SCHOOL OF ELECTRONICS ENGINEERING

Course: - ECE3502 (IoT Domain Analyst)
Expt/Task No.: 5
Date: 31-03-2023
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Regd. No.: 20BEC0740

1. **Aim of the Experiment/Simulation:**

   Smart Street Light and Traffic pattern prediction

2. **Name of the Simulation Platform:** (If applicable)

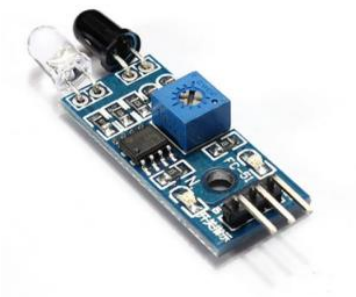
   ThingsSpeak

3. **Theory:**

   The primary goal of a smart street light system is to reduce energy consumption by only turning on the street lights when they are needed. This can be achieved through the use of sensors such as LDRs and IR sensors, which detect the ambient light level and the presence of vehicles or pedestrians. The sensors provide data to the microcontroller, which controls the operation of the street lights, turning them on or off as needed. Smart street light system can also improve safety by providing better lighting in areas where pedestrians or vehicles are present. This can help to reduce accidents and improve overall visibility in the area.

   IR sensor

   The role of the IR (infrared) sensor in a smart street light system is to detect the presence of vehicles or pedestrians on the road. An IR sensor works by emitting and receiving infrared radiation. When an object comes within the range of the sensor, it reflects the infrared radiation back to the sensor, which then detects the object's presence which then detects the object's presence.



LDR sensor

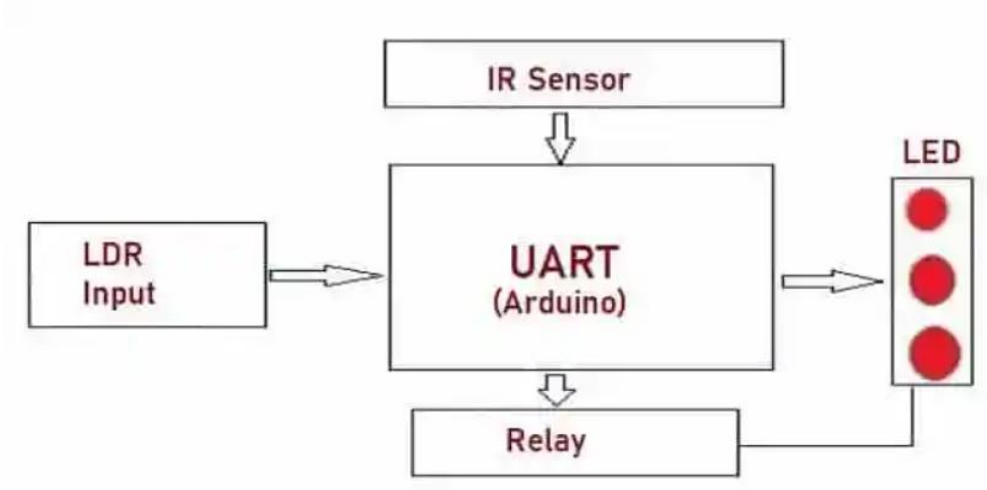
The role of the LDR (Light Dependent Resistor) sensor in a smart street light system is to detect the ambient light level in the environment. An LDR works by changing its resistance in response to the amount of light it is exposed to. In bright light, the resistance of the LDR decreases, while in low light, the resistance increases.

In a smart street light system, the LDR sensor is used to detect the ambient light level and signal the microcontroller to turn on or off the street light accordingly. For example, if the LDR sensor detects low light levels, it will signal the microcontroller to turn on the street light. Conversely, if the LDR sensor detects high light levels, it will signal the microcontroller to turn off the street light.

ESP8266

The ESP8266 is a microcontroller-based system on a chip that can be used to connect a smart street light system to the internet. It is a low-cost, low-power, and high-performance Wi-Fi microcontroller that is commonly used in Internet of Things (IoT) devices.

3.1. Algorithms/ Flowcharts/



- If the LDR detects that it is dark outside and the IR sensor detects the presence of a vehicle, the microcontroller will turn on the street light.
- Conversely, if the LDR detects that it is bright outside or there are no vehicles or pedestrians, the microcontroller will turn off the street light.

