

# IOT BASED DYNAMIC CONTROL OF STREET LIGHTS FOR SMART CITY

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**Abstract** - Now-a-days Street light have become a vital aspect including road safety. A lot of electricity is consumed by street lights. So it is imperative to save the power as much as we can. The cost of electricity continues to increase as wastage of energy increases. It has become very crucial for saving power. Street light monitoring control is an automated system designed to improve the efficiency by automatically controlling the switching of street light. This project describes a new solution for street light control system. It consists of wireless technology. The street lights are controlled by the base server by just sending a notification by using wireless network. It consists of a client-server application. The primary motive behind implementing this project is to save the energy.

**Key Words:** Internet of things (IOT), Streetlights, Google Maps.

## ORGANIZATION OF PAPER

There are ten sections in this article. In the first section, we are introducing the project which describes the various scenarios of the project. Project idea is explained in the second section. Third section is all about project goals and objectives. The motivation of the project is mentioned in the fourth section. The work of previous researchers with their drawbacks are enacted in the fifth section. Project methodology is provided in the sixth section. The proposed system is explained in the seventh section. The architecture of a system is described in the eighth section. However the project is concluded in the ninth section. In the last section, we have acknowledged our project guide, HOD of our department and all the supporting staff.

## 1. INTRODUCTION

A Street light, lamppost, street lamp, light standard, or lamp standard is a proposed source of light on the side of a road or walkway, which is turned on or lit at a certain time every night. Significant benefits of street lighting include prevention of accidents and increase in safety. Studies have shown that darkness results in a considerable number of crashes and accidents, especially those involving pedestrians; pedestrian accidents are 3 to 6.75 times more prone in the dark than in day. Street lighting has been found to reduce walker crashes by nearly fifty percent. Street Light Monitoring & control is an automated system designed to increase the efficiency and accuracy of an enterprise by automatically timed controlled switching of street lights. This project describes a new practical solution of street light control systems. The system also includes the client-server mechanism where a user can directly interact with the web-based application to manage the Street lamp of any place

from the single position. Some street light control systems have been developed to monitor and reduce the use of power in town's public street lighting system. It includes a monitoring circuit of street lights and individual lights with network operating protocols. For most kinds of lights, compatible hardware with certain protocols are used.

- Today's Streetlight system is not flexible.
- Most of the controlling are manual, whereas some are automated based on environment parameters.
- The biggest problem is to handle remote area locations.
- Manual mistakes results into power wastage.

## 2. PROJECT IDEA

Street lights are the essential factor of any city to make it a smart city. But we have seen such situation when our street lights are ON in the day. We can handle some street lights by using this system.

## 3. GOALS AND OBJECTIVES

By use of this system, we will try to control streetlights from the remote server.

The primary objective is to develop efficient Street Light System.

- To provide wireless access for handling it.
- Need some Server which can be used to monitor whole city's street lights.
- Low-cost Internet technology can be used for remote access.

## 4. MOTIVATION OF THE PROJECT

To design an intelligent lighting system which aims to power saving and self-governing operation on fair affordable for the streets. Build an energy saving intelligent lighting system with integrated sensors and controllers. Design a smart lighting system with modular approach design which makes the system scalable and expandable. To develop an intelligent lighting system which are compatible and scalable with other commercial product and automation system which might include more than lighting systems.

## 5. RELATED WORK

1. Zigbee wireless module is used for street light controlling. [8]

Their aim is to monitor the vitality of street lights and forward monitored returns to the control station. Inside the lamp module, it consists of light dependent resistors (LDR) module, microcontroller module and the transmission module. The lamp module will communicate with the control

station through wireless using Zigbee. In the LDR module, it consists of two LDR. One of the LDR is installing on top of the street lamp for checking the day/night status condition. Another LDR is placed under the street light to monitor and check the lamp health status. The results of the LDRs send to the microcontroller, where the microcontroller will process the data and send the data to the transmission module. In the communication module, there is wireless ZigBee that send the data through wireless to the control centre. In the control centre, it will monitor each of the street lamp statuses, as well as will be controlling the operation of the street lights.

#### 2. *Optimisation of a standalone street light system with consideration of lighting control. [4]*

This paper aims at designing and executing the advanced development of embedded systems for energy saving of street lamps. Nowadays, the human has become too busy and is unable to find time even to switch the lights wherever not necessary. This paper gives the best solution for electrical power wastage. Also, the manual operation of the lighting system could eliminate. In this article, Light Emitting Diode (LED) is used. In this system, the main drawback was switching arrays of street lights were not possible. Only Single Street can be operated.

#### 3. *Intelligent Street Lighting System Using GSM: [5]*

The system comprises of a server, GUI to display and nodes which are micro controlled processed with embedded sensors measuring different parameters. Each node in the network connects to the primary server via a protocol. The analogue data sensed by the sensor converts it to digital form, processes by microcontroller and then sends to the server. The master controls all the slaves. The other nodes send the data to master, and the master collects the data and sends to concentrator and server where the data can monitor and on fundamental alterations process it to switch On/Off the nodes of the devices. This system also senses various parameters like surrounding temperature, fog, carbon emission and noise intensities and suggests corrective measures [5]. GSM modem required per street light for operating, which increases the cost automatically. It also consists of some network issues.

