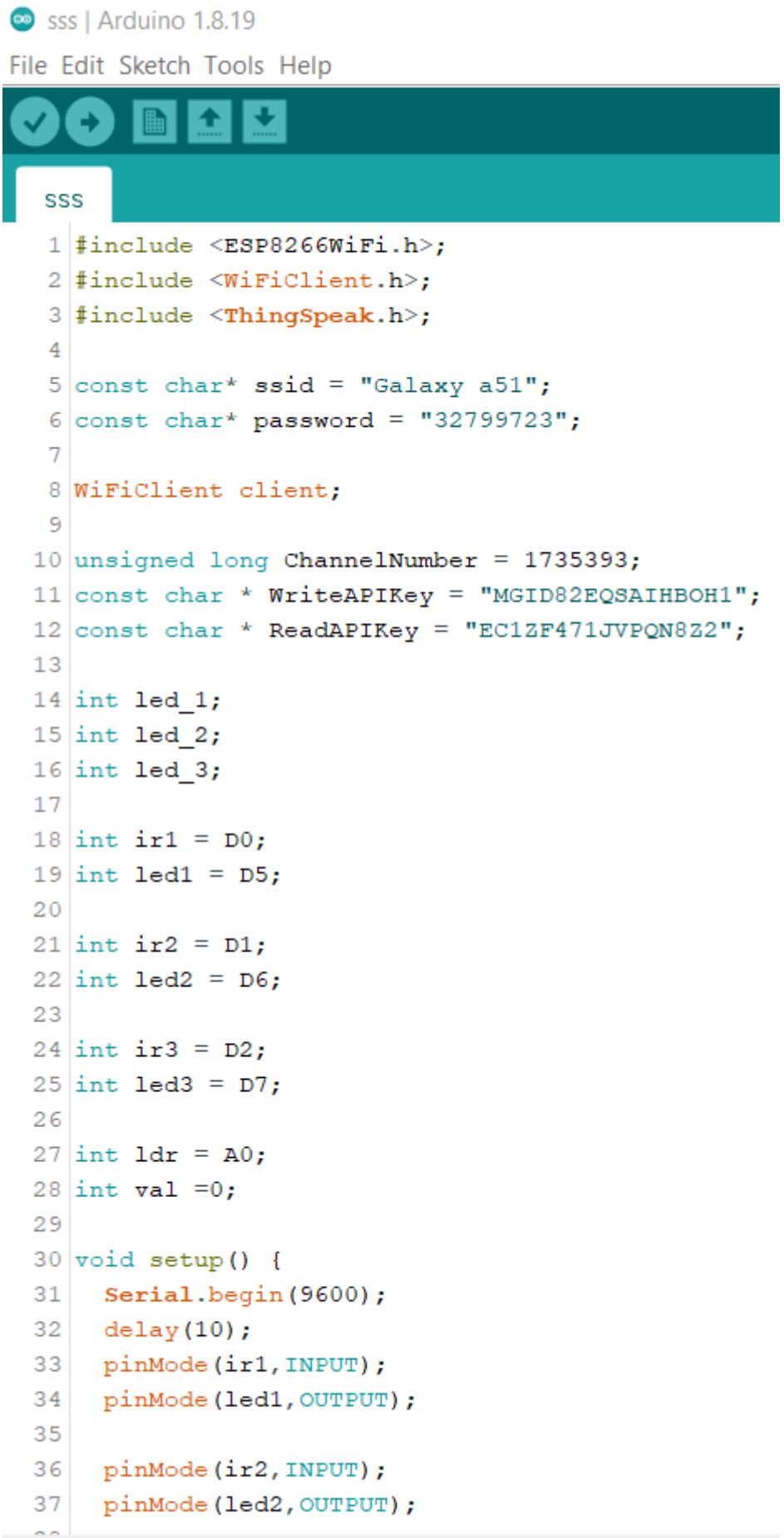
```
}else{
  digitalWrite(led1,HIGH);
}
if(proxy2 == HIGH)
{
  digitalWrite(led2,LOW);
}else{
  digitalWrite(led2,HIGH);
}
if(proxy3 == HIGH)
{
  digitalWrite(led3,LOW);
}else{
  digitalWrite(led3,HIGH);
}
}else{
  digitalWrite(led1,LOW);
  digitalWrite(led2,LOW);
  digitalWrite(led3,LOW);
}

}
```