4. Programs and Outputs:

Code:

```
//Tanya Gupta 20BEC0740
#include <ESP8266WiFi.h>;
#include <WiFiClient.h>;
#include <ThingSpeak.h>;

const char* ssid = "OnePlus";
const char* password = "88888888";

WiFiClient client;
unsigned long myChannelNumber = 1836243;
const char* myWriteAPIKey = "W1AHEPHF08T1E49J";

int ir = 0;
int led = 5;
int ldr = A0;
int val =0;
int timer = 0;
int count = 0;
```

```
void setup() {
  pinMode(ir,INPUT);
  pinMode(ldr,INPUT);
  pinMode(led,OUTPUT);
  Serial.begin(19200);
  Serial.println("Connected");
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected..!");
  ThingSpeak.begin(client);
}

void loop() {
  Serial.println(".");

  int s = digitalRead(ir);
  val = analogRead(ldr);

  //---timer
  if(timer>10){
    Serial.println();
    delay(1000);
    Serial.print("Count of people after 10s: ");
    Serial.println(count);
    ThingSpeak.writeField(myChannelNumber, 4,count,myWriteAPIKey);
    timer = 0;
    count = 0;
   }
  else{
    timer++;
    delay(50);
    if(s==0){
      count++;
    }
```

```
   Serial.println(s);
  }
  //---timer

  if(val<100)
  {
   if(s==1)
   {
    digitalWrite(led,LOW);
    Serial.println("Its dark but no people detected so street lights are off.");
   }
   else
   {
    digitalWrite(led,HIGH);
    Serial.println("Its dark and people detected so street lights are on.");
   }
  }
  else
  {
   digitalWrite(led,LOW);
   Serial.println("Its bright so street lights are off.");
  }
  ThingSpeak.writeField(myChannelNumber, 1,val, myWriteAPIKey);
  ThingSpeak.writeField(myChannelNumber, 2,s, myWriteAPIKey);
  delay(100);
}
```

IDE screenshots

IoT_labTask | Arduino 1.8.15
File Edit Sketch Tools Help
IoT_labTask §
//Tanya Gupta 20BEC0740
#include <ESP8266WiFi.h>;
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#include <ThingSpeak.h>;
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WiFiClient client;
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int ir = 0;
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int ldr = A0;
int val =0;
int timer = 0;
int count = 0;
void setup() {
pinMode(ir,INPUT);
pinMode(ldr,INPUT);
pinMode(led,OUTPUT);
Serial.begin(19200);
Serial.println("Connected");
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED) {
delay(1000);
Serial.print(".");
}
Serial.println("");
Serial.println("WiFi connected..!");
Done uploading.
Writing at 0x00024000... (76 %)
Writing at 0x00028000... (84 %)
Writing at 0x0002c000... (92 %)
ndst compatible), 32KB cache + 32KB IRAM (balanced), Use pgm_read macros for IRAM/PROGMEM, dtr (aka nodemcu

IoT_labTask | Arduino 1.8.15

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IoT_labTask §

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  Serial.println("");
  Serial.println("WiFi connected..!");
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void loop() {
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  if(timer>10){
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    ThingSpeak.writeField(myChannelNumber, 4,count,myWriteAPIKey);
    timer = 0;
    count = 0;
   }
  else{
    timer++;
    delay(50);
    if(s==0){
      count++;
    }
    Serial.println(s);
  }
  //---timer

  if(val<100)
```

Done uploading.

```
Writing at 0x00024000... (76 %)
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IoT_labTask | Arduino 1.8.15

