

# Street Light Power Management and Control System using IOT

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**Abstract-**The proposed system is easy to setup and implement and it doesn't require extra maintenance compared to the already existing system. This system can be further enhanced by writing logic into the code and that can be able to retrieve information of the time of sunset and sunrise from a reliable weather reporting source and automate the process completely by turn ON the street light at the time of sunset and turn it OFF by sunrise. This further eliminates human intervention and a manual visit to the location of the street lights will be required only in case of a malfunction. The efficiency of automated systems is more than the manual systems. We can also reprogram these devices with respect to our needs. Smart street lighting solutions enable control, monitoring and automatic fault detection, transforming these systems into intelligent and energy efficient networks, resulting in huge savings in power bills. This paper presents an overall analysis of the smart grid solutions for street lighting and techniques to control through internet of things. By using the API key, the generated data is stored in Thing speak database which we can use for future references.

## INTRODUCTION

This street lighting is one of the largest energy expanses of a city. A street lighting system can cut municipal street lighting cost is 50% to 70%. The smart street lighting system is a system that adjusts light output based on the usage and occupancy, i.e., automatic classification of pedestrian versus cyclist, versus automotive. The project is mainly implemented to track the intensity of the light using sensors and it is done using the wireless system to control the energy consumption and uses reduction measures through power conditioning and control. The street light (ON/OFF Status) will be accessed from anytime, anywhere through internet based on the real time system. The street controller should be installed on the pole light which consists of NodeMcu ESP8266. The

data from the street light controller can be transfer to base station by using wireless technology to monitor the system. The operation of the system can be conducted using auto mode and manual mode the control system will switch on-off the lights are required timings and can also vary the intensity of the street light according to requirement.

Internet of Things plays a most important role in our everyday life. It connects enormous devices to the internet and involves the use of various data points, all of which need to be secured. The IoT is used in various applications like surveillance systems that analyze abnormalities in security, RFID tags in luggage, sensors in chemical industries, smart homes, military applications, healthcare, industrial management and diverse environments [1].

Predominantly, street lights plays the vital role in the urban areas where the main purpose is to improve the streets throughout shady periods of the daytime. Before hand, the quantity of streets in the cities and towns were very fewer but by the growth of urban areas, the quantity of streets grows quickly with high traffic concentration [2]. This paper gives the finest resolution for electrical energy consumption.

The idea of designing a new system for the streetlights that do not consume huge amount of electricity and illuminate large areas with the highest intensity of light is concerning each engineer working in this field. Providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typically cities worldwide. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy

efficient technologies and design mechanism can reduce cost of the street lighting drastically.

The main objective of this project is to implement a IoT based Automatic Street Lighting System. As the traffic decreases slowly during late-night hours, the intensity gets reduced progressively till morning to save energy and thus, the street lights switch on at the dusk and then switch off at the dawn, automatically. The process repeats every day. White Light Emitting Diodes (LED) replaces conventional HID lamps in street lighting system to include dimming feature. The intensity is not possible to be controlled by the high intensity discharge (HID) lamp which is generally used in urban street lights. LED lights are the future of lighting because of their low energy consumption and long life. LED lights are fast replacing conventional lights because intensity control is possible by the pulse width modulation.

#### LITERATURE SURVEY

The project is usually a multi-functional prototype that has a aptitude to get rid of the manual operation of the old street lightning system by strategy of the self-automation [1]. It aims at designing and executing the advanced development in embedded systems for energy saving of street lights and their maintenance at reduced cost with modern development. Street Lightning system has a feature as two sensors are used which are Light Dependent Resistor (LDR) to point a day/night time and therefore the passive infrared sensor (PIR) to detect the movement on the road [2].

In this IoT context, among the all integrated wi-fi chips, ESP8266 is one of the best and it is a low-cost of wi-fi module. A 32bit TensilicaXtensa L106 micro-controller is integrated into it. Within less PCB area RF balun, low noise receive amplifier, power amplifier, filters and power management modules with minimal external circuitry are included in front end module [3].

