A Review of Automatic Irradiation Adjustment Based LED Street Light with Vehicle Movement Detection

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Abstract

In present day, the maintenance of streetlight is one of the major problem for electricity boards in India. Also, there is scope for saving power during off peak time i.e. in from around midnight 12AM to 04AM in the morning. The methods that are currently used to maintain and control the street light is more complex and uneconomical. In this paper a new technique is proposed to control the intensity of LED Street lights using LDR, and to automate street lights using PIR sensors, and LDRs, resulting in power saving. Implementation is done using PIC controller. This paper presents a smart street lighting system which provides a safe night time environment for all road users and pedestrian. The main objectives are to build an automation system of street lighting using a low-cost microcontroller which is PIC and to achieve energy-saving. Light Emitting Diode (LED) is represented as the light module. This system is controlled according to the specific mode. These modes are controlled by two sensors which are Light Dependent Resistor (LDR) and Passive Infrared (PIR) sensor. This system can automatically turn on and off the lights according to traffic flow. This system operates during the night and the focus is only for the one-way road at a junction. Street light will be on when only there is road user otherwise, it will turn off. This design can save a great amount of electricity or energy consumption compared to conventional street lights that keep alight during nights. Moreover, the maintenance cost can be reduced and lifespan of the system will increase. As the result, the system has been successfully designed and implemented as a model system

Key Words: PIR, LDR, Streetlights, Power supply, microcontroller

I. INTRODUCTION

In a city street light is one of the major power consuming factor. Even in day time when there is no requirement of street light it is frequently seen that these light remain on violating the energy conservation rule. This continuous lighting pollutes the environment as well as increase the tariff of the electricity. The vital use of street light is in public transportation during night time or when the day light is very feeble. Therefore the design an controlling of street lighting is an important area of work for maintaining safe transformation in or daily life. A number of researches have concentrated on the work to reduce the energy consumption an also to reduce environment pollution. A report was made to present an efficient street lighting system with reduce power consumption in comparison to classical lighting testing system.by study various street lighting lamps, as incandescent, CFL, High-intensity discharge and Light-Emitting diode showing that the LEDs are more efficient than other lighting system.

Nowadays, street lighting is essential for all areas whether urban or rural since people know that street light is an alternative during the day night in order to keep the safety of the road users. Street lights management control is quite simple, yet as the urbanization, the number of streets increased rapidly. The traditional lighting street lamp on-off control is based on chronological time, which may inefficient and inflexible. The existing street lighting control system used timer and photocell. The timer is set up to turn on the street light within 7.00 p.m. until 7.00 a.m. Meanwhile, photocell reacts based on the presence of light or electromagnetic energy. In a rainy day or when the light intensity is low, the photocell will energize the contact and automatically turn on the street lights. This system is quite inefficient since the condition of day and night is uncertain. Sometimes at 7.00 p.m. the day is still bright but the street light is already switched on. In contrast, at 7.00 a.m. the street light is already switched off although the day is still dark. Thus, this system is quite inflexible. The public lighting is designed to meet the needs of local communities, such as the rising number of road and sidewalk traffic safety [2]. In order to surge the efficiency, a modern street lighting control system must be able to adapt the light level intensity to determine the optimum energy consumption level. However, power wastage will happen if there is no user or vehicles use that road especially in rural areas at midnight. Figure-1 shows the power

consumption in the urban city, traffic routes and highways from 7.00 p.m. till 7.00 a.m. The graph showing the use of road reduced beginning at 1.00 am until 7.00 am.

This Street Lighting Automation System is an intelligent system which provides the flexible and efficient system in order to control the street lighting autonomously. This system is controlled by two sensors which are PIR sensor and LDR sensor. LDR sensor is used in order to detect darkness to activate ON/OFF switch. Also new technique to automate their system using both sensors. With the presence of these sensors that detect the intensity of light and used to detect the presence of humans or cars then, it turned on the system automatically. The main controller for this project is using an PIC

The main reason LED was chosen is to reduce the energy consumption as it were very effective in lighting and low light decay in the lifetime. The LEDs have about 110° light emission angle. Meanwhile, the conventional lamps usually have 360° and need a reflector to direct the light beam to the target street lighting.

II. RELATED WORK

In [1] the design has to propose energy efficient to smart street lighting system using low cost microcontroller. The main objective is to design energy efficient smart street light for energy conservation is existing of rural area, urban area and exclusively for smart cities. In [2] the design has explores this combination on of a solar PV with MPPT supplying power to a street light equipped with LEDs with automatic intensity control through a DC-DC converter. In [3] the design has represents a remote street light system with intensity control based on LED and wireless sensors network like ZIGBEE. The system is automatic controlling of street light according to seasonal variations, which include auto loop system with respective time dependent, while vehicle crossing the road. It will give large impact of saving electricity.