Using Node MCU:

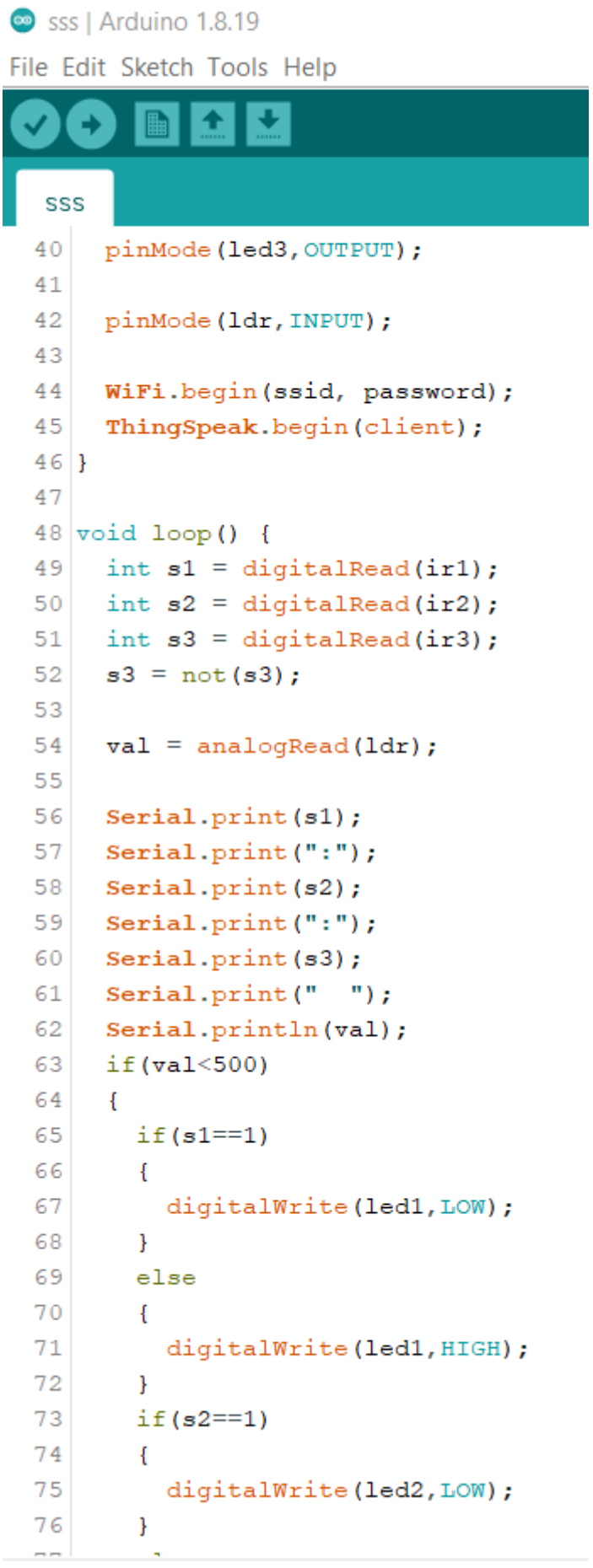
Circuit



Coding



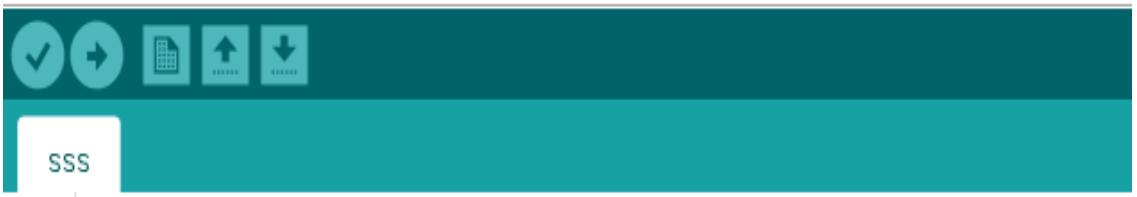

```
#include <ESP8266WiFi.h>;
#include <WiFiClient.h>;
#include <ThingSpeak.h>;

const char* ssid = "Galaxy a51";
const char* password = "32799723";

WiFiClient client;

unsigned long ChannelNumber = 1735393;
const char * WriteAPIKey = "MGID82EQSAIHBOH1";
const char * ReadAPIKey = "EC1ZF471JVPQN8Z2";

int led_1;
int led_2;
int led_3;

int ir1 = D0;
int led1 = D5;

int ir2 = D1;
int led2 = D6;

int ir3 = D2;
int led3 = D7;

int ldr = A0;
int val =0;

void setup() {
  Serial.begin(9600);
  delay(10);
  pinMode(ir1,INPUT);
  pinMode(led1,OUTPUT);

  pinMode(ir2,INPUT);
  pinMode(led2,OUTPUT);
```




```
  pinMode(led3,OUTPUT);

  pinMode(ldr,INPUT);

  WiFi.begin(ssid, password);
  ThingSpeak.begin(client);
}

void loop() {
  int s1 = digitalRead(ir1);
  int s2 = digitalRead(ir2);
  int s3 = digitalRead(ir3);
  s3 = not(s3);

  val = analogRead(ldr);

  Serial.print(s1);
  Serial.print(":");
  Serial.print(s2);
  Serial.print(":");
  Serial.print(s3);
  Serial.print("  ");
  Serial.println(val);
  if(val<500)
  {
    if(s1==1)
    {