In [4] Automatic Street Light Control System is not only easy but also the powerful technique. Relay uses a automatic switch in this system. It releases the manual work almost up to 100%. As soon as the sunlight goes under the visible region of our eyes this system automatically switches ON lights. Light Dependent Resistor (LDR) is a type of sensor which actually does this work and senses the light as our eyes does. As soon as the sunlight comes, visible to our eyes it automatically switches OFF lights. Such type of system is also useful for reducing energy consumption.

In [5] this project is designed to detect the vehicle movement on the highways to switch ON only a block of the street light ahead of it and switch OFF the trailing light to save energy. During the night all the lights on the highways remain ON for the vehicle, but IoT of energy is wasted when there is no vehicle movement on the highways. The Wi-Fi ESP8266 MODULE is employed to upload to the important time information on the cloud through IOT panel [6]. Providing a street lightning is one in every of the foremost important and expensive responsibilities of a city. Lightning can account for 10-38.

Manual control is prone to errors and leads to energy wastages and manually controlling during mid night is impracticable. Also, dynamically tracking the light is manually impracticable. The current trend is the introduction of automation and remote management solutions to control street lighting. The key indicators of India's energy problems include; Over 40 per cent of the households(particularly rural areas) in India still do not have electricity, about a third of our total primary energy supply to rural areas still comes from non-commercial sources (biomass, dung) and currently India faces an enormous demand supply gap of about 15-25% energy shortage. Due to shortage of the energy supply till today several villages have not facilitated with electricity and even if provided, the supply of the electricity is limited to few hours in a day and are facing serious problems due to unlimited power cuts.

During the day time we get enormous amount of light energy from sun and the problem for pedestals are common during the night time. Though most of the streets are equipped with streetlights in each and every village areas but due to the uncontrolled power failures/power cut it is becoming a serious problem for villagers to commute for irrigational field work during the nighttime due to unlimited power cuts which indirectly affect the crop yield of the farmer. Such trends often discourage the villagers taking up agriculture which is the backbone of our economy. It also poses a serious threat to the villagers from physical hazards such as thieves, snakebites, etc. Installation of street lights may seem a pleasant option. Hence the best option is to install solar powered street lights and moving a step ahead, we designed this 'Solar Powered Smart Street Lighting System with IOT

#### METHODS

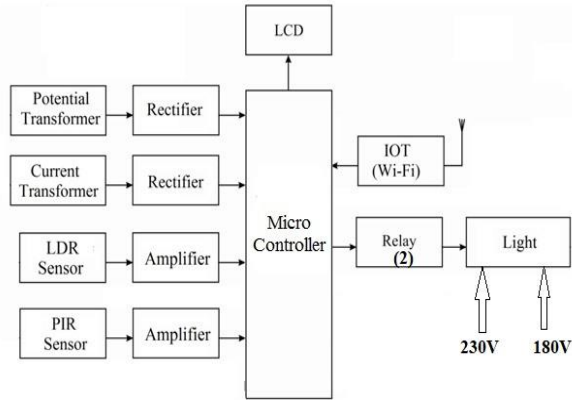


Fig 1: PROPOSED BLOCK DIAGRAM

The idea of this project is to give information about the IOT SMART STREET LIGHT SYSTEM. So, we have chosen the THING SPEAK technology to get more control over the street lighting. In this project we are interfacing NODEMCU ESP8266, RELAY & LDR SENSOR. India facing one of the major Problem is maintenance of street lights. In India street lights are maintained manually, it is found that there is wastage of power by operating the street lights due to manual operations like switch on the light.

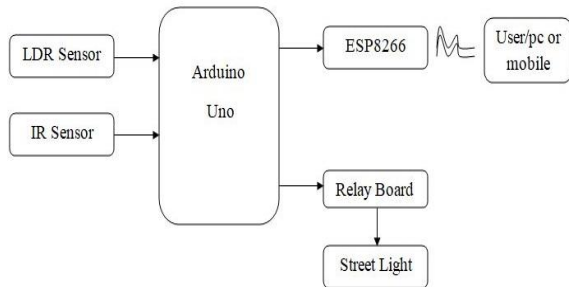


Fig 2: Weather Include Street Lights System

In this project is to monitor Parameters such as voltage, current, illumination and human. The microcontroller monitors this value and if exceeds the set value it will automatically control the load and also indicates with help of IOT technology. The street light system is checking the weather for street lamp ON/OFF condition. The weather is light or dark are sense through a LDR sensor, If the weather is light, the system will OFF. If the weather is dark, the light system will ON. After the light on the light condition also check through LDR sensor for light glow or not glow status. If light is not glowing, the sensor sends the value to street light system. The street light system will generate message and send to ward member and ward serviceman mobile through IOT. At the same time the sensor values are stored in cloud server.