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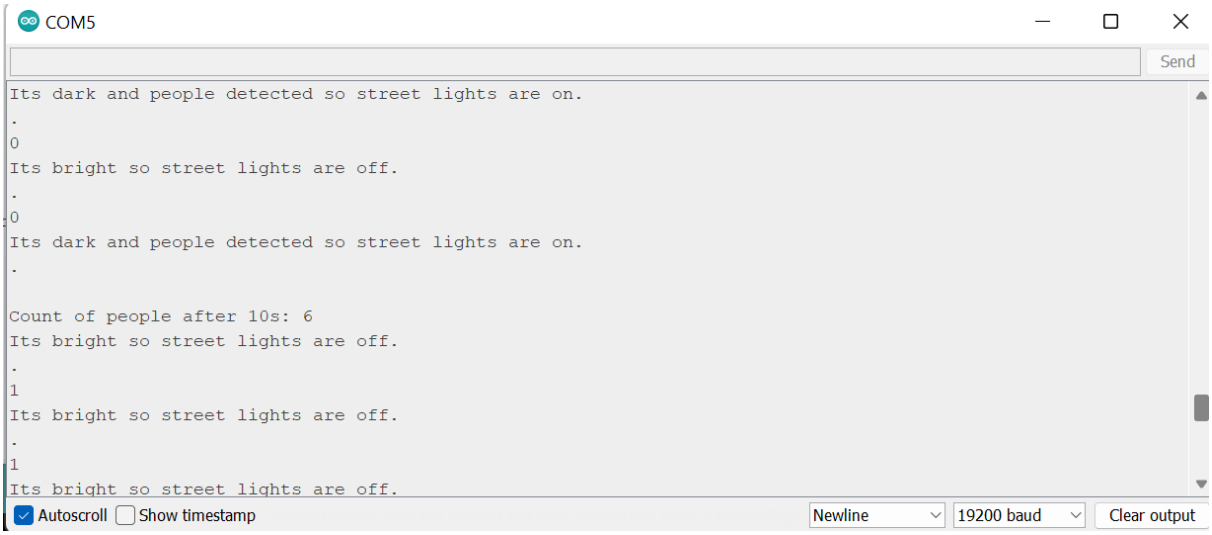
IoT_labTask §

```
    timer++;
    delay(50);
    if(s==0){
      count++;
    }
    Serial.println(s);
  }
  //---timer

  if(val<100)
  {
    if(s==1)
    {
      digitalWrite(led,LOW);
      Serial.println("Its dark but no people detected so street lights are off.");
    }
    else
    {
      digitalWrite(led,HIGH);
      Serial.println("Its dark and people detected so street lights are on.");
    }
  }
  else
  {
    digitalWrite(led,LOW);
    Serial.println("Its bright so street lights are off.");
  }
  ThingSpeak.writeField(myChannelNumber, 1,val, myWriteAPIKey);
  ThingSpeak.writeField(myChannelNumber, 2,s, myWriteAPIKey);
  delay(100);
}
```

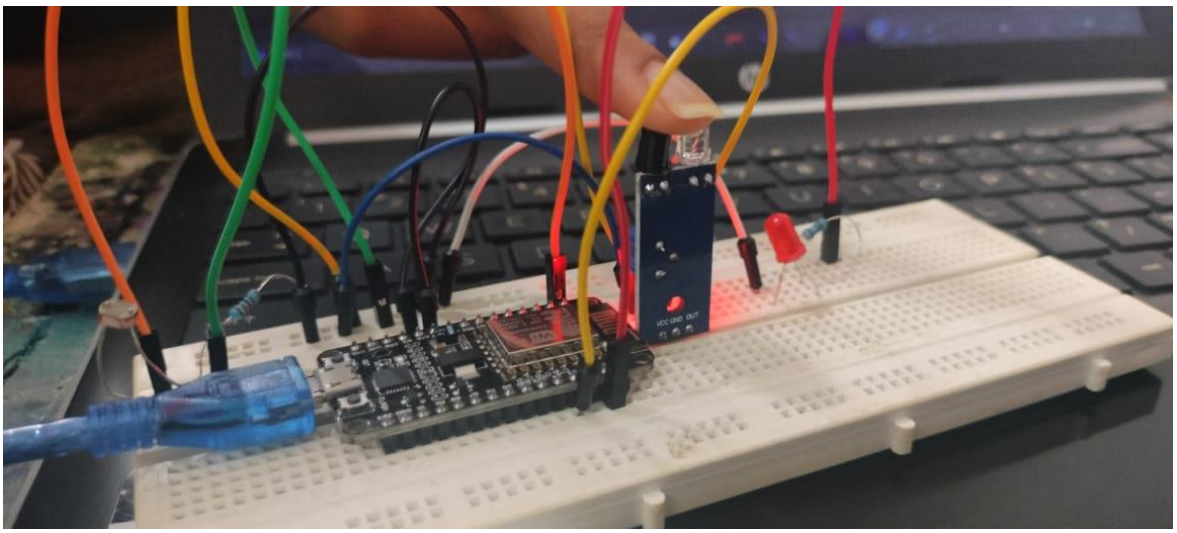
Done uploading.