      digitalWrite(led1,LOW);
    }
    else
    {
      digitalWrite(led1,HIGH);
    }
    if(s2==1)
    {
      digitalWrite(led2,LOW);
    }
```

sss | Arduino 1.8.19

File Edit Sketch Tools Help



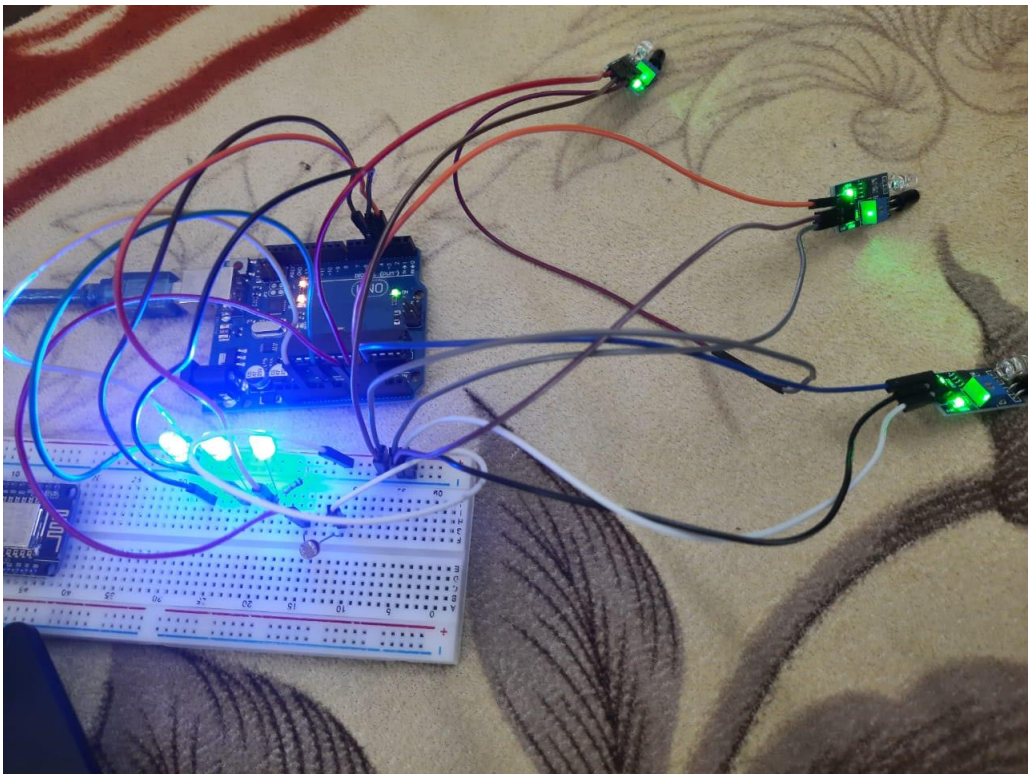
sss

```
    }
    else
    {
      digitalWrite(led2,HIGH);
    }

    if(s3==0)
    {
      digitalWrite(led3,LOW);
    }
    else
    {
      digitalWrite(led3,HIGH);
    }
  }
  else
  {
    digitalWrite(led1,LOW);
    digitalWrite(led2,LOW);
    digitalWrite(led3,LOW);
  }

  ThingSpeak.writeField(ChannelNumber, 1,val, WriteAPIKey);
  ThingSpeak.writeField(ChannelNumber, 2,s1, WriteAPIKey);
  ThingSpeak.writeField(ChannelNumber, 3,s2, WriteAPIKey);
  ThingSpeak.writeField(ChannelNumber, 4,s3, WriteAPIKey);
  ThingSpeak.writeField(ChannelNumber, 5,led1, WriteAPIKey);
  ThingSpeak.writeField(ChannelNumber, 6,led2, WriteAPIKey);
  ThingSpeak.writeField(ChannelNumber, 7,led3, WriteAPIKey);

  led_1 = ThingSpeak.readIntField(ChannelNumber, 5, ReadAPIKey);
  led_2 = ThingSpeak.readIntField(ChannelNumber, 6, ReadAPIKey);
  led_3 = ThingSpeak.readIntField(ChannelNumber, 7, ReadAPIKey);

  if(led_1==1)
  {
    digitalWrite(led1,HIGH);
```

