

# Smart Street Light Working and Power Supply Monitoring System

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## Abstract

Even though only a small portion of all travel occurs between 7pm and 8am, yet this time duration takes responsibility for 40% of death, serious injuries and road accidents. Street lighting is the prominent solution that reduces the risk of all road users such as drivers, riders, and pedestrians during the hours of darkness. This paper intends to reduce dissipated man power needed to manage the automated switching on/off, monitoring the current status of lights after fixation. The system includes a set of light sensors like LDR at each street light node to monitor the degradation of the lights and the alerts are transmitted directly to the concerned Zone ADE through IOT based remote application and to the direct workers through GSM based SMS by the system. The system aims direct remote monitoring and immediate repair intimation of lights in a user friendly and effective manner.

**Keywords**— IOT (Internet of Things), LDR (Light Dependent Resistor), GSM Module.

## 1. Introduction

Street lights are installed to light public roads and ingress ways for traffic and pedestrian users for safety purposes. At present the demand for advancement of current technologies leads to exploitation of earth's natural resources. As such electricity is the key component of most modern innovations and whether it's during the day or at night, electricity keeps our lives in order.

At instant, constant power supply in cities and urban areas is not a big issue as India has risen its potential of power generation in various ways. But in case of villages and rural places still power supply problems are needing to be arrested and to be solved. In India many people have lost their lives and faces worst affects due to power failures, the causes include a short circuit or damage in transmission lines or faults at power station or overloading of electricity mains or low voltage problems or lack of power backup facility that makes us digitally blind.

Public lighting services play an important role in providing safety, secure and stunning public areas for both pedestrians and vehicles. It also involved in the order of 25 to 70 percent of any local government's energy consumption & greenhouse gas emissions in the adjoining areas. Street light controllers are presently using mechanical or electronic timers in order to make the

street light ON-OFF. The first circumstance is the high energy consumption.

A high consumption leads to the high amount of generated energy, which in turn interprets into a high level of very unpleasant emissions. Then the next emerging difficulties related to the maintenance of the system is catch out a certain lamp or a certain component of a light faulty and brought out of a process and needs to be renovated. The lack of proper street light maintenance at night time has led to unhealthy living conditions and as such, street crimes, and other mishaps.

This system incorporates an IOT (Internet of things) and GSM technology in order to monitor and intimation. It enables the remote user to forecast the problem raise in the system. The Internet of Things (IOT) is the web networking of physical device equipment, smart devices and other entities involved with electronics software, sensor modules, and inter-network connectivity which permits the acquisition and commerce the data about the objects too.

The system includes a set of light sensors like LDR which is a component that has a resistance that changes with the light intensity that bound on it. This grants them to be used in light sensing circuits. This used in each

street light node in order to monitor the degradation of the lights and the alerts are transmitted directly to the concerned Zone ADE through IOT based remote application and to the direct workers through GSM based SMS by the system. The system aims direct remote monitoring and immediate rehabilitation intimation of lights in a user friendly and effective manner.

If the reported issue is not addressed on time means, then a complaint is raised to the higher officials of ADE and it should be monitor by higher officials through SMS via GSM module. And, the message passed to the responsibility person through GSM Module to take the decision accordingly in order to ensure enhanced lighting performance and maintenance.

## 2. Related Works

### [1]. Intelligent Street Lighting based on PIR sensor

This system works on smart street lighting with enormous energy conservation. The system design involves with PIR sensor module, Arduino controller, solar panel and LED lights. The light is enabled to be with tuned high illumination when there exists the presence of human. In absence of human presence, the light intensity is made low to preserve electricity wasted.

### [2]. LED Based Street Lighting with Automatic Intensity Control Using Solar PV

Since issues like fossil fuel depletion, drastic climate and sudden global warming are at alarming rate, the demand for renewable energy is elevated intensely. Solar cells can extract comparatively enormous source but in DC form. This paper utilizes DC powered smart street LED lights which support low power consumption with advanced light intensity control.

### [3]. Design and Implementation Of Smart Solar LED Streetlight

This system deals with low-cost and high efficiency intelligent street light system leans on Arduino. It majorly aims to conserve energy wasted by the existing systems. The system design includes solar panel, LED driver and 2 sensor modules like light sensor and motion control sensor through which maximum power can be extracted.

## 3. Proposed System

Our system aims to design and develop a Smart street light working and power supply monitoring system that enables the user to remotely monitor and control the enhanced and effective street lighting through Internet of Things.

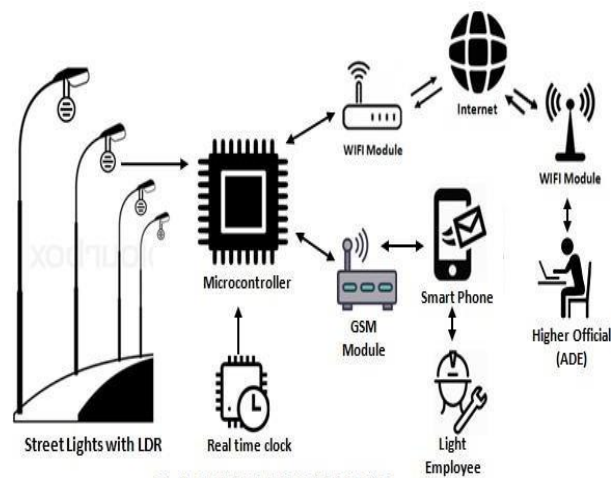


Fig 1. SYSTEM ARCHITECTURE

### A. Smart Ldr Unit

Our system is developed with smart design as each street light is embedded with a LDR (Light Dependent Resistor) that changes with the light intensity that bound on it. It helps to monitor the degradation of lights and responsible to intimate the controller in case fault issues.

