

# IoT Based Street Light Automation System

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**Abstract**— This IOT Based Street light System is Automated , power efficient and smart system. This Paper will be focused on energy saving, which is main point of this whole system which will help in conserving energy. The system uses Arduino microcontroller(ATmega-328P), for managing the system functionality. System makes the street light ON/OFF by giving power to the system. The ON/OFF state of the system depends on the intensity of Infrared(IR) in the atmosphere. This system uses IR receiver which sense infrared in surroundings and also it has microwave Sensor which is used to detect motion of the object. Arduino has been connected with a proper circuit to perform desired tasks. Arduino contains the C++ code which serves as the instruction to Arduino to perform tasks i.e. system functionality.

**Keywords:** PC, Microcontroller(ATmega-328P), Arduino-Uno, IR, C++.

## I. INTRODUCTION

This new system is a result of Thinking about the huge power consumption of the present lighting system that consume over world's 79.3% of electricity and also the human intervention. This IOT based Street light automation is a project on smart and automated light control to control the problem of power consumption and usage of the streets manually, late in the night. Street lights today are getting replaced by LED street lighting system, which reduces the power consumption to great extent. Also, this system remove the human intervention results in the fully automated street light system. Another advantage of LEDs is the ease with which strength of the light can be controlled. Hence, automation and movement detection based street light control can be designed easily and operable.

## II. EASE OF USE

The present street lightning framework have many problems which needs to be worked upon. The Problem with the present framework is that it requires human intervention to make system to operate. In Bad weather condition, the timing of street light ON/OFF differ discernibly which is one of the main problem of the present street lights systems. Due to human intervention sometimes street lights are ON most of the day without any purpose because these are manually operable and this cause huge amount of power loss meaninglessly. With the wide acceptability of energy conserving and sustaining technologies like light emitting diode (LED) lights and quick response system, dependable working, and power saving street lighting system getting into reality. The reason for this is to showcase the Smart-automated Street Lighting System. The only aim of this research paper is to describe an automated lighting framework which focuses on the energy saving and reducing human intervention, and also to construct a smart street lighting system with sensors and controllers, to outline an automated lighting system with particular methodology plan, which makes the system more user friendly and that requires less involvement of manpower.

## III. EXISTING SYSTEM

The current system of street lights consists of manual controls which need Human intervention to work upon. This cause the loss of energy due to manual control, or the use of outdated technology. These systems are designed in such a way that they could reduce their intensity of light and save energy as much as possible. These systems are made to use of HID (High Intensity Discharge).Due to manual system one needs to turn the street lights ON or there is a time allotted during which the intensity of the system keeps on high and then turns the lights OFF when the sun rise up . Intensity reduction starts at during dawn when it is not much dark and there is not much traffic and is switched OFF when the light is totally visible in the morning. Mostly use IR (Infrared Ray) sensors to detect vehicles presence. Existing systems do overcome the problems of HID based systems by using the LED, but are not able to save that much amount of energy as required also they are time based, also in seasons like monsoon the surroundings are remains dark compared to usual days. In Winters there is a fog and if the lights are less it could result into a great accident or catastrophe. Therefore still some improvements in these systems are needed. Time interval based systems consider the time slot as an edge, but it actually is a drawback as it could not work in all conditions. As above discussed it creates problems during Bad weather changes, it needs to be changed if it is needs to be implemented globally or in India where the weather differs the most from Jammu to Thiruvananthapuram. Also, if any, hardware failure or fault occurs, it could be costly to solve it. Also, there are some Automated systems that are using the components which is not feasible in large scale. Thus, another system is needed which overcomes these problem.

## IV. PROPOSED SOLUTION

So there were the several problems which need to be worked upon in former system. This can be done by creating a new system which is Automated, Energy conserving and cheap. Our system works in a similar fashion first, it sense the Infrared from the surrounding and check whether the lights needs to be ON or not as per the intensity value . This system will eliminate the system of manual control as the system will cause to light up when the infrared value become less than our defined value. Also the light will automatically switch OFF when detected value of infrared become greater than the defined value.

This system works in 2 forms, First, for highways Second for the Streets. For highways the lights remain OFF as long as the motion of the object is detected. If motion is detected the light will be in ON state and Glows for specific time interval. In second form the lights does not remain in OFF state, instead they remain ON but in less intensity. This is because the streets needs light more frequently than that of highway. Again if the motion is detected here the intensity of light become greater for the particular time interval. This is dimming effect created by our system.