Serial monitor output

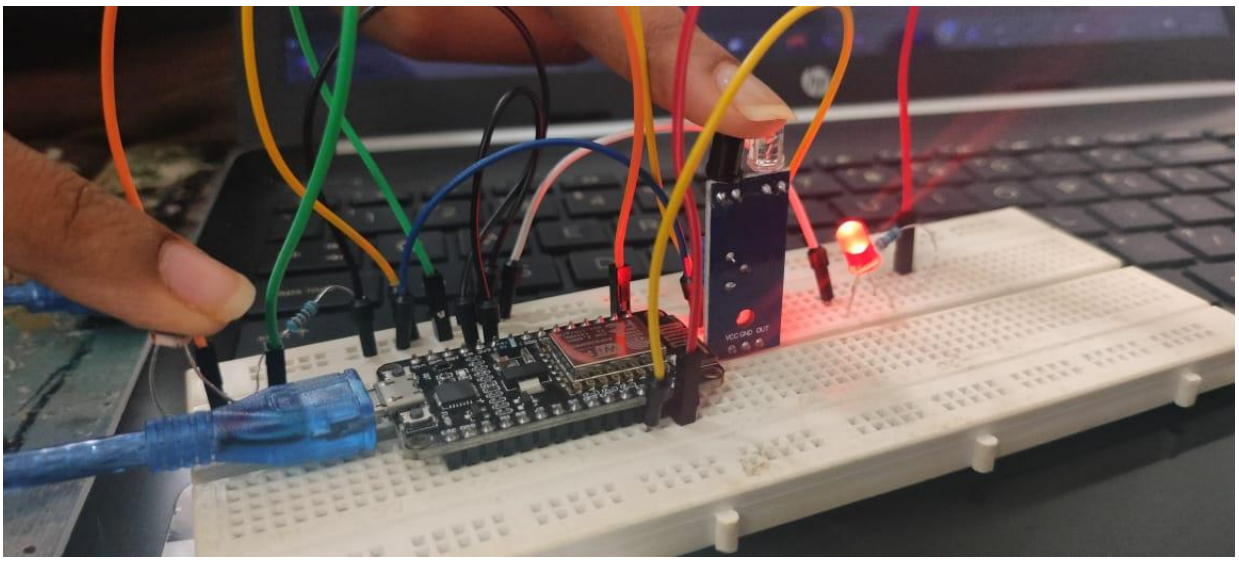


Hardware setup

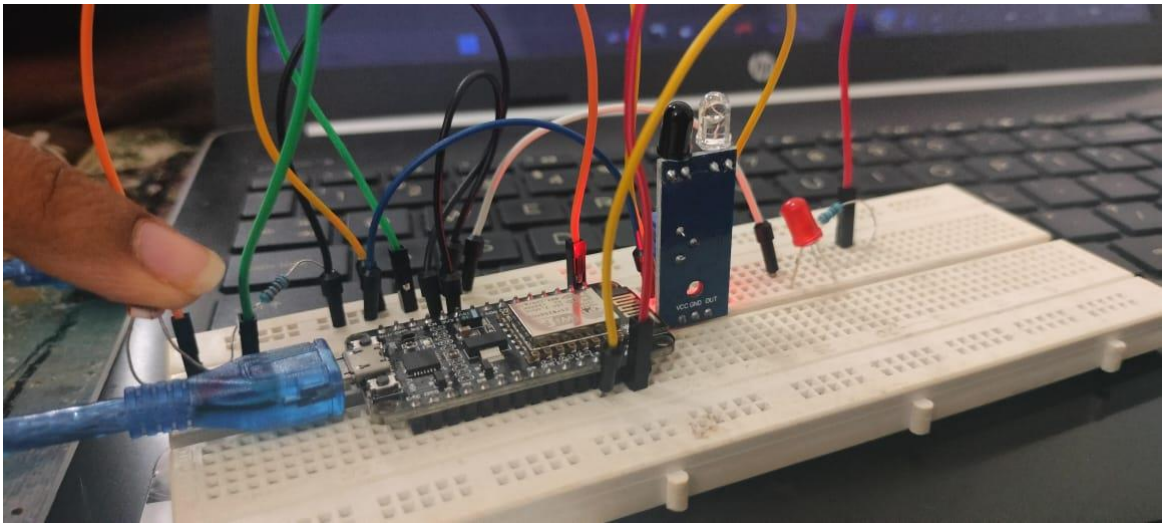
Case1: when person is detected but it’s bright, so street light is off