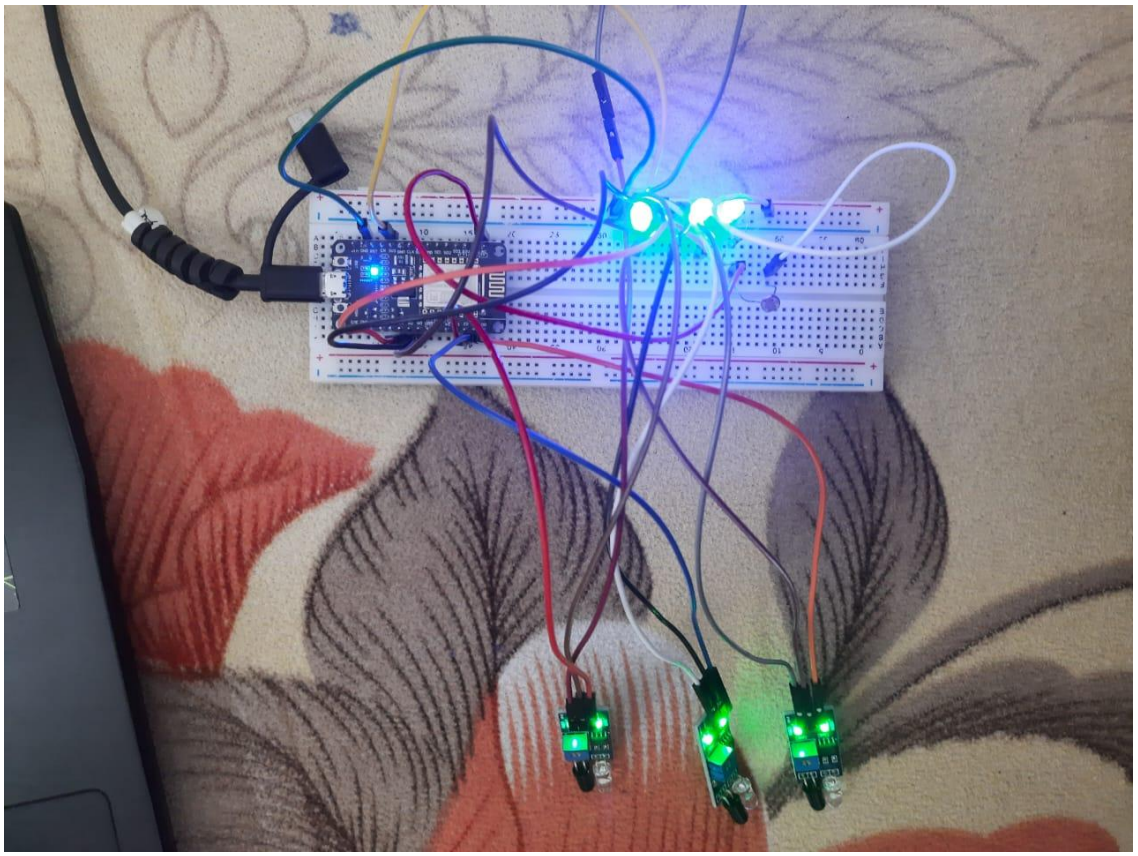
```
113   }
114   else
115   {
116     digitalWrite(led1,LOW);
117   }
118
119   if(led_2==1)
120   {
121     digitalWrite(led2,HIGH);
122   }
123   else
124   {
125     digitalWrite(led2,LOW);
126   }
127
128   if(led_3==1)
129   {
130     digitalWrite(led3,HIGH);
131   }
132   else
133   {
134     digitalWrite(led3,LOW);
135   }
136 }
```

