

**Smart Street Lighting System**

**(2020CSIOTMPID05)**

**by**

1. **Mahi Tyagi(2002901550014)**
2. **Sonia Verma(2002901550032 )**
3. **Vidhisha Kachawaha(2002901550037)**

**Under the Supervision of**

**Prof. Govind Kr. Rahul**

**Asstt. Professor**



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI )**

**ABESIT INSTITUTE OF TECHNOLOGY GHAZIABAD**

**Affiliated to**

**DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY**

**(Formerly Uttar Pradesh Technical University, Lucknow)**

**22 September, 2021**

| **Contents** | | |
| --- | --- | --- |
| **Chapter no.** | **Contents** | **Page no** |
| 1 | Abstract |  |
| 2 | Motivation |  |
| 3 | Problem formulation/Objectives |  |
| 4 | Methodology/ Planning of work  (Methodology will include the steps to be followed to achieve the objective of the project during the project development.) |  |
| 5 | Facilities required for proposed work  (Software/Hardware required for the development of the project.) |  |
| 6 | Conclusion |  |
| 7 | Bibliography/References  (Here specify the description of the study material referred for the development of the project.) |  |

**Chapter : 1**

Abstract

This project is about a smart lighting system that can control the street light efficiently by using sensors to dim and brighten whenever it is required. This system is based on the concept of IoT(Internet of Things). It helps to reduce the number of accidents that takes place on the roads and also saves a lot of power and electricity. It increases safety and provides more efficiency. It also provides a safe environment for the pedestrians during the night time by lighting up the place.

The system integrates technologies such as: Passive Infrared (PIR) sensor, Raspberry Pi and dimmable LEDs.

The feasibility study done by the team details the requirements and constraints considered in the design of the system, as well as a technical overview of the solution. Additionally, the successful implementation of a prototype further supports a possible large-scale development of the project. Finally, it aims to present an overview of a profitable and green solution to the energy consumption problem imposed by street lighting.

**Chapter : 2**

**Motivation**

Currently urban areas in the entire world are dealing with increasing energy consumption and carbon emissions, a known contributor to climate change. Due to inadequate dimming control and low efficiency, current street lighting is wasteful in terms of energy spending, accounting for a major part of governmental electricity costs. Therefore, it has become desirable and of great importance to design a new smart lighting system that is more efficient and environmentally friendly.

Due to a lack of „area-wise‟ study, standard tenders are issued on a „city-wise‟ basis, leading to high operational cost incurred on street lighting. Very often, one notices that the street lights stay on well past sunrise. This is because the lights are switched off based on a predecided time rather than lighting needs, which vary based on season and location of the city. There is a need for devising a well thought out way to prevent wastage of electricity. Perhaps, the government can think of implementing Automatic Street Light Control System using LDR (Light Dependent Resistor), which automatically switches off lights when sunlight fall on it.

**Chapter : 3**

**Literature Survey related to Topic of Mini Project**

| **SL No.** | **Paper Title** | **Authors** | **Year** | **Name of Publisher** | **Technology** | **Method** |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Smart Street Light | [**Yusaku Fujii**](https://www.researchgate.net/scientific-contributions/Yusaku-Fujii-15994070)**,**  [**Noriaki Yoshiura**](https://www.researchgate.net/profile/Noriaki-Yoshiura-2) | 2013 | Research Gate | Sensor |  |
| 2 | Smart Street Lighting System | [Siddarthan Chitra Suseendran](https://ieeexplore.ieee.org/author/37086846291); [Kishore B. Nanda](https://ieeexplore.ieee.org/author/37088828318); [Josephus Andrew](https://ieeexplore.ieee.org/author/37086848030) | 2019 | IEEE | Sensor |  |
| 3 | Smart Street Light | Monali Y. Khachane | 2018 | (IJERCSE) | Sensor |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |

**Chapter : 4**

**Literature review**

(with cons and pros of existing methods in tabular form)

Automatic Street Light Control System Using Microcontroller . This project aims at designing and executing the advanced development in embedded systems for energy saving of street lights. Nowadays, human has become too busy, and is unable to find time even to switch the lights wherever not necessary. This project gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated. In this project the two sensors are used which are Light Dependent Resistor LDR sensor to indicate a day/night time and the photoelectric sensors to detect the movement on the street. The microcontroller PIC16F877A is used as brain to control the street light system, where the programming language used for developing the software to the microcontroller is C-language . Intelligent Street Lighting System Using Gsm: The system comprises of server, GUI to display and nodes which are micro controlled processed with embedded sensors measuring different parameters. Each node in the network is linked to the main server via a protocol. The analog data sensed by the sensor is converted in digital form, processed by microcontroller and then sent to the server. The master controls all the slaves .The other nodes sends the data to master and the master collects the data and further sends to concentrator and server where the data is monitored and on necessary alterations process it to switch On/Off the nodes devices. Intelligent Street Light System using RF Transmission The proposed prototype of intelligent street light can detect daylight and vehicles and vary the intensity of the LED based street lamps as per the traffic flow. It can also help in monitoring of street light system and fault detection through RF wireless technology. If intelligent street light is designed and installed in the cities, then, lot of power can be saved and this will also minimize the cost of maintenance over traditional wired systems. The system is versatile, and can be extended as per user needs.. **EXISTING SYSTEM** Currently all the street lights are controlled manually.Street lights are not switched on/off according to need due to human mistakes. **PROPOSED SYSTEM** System involves efficient street light control system to provide wireless access for controlling it. Server is used to control street light. Low cost internet technology is used for remote access .