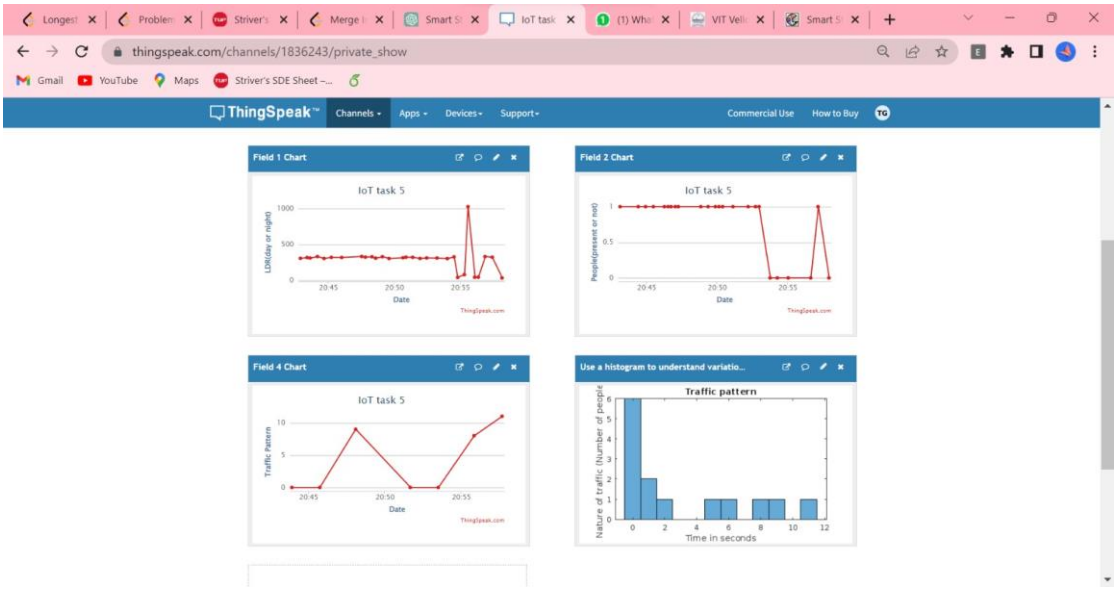
Case 2: when person is detected but it’s dark, street light is on