Results:

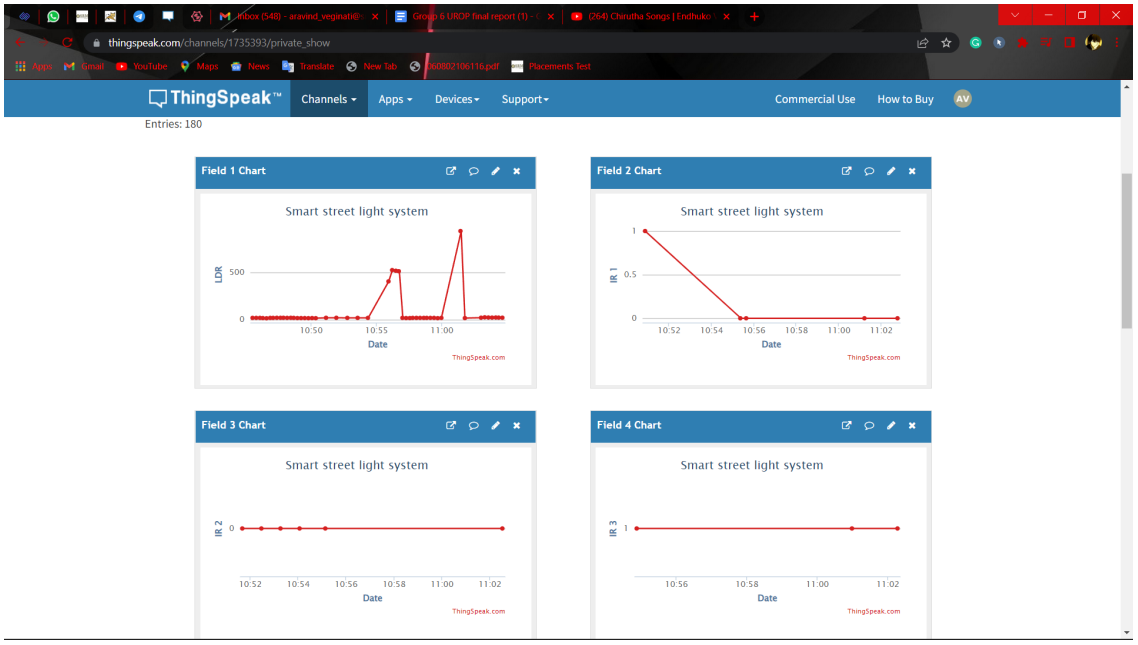
Using Arduino Uno:



Using Node MCU:



WEB PAGE:



Limitations:

The delay is high as we are using Node MCU.

This might not be much efficient in the case of highways and it can be used in parking lots and streets.

Future scope:

We can see more such IOT based concepts in the future. It reduces manual labor and helps in reducing power consumption.

More of these projects should be proposed to make the world smarter and a better place to live in.

References:

preference is from: https://ieeexplore.ieee.org/document/9012376.