



## **IOT Based Smart Street Light Using NODEMCU and Thingspeak**

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### **ABSTRACT**

Globally it can be understood a very rapid change in the field of technology of all kinds, and its great impact on our lives and the smoother running of our daily and practical work. So, these technologies have been modified, improved and developed with billions of inventions, especially in the field of electricity and electronics. We decided to choose a topic related to high technology and our field of specialization. Where we seek in this work to reduce the consumption of glow energy in the streets only when needed instead of consuming it throughout the day. In this work the first prototype of smart street lights is exhibited with 3 sensors, 1 LDR and 3 LEDs each representing one street light. In this work, the LDR identifies the vicinity of daylight and turns off street lights in daytime and turns them on without daylight, reducing the problem of manually switching road lights. Sensors identify the moving object and command a microcontroller to glow the road lights. On the opposite side, when the place is empty of pedestrians, the glow is extinguished in order to conserve energy.

Keywords: Arduino Node MCU, IR sensor, LDR sensor, Thingspeak.

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### **1. Overview**

Most of the streets and regions in our country, power is consumed at time when it is not needed for example late at night. We notice that the technology has provided and facilitated many things that reduce waste and consumption only when needed. As it was able to provide many machines, including in the field of providing electricity. Therefore, we choose this work for several reasons, the most important is that device simple in its consumption and responds quickly. This work works by automatically turns on the light in the evening and turn off in the morning. So, it useful because it works automatically no need for person for doing that. The proposed idea uses interactive IOT technique to manage and reduce the waste of the electricity in an effective manner. Due of all this, we use this method to reduce the waste of electricity, costs and increasing the country's economy. The purpose of our work is to reduce energy usage by only turning on the street lights when necessary. In this instance, the LDR sensor is utilized to determine whether it is day or night. The LDR sensor must be linked similarly to a potentiometer since it produces changing resistance depending on the amount of light that strikes it. The LDR sensor has two connections: one end to 5V and the other to a fixed resistance that is further connected to ground. One ADC pin (A0) on the NodeMCU is connected to a position between fixed resistance and the LDR sensor's one end. Due to the varied resistance the LDR sensor exhibits, fluctuating voltage will be produced at A0 in accordance with the amount of light hitting the LDR. To determine whether a person is crossing the street or not, IR sensors are utilized. It recognizes any nearby obstacles or motion. When an item, such as a human, animal, or vehicle, comes in contact with the IR rays being transmitted by the transmitter, they are reflected back. The receiver diode will pick up the reflected beam and confirm the object's presence by glowing the relevant LED. As the street light will only come on if someone is in the street, this strategy will significantly reduce the amount of electricity used. Three pins make up an IR sensor, two of which are used for VCC and ground and one for an output pin. If an object is present, the IR sensor's output increases. This connection is connected to a NodeMCU GPIO pin so that anytime an IR sensor detects a person crossing the street, the street light is activated. In this instance, only one LED will be lit.

#### **1.1 Goals and Objectives**

The main goal of this work is to reduce the power consumption by glowing the Street light only when is needed. The objectives of the work are:

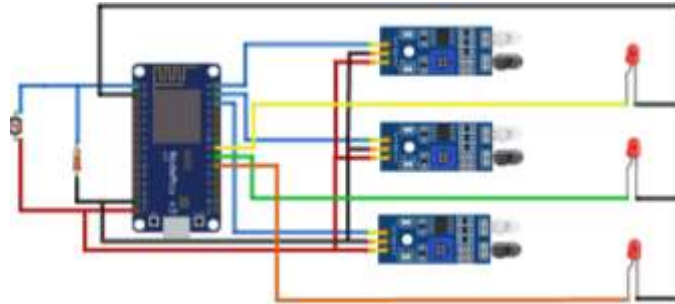
- To study the function of the IR sensor.
- To study the characteristics of LDR sensor.
- To get knowledge about Arduino and its features.
- To understand the work of Thingspeak.

### 1.2 Scope and Limitation

This work reduces the use of electrical energy resulting from the permanent operation of street lights by lighting the street only when needed. Where the street light glows automatically only if there is darkness and an object passes through in the street. Without the need for human control. In terms of limitations, the Arduino was designed for educational purposes rather than industrial uses, so its lifespan is short and its memory size is small.