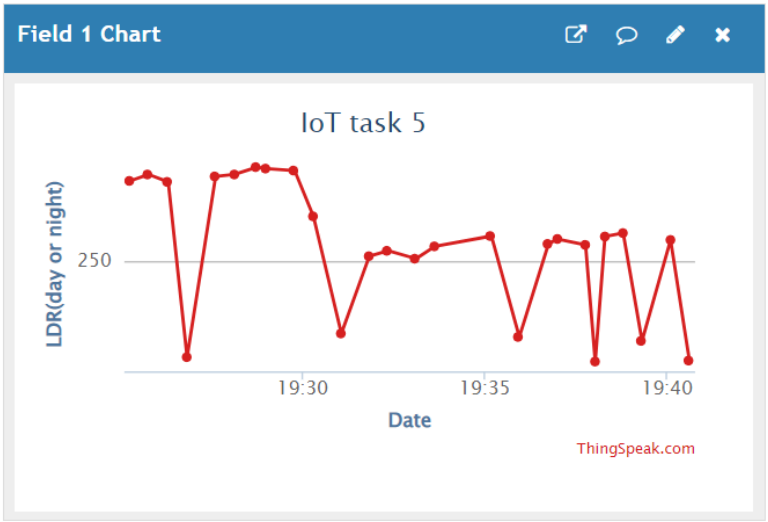


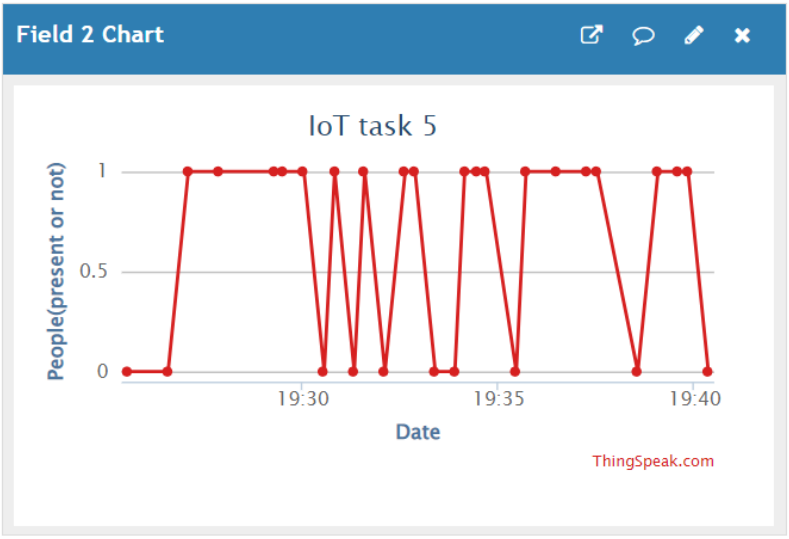
Case 3: when person is not but it’s dark, street light is off