**Chapter : 5**

**Problem formulation/Objectives**

**Energy Prices and Carbon Emissions :**

Conventional street lighting systems use constant illumination lighting which leads to high energy consumption accounting for up to 60% of a municipal government’s total electricity expenditure. Furthermore, forecasts show that the energy spending for street lights is likely to increase over the next few years as the demand and price for electricity increase. Many urban areas are currently facing high carbon emissions due to public lighting, which are a known contributor to climate change. For example, in Harrow, street lighting consumes 6,551,500 kWh of electricity, which leads to emissions of around 3900 tons of carbon annually .

**Inadequate Dimming Control :**

The current street lighting policy requires all lights to be fully operational during the entire night, due to security reasons and inadequate dimming technology. This leads to unnecessary energy use, lowers the lamps’ life and causes significant light pollution. Considering the above problems of conventional lighting methods, it has become increasingly important to develop a radically new system that is both environmentally friendly and cost effective.

**Current Solutions :**

There are 3 options available to reduce energy use caused by conventional street lights. These are: Variable Lighting, Part Night Lighting, and Light Trimming.

**Chapter : 6**

**Methodology/ Planning of work**

Automated lighting system using Raspberry Pi is a flexible system which reduces electricity bills and carbon emissions. The conserved energy can be generated in the electrical grid and this energy can be used by another individual for different purpose. The system can undergo slight modifications in the hardware and software for the addition of a new module. This system can be used in residential, institutional, commercial and other industries to conserve energy and to reduce the cost of consumables on yearly bases. .The proposed system needs no manual operation for switching OFF lights when a person exits from a room A Micro SD card is inserted into the slot on the board which acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output. This gives us all of the basic abilities of a normal computer. It also has an extremely low power consumption of about 2 watts (approximately equivalent to a mobile charger). The Raspbian operating system is a lightweight version of Linux that is optimized for this low powered device. With the help of Raspberry Pi we can program the circuit board as per our requirements in Python language [7]. By using a web camera we can capture the images and then compare these images with the human patterns that are stored in the OpenCV (Open source Computer Vision) software [8]. If it fails to match then power supply is disabled. There is no need for any sensors to be installed for this proposed system.

A web camera is used to capture the images and then compare these images with the human patterns that are sorted in the OpenCV software. If it fails to match then the power supply is disabled and lights are turned OFF. This can reduce the bill to the extent of 50%.

**Chapter : 7**

**Facilities required for proposed work**

(Software/Hardware required for the development of the project.)

Our system is currently designed for a residential area where the lights are on average 15-45m apart . The widths of the roads are on average 10-15m wide. Therefore the sensors are required to have a range greater than 15m, and a viewing angle as close to 180 as possible, to provide adequate coverage of the road. The casing for the sensor will need to be tamper proof and resilient to all weather conditions. The minimum Ingress Protection (IP) rating required is 65, which means the casing must be dust tight and resilient to water jets. The IP rating applies to all parts of the lamp , . Another requirement is for the lights to only function at night. This can be achieved by using existing methods present in the current system such as timers or photo-detectors. These detect light and turn on the lights when it is dark.

**Sensor :**

1. **PIR**
2. **Ultrasonic Sensor**

* **Raspberry Pi**
* **LDR Input**
* **IR Sensor**
* **LED**
* **Arduino UNO**

**Bibliography**

[1] Shivakumara Tuppada “BMS Institute of Technology and Management” (24/05/2018)

[2] Roxana Alexandru, Vijay Gami, Vivek Aggarwal

[4] Jiaxi Sun, Pei Tu, Iulian Ionascu, Niccolo’ Lamanna

[5] Monali Y. Khachane Vol 5, Issue 2, February 2018

**References**

[1]http://ijariie.com/AdminUploadPdf/SMART\_STREET\_LIGHT\_SYSTEM\_ijariie5537.pdf

[2] Monika Vaghela, Harshil Shah, Hardik Jayswal et al., "Arduino based auto street light intensity controller", *Invention Rapid: Embedded Systems*, vol. 2013, no. 3, pp. 1-4, 2017.

[3] https://ieeexplore.ieee.org/document/8723949

[4]J. Higuera, W. Hertog, M. Perálvarez, J. Polo and J. Carreras, "Smart Lighting System ISO/IEC/IEEE 21451 Compatible", *IEEE Sensors Journal*, vol. 15, no. 5.[5] <http://centrallibrary.cit.ac.in/dir/Project%20Report/2018/Diploma/ETE/Smart%20street%20light%20system.pdf>

[6] Bruno, A., Di Franco, F. and Rasconà, G. 2012. Smart

street lighting. EE Times

http://www.eetimes.com/design/smart-energy-

design/4375167/Smart-street-lighting