## 2. Circuit Diagram & Working

The main purpose of LDR sensor is to sense light intensity. In addition, IR sensor sense the movement of the object (animal, persons, vehicle). NODE MCU for powering 3 LED as output. LDR and IR sensor give input to NODE MCU, the input and follow the Arduino program condition and control the light.



**Fig. 1 – Circuit diagram of the system**

This diagram contains the LDR sensor, the IR sensor, and the LEDs. Here we used the LDR sensor to detect the time if it is day or night. This sensor produces a variable resistance that depends on the amount of light falling on the sensor, so we connected it to a voltage divider. One end of this sensor is connected to a voltage, while the other end is connected to a fixed resistor well connected to the ground. The NODE MCU contains one ADC pin (A0) that is connected to the point between the fixed resistor and one end of the LDR sensor. At A0, it produces a variable voltage according to the amount of light falling on the LDR. As for the IR sensor, we used it to detect if there is a person walking on the road or not. It also detects movement in the surrounding areas. The transmitter sends infrared radiation that is reflected if it is reflected on any object (people, animals, or vehicles). Reception of the reflected ray. This is what may save electricity consumption, as the light is turned on depending on the presence of a person or object moving in the road.

The IR sensor consists of 3 pins, two of them are VCC connected to voltage, the second is connected to ground, and the third is connected to the output. The output that is produced from the motion sensor increases if it finds some objects. This pin is connected to the GPIO of the NODE MCU, when it detects a person passing by On the road, the light shines on the street. As for the rest, they do not light because nobody passed them. As soon as a body passes, the rest will light up. Then, we upload the data on the Thingspeak cloud.

## 3. Result & Discussion

Thingspeak is a cloud-based platform for aggregating, visualizing, and analyzing live data streams. Thingspeak has a number of significant features, including the capacity to:

- Configure popular IOT protocols to deliver data to Thingspeak with ease.
- Real-time visualization of sensor data.
- On-demand data aggregation from third-party sources.
- Make sense of your IOT data with the help of MATLAB.
- Automate your IOT analytics based on schedules or occurrences.
- Without having to set up servers or develop web software, you may prototype and build IOT systems.

The account was created in Thingspeak IOT platform and API keys and Wi-Fi connection details are included in the Arduino program. After gathering data from various sensor devices installed in a specific area of interest, when a proper connection is established with the server device, the detected data will be automatically transferred to the web server. The web page provides data on movement of the object (animal, people and vehicles) and intensity of the lights. The data collected will be saved in the cloud. The data stored in the cloud can be used for parameter analysis and continuous monitoring. In every field, the X-axis indicates the Time. However, the first field in Y-axis indicate the value of LDR sensor and in the second graph the Y-axis Indicate the value of IR sensor for three first figures, and the last three figures the Y-axis Indicate the value of LEDs.



Figure 2 - The LDR1 sensor value related to the day time

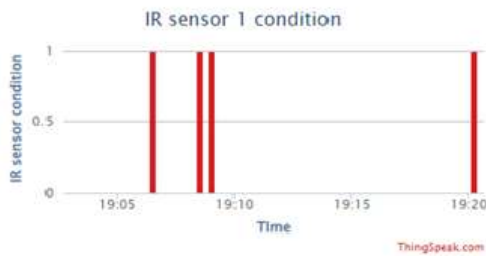


Figure 3 - The IR1 sensor value related to the day time



Figure 4 - The LED1 value related to the day time

At 19:15 the figure 2 shows that the decrease in the intensity of light, that is, with the advent of darkness, the value of the LDR sensor increases. As figure 3 shows that there is no movement that is way the value of the LED is minimal approximately equal to zero.

## Conclusion

This work talks about how to reduce energy consumption by turning on the street light only when user need it. It uses the basic parts IR (reflective type) sensor, LDR sensor, Arduino NODE MCU ESP8266, resistors (1kohm and 10kohm), LED and power supply and other parts. There are many ways to make the product better in the future to increase its marketability. This work will be developed and more accurate in the future. We use two types of sensors; IR sensor use to sense the movement of the body and LDR sensor use to sense the light intensity. Both provide power consumptions. Which can be used for other important things such as lighting control, automatic doors and security system. This work can be used and installed very quickly and does not require time in its manufacture. It is also small in size and light in weight. Protection nowadays is very important and this work does not cost much money.

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