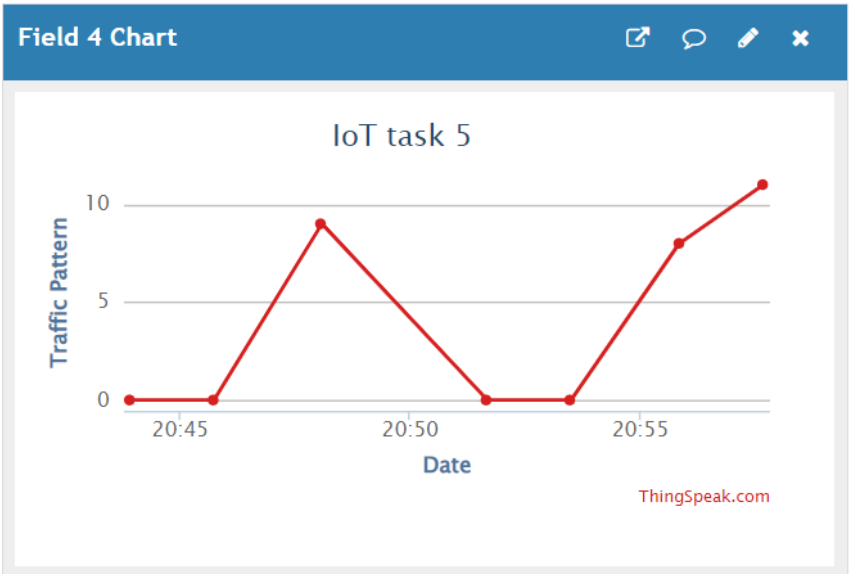


Thingspeak Output

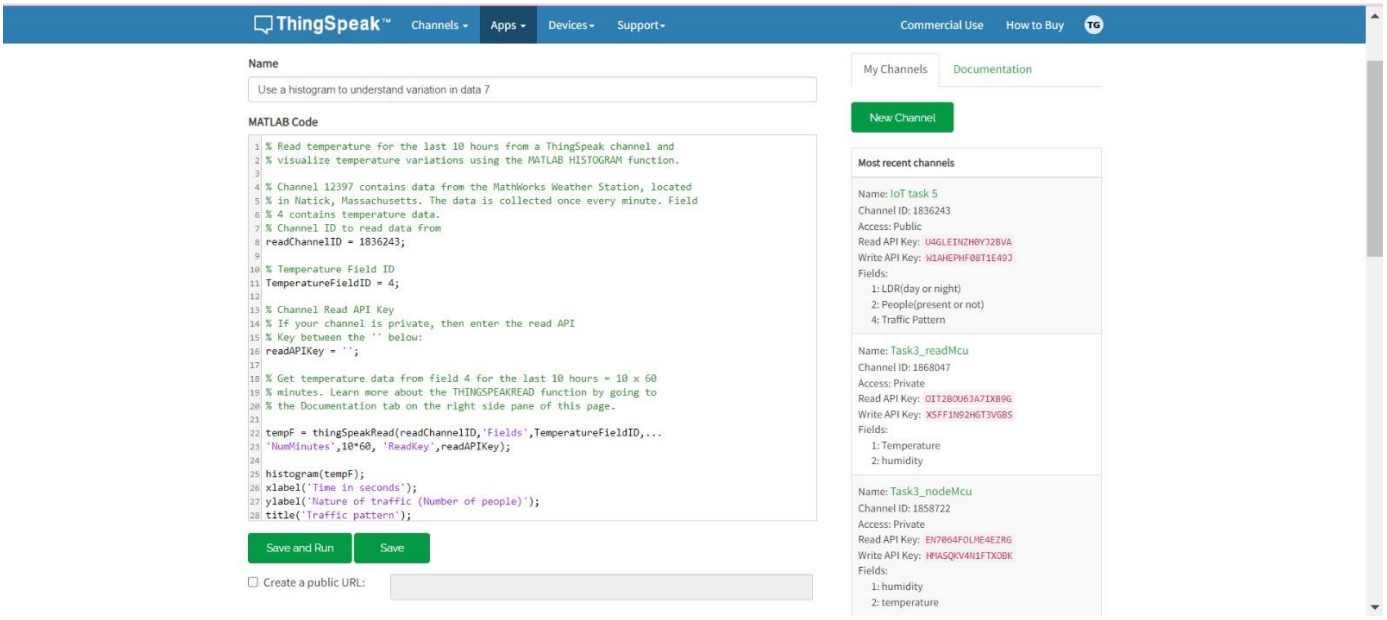


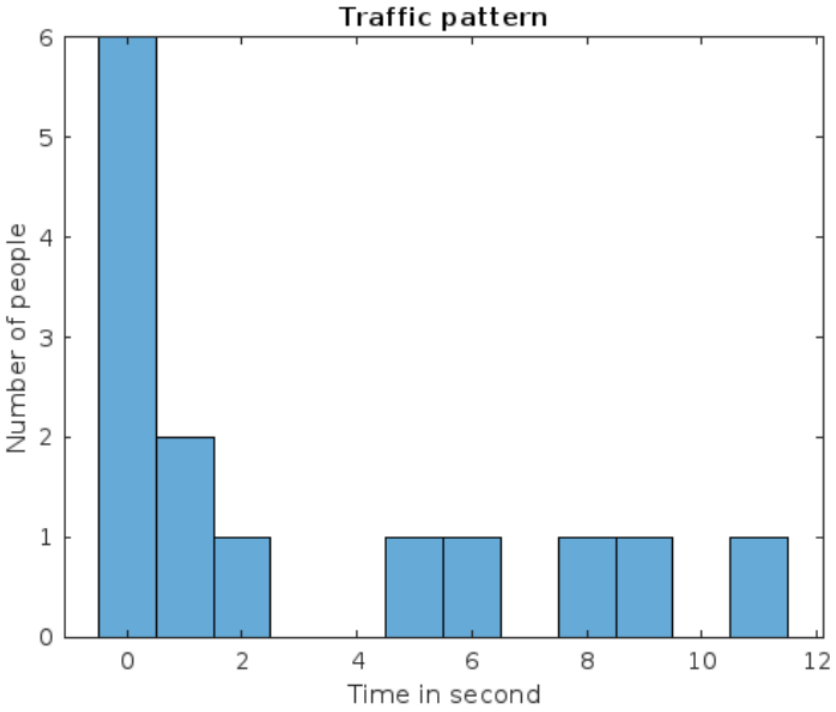






Graphical Visualization of traffic pattern





5. Conclusions:

- Smart street light system has been implemented which is capable of predicting traffic patterns based on the time of day.
- During the initial hour of the day, when traffic is at its peak, the street lights are turned on. As the day progresses and the traffic decreases, the street lights are gradually turned off.
- The system uses light intensity sensors to determine whether it is dark or bright outside. If it is dark and traffic is present on the road, the street lights are turned on.
- Conversely, if it is daytime or there is no traffic, the street lights are turned off. This system optimizes energy consumption and enhances safety by ensuring that the street lights are only used when needed.