### B. PIC CONTROLLER

In our system PIC 16F877A acts as the central controller that manages most of the functionalities of the system like sensor reading, alert generation and control. This is a lower power, high performance controller suitable for the embedded control application.

### C. WIFI MODULE

Our system uses Node MCU module, which is a firmware on ESP8266. It is an interactive inexpensive and open source portable wireless chip with complete TCP/IP stacks and controller potentiality. It takes responsibility for transferring the sensor readings to the web service.

### D. REMOTE APPLICATION

In our system, the IOT based remote application acts as the user interface through which the remote authorized user (ADE) monitors the street light entities and receives alerts on problem detection and control.

## 4. Implementation

Our system is a less expensive, user friendly and requires less effort to install and it also motivates the road users such as drivers, riders, pedestrians and the EB employees.



Fig2 Pictorial Representation of System installation

The above figure illustrates the pictorial representation of our system installation in which the LDR is fixed along with the street light to monitor the current status of the light and intimates the PIC controller in case of fault issues. The RTC is used for automated power ON/OFF lights according to the time. Each Street light along with LDR is considered as a node. In case of failure of any node intimates the authorized user (ADE) through Wi-Fi module and the system allows the ADE to instruct the EB employees through SMS via GSM module to fix the light within a period. If the fix is not done within the given time, a report is raised against the ADE to the higher official to enhance the immediate repair intimation of lights.

### 5. Integral Methodology

The working methodology of the system is depicted in flow diagram for each feature. Our System ensures safety of road users, remote monitoring of lights and immediate report mechanism through a less expensive system by the following significant features:

- [1] Detection of Street Light failure
- [2] Remote intimation and control
- [3] RTC based Automatic ON/OFF street lights

#### [1] Detection of Street Failure

On detection of street light failure through LDR intimation is made to the ADE through IOT technology. This functionality permits the remote user to monitor and control the street light faults.

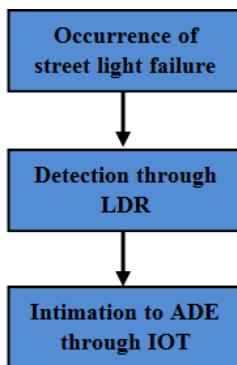


Fig 3 Detection of street Light Failure

#### [2] Remote intimation and control

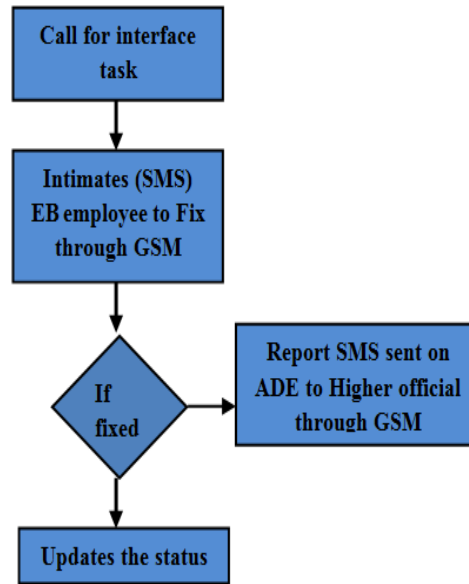


Fig 4 Remote intimation and control

On receiving intimation, the ADE call for interface task to instruct the EB employee via SMS through GSM to fix the light within a period of time. If the fix is not done on time, then a report SMS is sent against ADE to Higher official through GSM module. This feature ensures immediate repair intimation and control.

#### [3] RTC based Automatic ON/OFF street lights

By using the Real time clock along with PIC controller, the system lights are enabled to automatic power ON/OFF according to the programmed timing. This feature reduces the manual effort of the humans and the amount of electricity wasted at highways in a significant manner.

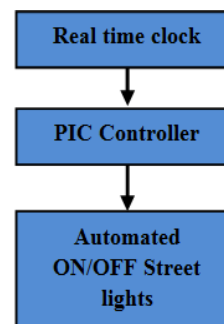


Fig 5 RTC based Automatic ON/OFF of street lights

### 6. Conclusion

At present, Street Lights are the major requirement in today's life of transportation and acts as the aid to police protection and enhanced sense of personal security. As per survey data

we can conserve greater than 47% of current consumed by the roads and highways. Our system majorly aims to eliminate the problem of constant manual monitoring effort and reduces the various possible risks of neglect of immediate repair works in a cost-effective manner. It clearly tackles many significant problems and assures vital features such as conservation of energy, remote monitoring and immediate repair intimation and control through a cost effective and user-friendly system.

## 7.Future Enhancement

IOT has the power to enhance and modernize the correct prediction of upcoming dangerous failures. Most of transportation issues at night are addressed and managed well through our system. The future enhancement scope can be focused by improving the present system with additional sensors, more dynamic user interface with real time interactive modules and voice alert modules that intensify the user practice, system performance and reduce the manual effort of human monitoring and control.

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