We can access the light system data in cloud anywhere and anytime.

A Street light, lamppost, street lamp is a raised source of light on the edge of a road or walkway, which is turned on or lit at a certain time every night. Major advantages of street lighting include: prevention of accidents and increase in safety. Studies have shown that darkness results in many crashes and fatalities, especially those involving pedestrians; pedestrian fatalities are near to 7 times more likely in the dark than in daylight. Street lighting has been found to reduce pedestrian crashes by approximately 50%. A street light control system is to be developed to control and reduce energy consumption of a town's public lighting system. These range from controlling a circuit of street lights and/or individual lights with specific ballasts and network operating protocols. These may include sending and receiving instructions via separate data networks, at high frequency over the top of the low voltage supply or wireless. Various protocols are to be developed as well as compatible hardware for most types of lighting. The control centre will deal with the data so that it can know the situation of each streetlight. As per the result the control centre gives orders to each streetlight to control the switch state and illumination of them.

## RESULT AND DISCUSSION

The project aims were to reduce the side effects of the current street lighting system, and find a solution to save power. In this project the first thing to do, is to prepare the inputs and outputs of the system to control the lights of the street. The prototype as shown in Fig..has been implemented and works as expected and will prove to be very useful and will fulfil all the present constraints if implemented on a large scale.

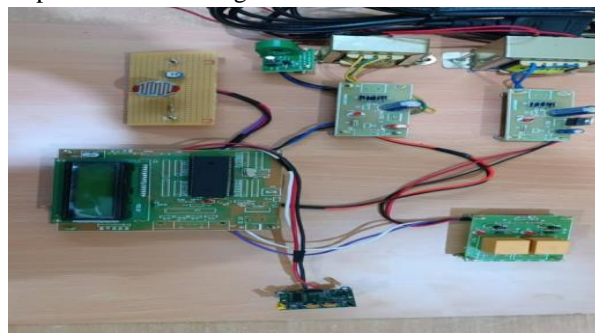


Fig 3: Out Put for PIR and LDR

GSM based street light monitoring & control system is an automated system designed to increase the efficiency and

accuracy by automatically controlled switching of street lights. It consists of an ATmega32 microcontroller which on setting of time delays switches ON/OFF the street lights and sends the update through a server to the control centre. This is a smart way of managing street lighting systems. There are basically two modules which include the DCU and the server side. The status signals sent by the base unit are received by the DCU thus these signals are processed by the microcontroller unit and stored in a flash memory. After all the processing task is finished this status data signals are transmitted to a cloud based application through GPRS technology so that the status of all streetlights can be monitored and controlled remotely.

#### CONCLUSION AND FUTURE WORK

This project “IoT Based Smart Intelligent Lighting System for Smart City” is a cost effective, practical, eco-friendly and the safest way to save energy and this system the light status information can be accessed from anytime and anywhere. It clearly tackles the two problems that world is facing today, saving of energy and also disposal of incandescent lamps, very efficiently. Initial cost and maintenance can be the draw backs of this project with the advances in technology and good resource planning the cost of the project can be cut down and also with the use of good equipment the maintenance can also be reduced in terms of periodic checks. The LEDs have long life, emit cool light, don't have any toxic material and can be used for fast switching. For these reasons our project presents far more advantages which can overshadow the present limitations. Keeping in view the long-term benefits and the initial cost would never be a problem as the investment return time is very less. The project has scope in various other applications like for providing lighting in industries, campuses and parking lots of huge shopping malls. This can also be used for surveillance in corporate campuses and industries.

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