#### 4. *E-Street zone-automatic Street light based on the movement of vehicles. [7]*

Every street light can be integrated with an IR sensor which detects the movement of vehicles. When the vehicle passes, light gets illuminated. Due to this electricity can be consumed less and energy can be saved up to some extent. A solar panel has been installed, and hence it gets charged by sunlight. But it is impractical as street lights are also useful for the people walking by the roadside and this sensor only goes on when the vehicle passes it. Also, it is costly due to IR sensors used in every single street light.

#### 5. *Remote-Control system of high efficiency and intelligent street lighting using a Zigbee network of devices and sensors.[1]*

This proposed remote control system can optimise management and efficiency of street lighting system [1]. In this system, Zigbee network is used. It consists of range less than a wireless network. The range of Zigbee is very short. In this article lot of hardware is needed for controlling and monitoring of street light, hence it is very costly to use and also it consists range issue due to short range of ZigBee network.

#### 6. *The efficient control algorithm for a smart solar street light.[2]*

This proposed system works on solar energy. The street light gets charged on sun energy in the daytime, and it is consumed at night. The sensors get automatically ON in the darkness and OFF in daytime. When the battery of solar street light gets discharged, it switched to RTC controller. If the weather changes, the sun energy is not sufficient to charge the solar batteries. Hence it may lead to the inconvenience of the lighting of the street light.

### 6. METHODOLOGIES OF PROBLEM SOLVING

Lights contain chips. Chips consists Microcontroller along with various sensors like CO2 sensor, fog sensor, light intensity sensor, noise sensor and GSM modules for wireless data sending and receiving between concentrator and PC. The data from the chips would get on a remote concentrator (PC), and the PC would also transfer the controlling action to the chip. According to the survey of variation in the intensity of light in the field area, an efficient programming would be done to ensure the least consumption of energy. The emissions in the atmospheres would detect along with the use of energy and any theft of electricity. The research work divides into the following Phases:

#### 1. *Research:*

To do a complete field study of a particular location for the existing use of energy, discharge levels, the cost of set up & maintenance, etc. of that area and design energy efficient system.

#### 2. *Web Application:*

- To collect the street light data (IP, Location, Area, City, etc.)
- To monitor lighting control status.
- To control the controllers depending upon the light intensity required.

#### 3. *Lamp Controllers:*

- Power on/off/dim the light.
- Monitor the status of the light.
- To collect the data from various sensors.

#### 4. *Communication Link:*

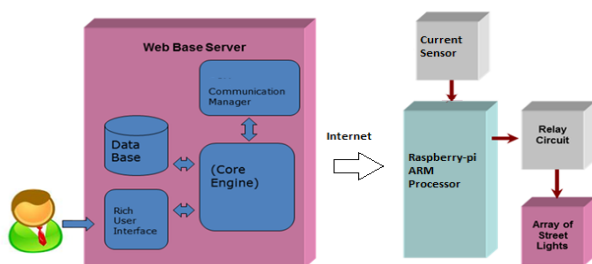
To establish an efficient path between the controller and PC for bidirectional data transfer.

## 7. PROPOSED SYSTEM

Street Light Monitoring & control is an automated system designed to increase the efficiency and accuracy of an enterprise by automatically timed controlled switching of street lights. This project represents a new cost-effective solution for street light control systems. The control system consists of control circuitry, internet and electrical devices. The system also includes the client-server mechanism where a user can directly interact with the web-based application to monitor the Streetlight of any place from a single position. The base server will run a Java Web Application which will maintain whole street light of Country/State/City. When we have to switch ON/OFF any streetlight, the server will send a notification to that Street controller to take necessary action. Street light controller will receive that information, and it will decode and find the particular streetlight which will set using relay circuit, the notification came it will then decode and finds the appropriate streetlight which needs to put ON/OFF using relay circuit. The entire street light lamps are connected to relay driver circuit. The base server will run a Java application which will maintain Whole Street light record of the city. When we want to ON/OFF any particular streetlight, Notification message is send to adjust the pattern.

## 8. ARCHITECTURAL DESIGN

Fig.1. shows the architecture of proposed system in which there are different modules with different purpose. This system consists of a client-server model. Web server is a program that supports various web protocols like HTTP, to process client requests. Database server usually supplies data in a structural form.



**Fig 1 :** Architecture of Proposed System

The Rich user interface is provided in which the interaction between human and machine occurs. The goal is to allow efficient operations and control the machine from human end, while the device simultaneously feedbacks information. The database uses special software to store and organise data. It includes storing of information generated during operation. Communication Manager is responsible for conveying an internal and external message that is communication between web server and embedded system. Raspberry Pi is a low cost; credit card sized computer that plugs into a computer monitor. It has a Wi-Fi support. A relay circuit is used as an electric operating switch. The base

server runs Java Web Application; it maintains the complete record of street lights over the junction. A notification is sent to a controller by a server to ON/OFF a particular street light. The street light controller receives that information and will decode it and put particular street light ON/OFF by using relay circuit. The entire street light lamps are connected to relay driver circuit.

## 9. CONCLUSION

The system solves the energy efficiency problem of conventional solar-powered street lamp system, ensure the traffic safety and prevent crime against night-time walking. It will also help in making our city a Smart City.

## 10. ACKNOWLEDGEMENT

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