Here many system uses the IR sensors or the Ultra sonic sensor, these components may be good for the small area

purpose. But when we are talking about the big area like 6 lane highways then they are not effective. So instead of these our system have Microwave sensor, this sensor radiates microwave 360 degree all over till 11 meters and detects the motions. Also, it is used because of its robust design. Thus our system not only reduces the Energy usage by the street lights but also make it smart enough to operate.

**V. WORKING**

As we all know the Street lights are the sources of light for the roads. In today’s perspective they glow all night even the light is not needed at that time. Our IoT based system is making these street lights automated as well as power efficient.

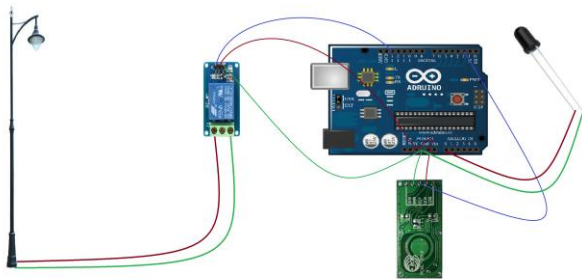


Fig. 1. Basic Circuit Diagram

**Hardware Requirements**

- Arduino Uno
- IR LED Receiver
- RCWL 0516 Microwave Sensor
- Relay
- Diodes and Resisters
- Wires
- LED Lamp

**Software Requirements**

- Arduino IDE
- Embedded CPP

Mainly it works in 2 programs:-

**A. For highways**

Usually on highways the Lights are only needed when the Vehicle is moving on the road and remaining time the lights needs to be OFF. So this System make the street lights ON only when the vehicle move over the road, which is sensed by our system and our system cause Specific number of lights to glow. Thus this become Automated, also When there is no vehicle on the road then the lights are on OFF state.

As the flow diagram says first the system detects the IR intensity, if the system detects intensity greater than our defined value(value define dawn and dusk) then the light remains OFF. If it detects the IR intensity smaller than threshold value the control shifts to Microwave sensor. The intensity value can become lower due to bad weather or fog. Now, microwave sensor broadcasts microwave 360 degree all over and detects the motion via sensing the value of microwave return if wave returns this means the motion of vehicle and the message is sent to Arduino and Arduino cause specific numbers of street light to ON for particular time interval.

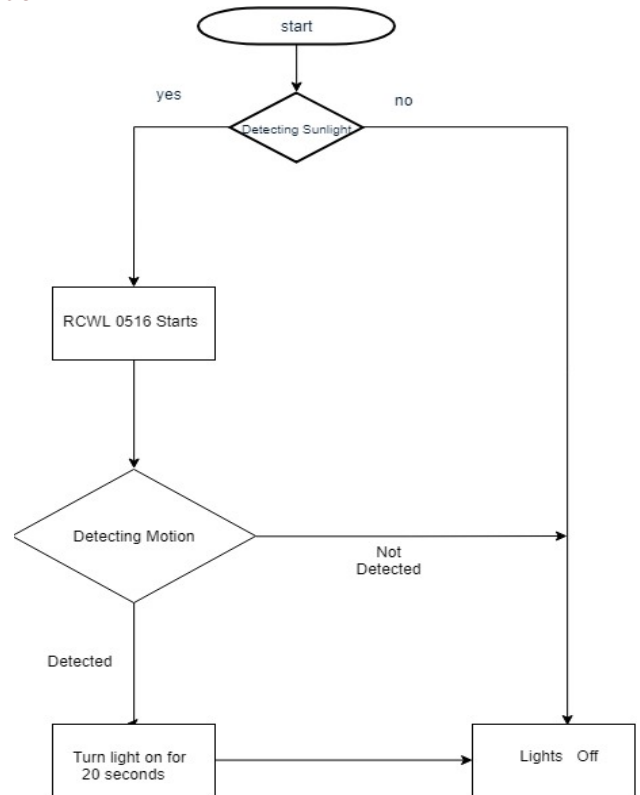


Fig 1- Flow diagram of System for Highways

**B. For Streets**

In streets the light in needed all the time due to continuous human presence. So instead of making lights OFF when no motion is detected the light become dim. This dim light become bright when the motion is detected by our system.

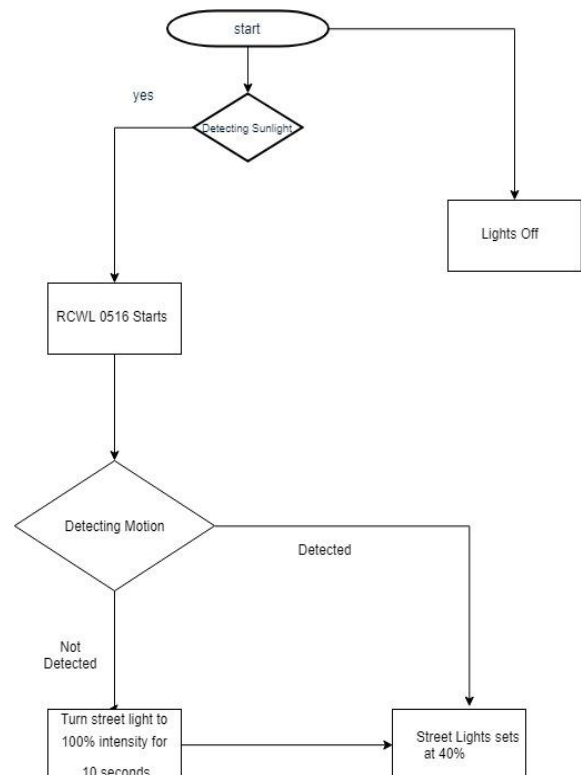


Fig 2- Flow diagram of System for Streets

As flow diagram says again the IR intensity is checked from surrounding and system behave the same as the program.

The change is that here instead of being OFF, the Street lights are dim i.e. have low intensity. Now again the microwave sensor senses the motion of the objects and if the motion is detected the light increases its intensity for a particular time interval for specific number of street lights.

## VI. RESULT & CONCLUSION

This paper aims towards the eliminating the drawbacks of the current street lightning system. Also it aims to find the solution of power consumption and manual working of the current system. As we have aimed this project is working as expected in both forms i.e in highway and in streets. As shown in table we have made the test cases for detecting the motion of a man, single car, 3 cars, 5 cars. The results are shown below in table. There may be small difference in the output as we have taken the round of values. This system overcomes the drawback of current system of manual operation. This system automatically works according to the Infrared values detected from the surroundings. Also the light remain OFF or in Dim state as long as the motion is not detected. Once the motion is detected the lights come to ON or bright state. This system is solely made for using in a wide scale projects. Also it is very cheap.

This research paper explains the construction of Automated street light system with its working via flow diagram and circuit diagram. Circuit works properly and make lights to be in ON/OFF state. IR receiver and microwave sensor are the two main components of the circuit design. If the components work properly and proper criteria for these components are met then the system works properly and produce desired result. With help of micro controller command the lights glow when it is dark and vehicle passes by. Also the microcontroller uses the C++ code which is extremely fast language. The former system code is also optimized according to our system design and to meet the system requirements. The idea of using the IR receiver instead of LDR is due to detection of bad weather and robust design. IR receiver works on the Infrared values so it become very easy for a system to use binary value. While LDR

sense visible light this may cause some malfunctioning in some testcases. Microwave sensor overcomes the drawback of ultrasonic sensor as it sense till 11 meters of distance. So this make system more reliable.

Table 1- Test Cases

Test Cases	Time on Street	Time on highway
A person	20 sec	NIL
A bike	20 sec	10 sec
1 car	20 sec	10 sec
3 Car*	20 sec	13 sec
5 car*	20 sec	15 sec

(\*) indicates that timing is variable according to the position of the cars crossing the sensors

## References

- [1] Mustafa Saad, Abdalhalim Farij, Ahamed Salah And Abdalroof Abdaljalil, "Automatic Street Light Control System Using Microcontroller" College of Electronic Technology/ Baniwalid Baniwalid- Libya.
- [2] Monika Vaghela, Harshil Shah, Hardik Jayswal, Hitesh Patel, "Arduino Based Auto Street Light Intensity Controller", Charotar University of Science and Technology, Changa-388421, Gujarat, India.
- [3] P. P. Fathima Dheena, Greema S. Raj, Gopika Dutt, S. Vinila Jinny, "IOT Based Street Light Management System", Department of Computer Science & Engineering, Noorul Islam University, Kumaracoil, Kanyakumari - 629175, India.
- [4] Snehal Bhosale, Komal, Dipali, Pallavi, "IOT Based Dynamic Control Of Street Lights For Smart City", *International Research Journal of Engineering and Technology (IRJET)*, vol. 04, no. 05.
- [5] Prabu V Parkash, Dandu Rajendra, "Internet of Things Based Intelligent Street Lighting System for Smart City", *International Journal of Innovative Research in Science Engineering and Technology*, vol. 5, no. 5, May 2016
- [6] Kubov, Vladimir. (2017). Radar Detector RCWL-0516 generator model. 10.13140/RG.2.2.25595.62246, [https://www.researchgate.net/publication/322096918\\_Radar\\_Detector\\_RCWL-0516\\_generator\\_model](https://www.researchgate.net/publication/322096918_Radar_Detector_RCWL-0516_generator_model).