In [4] the design has to describe about efficient automatic street lighting system using graphene coated (Light Emitting Diode) LED. The intensity of the graphene coated LED light is adjusting based on the requirements using LDR and PIR sensors via controller. The graphene coated LED and by controlling arrangement it benefits us by conserving more energy. In [5] the design has work emphasizes on the conservation of energy as well as on the reduction of environmental pollution. The system also detect the movement of vehicles and interrupts the

system to increase the intensity of light on the road. In [6] the paper propose an energy-free system for street lighting as there is no power demand from the grid. In [7] this street light system also include a time cut-out function and an automatic control pattern for even more electricity conserving, namely when vehicle pass by the light will turn on automatically later turn off .this design can save a great amount of electricity compared to street lamp that keep a light during night. In [8] the safety contributes in creating a street lighting system which focuses on solving the issues pertaining to environment, energy and public safety. In [9] the advancement in technology, automated system are being preferred over manual systems. The automated system refers to smart street lighting system that adapts to movement. In [10] the hardware development of a street lighting monitoring and control system. The dimming circuit that uses a PWM (Pules Width Modulation) signal, the vehicle detection circuit and the circuit for detecting potential malfunction. Another aspect that has been analyzed is the circuit for the detection of possible malfunction that are reported to the control center, thereby helping to reduces maintenance costs.

III. CONCLUSIONS

It can be concluded that a proper designed to optimize the management of street lighting in populated areas. [1] The smart solar LED street light system provides better illumination, optimum usage of electricity with reducing operational and maintenance cost after installation compare to high pressure sodium lamp and others. [2] This paper has presented a solar PV based street lighting system with automatic intensity control that can effect a power saving of up 50% during traffic - free hours of the road. [3] This paper has presented the idea and design of an efficient street lighting system using graphene coated LED. [4] It protect the environment by reducing carbon di-oxide emission and toxic chemicals. [5] The design can be modified to store the status of the traffic over a certain period of time in a memory module. [6]The proposed system conserver power by two ways the source and the load the source is a PV array that is a clean renewable energy. [7] Street lights provides an effective measure to save energy by preventing unnecessary wastage of electricity caused due manual switching of street light when it is not required .the system is versatile extendable and totally adjustable to user needs. [8] The advantages of this system are that, huge amount energy can be saved without having an impact on the visibility of the road. [9] It provides a proficient and brainy automatic street light control system with the help of PIR sensor and LDR, which also helps to cut down manual switching of streetlights when it’s not required. The hardware development of the street lighting monitoring and control system. One way to detect movement is to integrate a PIR (Passive Infrared Sensor) within the system. The employment of the PIR sensor for vehicle detection has a number of disadvantages due to the environment in which it will operate.

REFERENCES

[1] Maheshkumar Narsayya Bhairi, Design and Implementation of Smart Solar LED Street Light, International Conference on Trends in Electronics and Information ICEI 2017, 2017 IEEE, 509-512.

[2] Deepu Vijay M., Kamlesh Shah, G. Bhuwaneshwari and Bhim Singh * LED Based Street Lighting with Automatic Intensity Control using Solar PV IEEE Ias Joint Industrial and Commercial Power System/Petroleum And Chemical Industry Conference (ICPSPCIC) 2015, 197-202.

[3] Prof. Simta A. Bhosale, Tejaswini, 2018 International Conference on Information, Communication, Engineering and Technology (ICICET), Aug 29-31 2018, 01-04.

[4] M. Abdul Kader Riyaz, S. Arun Jayakumar, M. Abdul Hameed Sharik, Graphene Coated LED based Automatic Street Lighting System using Arduino Microcontroller Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI-2017), 2017 IEEE, 1555-1560.

[5] Biclam Roy, Aditya Acharaya K, Roy, Sudip Kuila, Jayita Datta, A Smart Street-Light Intensity Optimizer.

[6] Mokhtar Ali, Mohamed orabi, Desgin and Development of Energy-free solar street LED Light system

[7] Archana M, Mahalashmi R, E-Street LED Powered intelligent street lighting system with Automatic Brightness Adjustment Based on climatic condition and vehicle movement, International Journal of Advanced Research in Electrical, Electronic and Instrumentation Engineering ,Vol.3Special issue 2,April 2014,60-67.

[8] Supriya Kamoji, Dipali Koshti, Joshua Noronha, Edison Arulraj, Edwin Clement, Deep Learning-based Smart Street Lamps – A Solution to Urban Pollution, International Conference on Inventive Research in Computing Application (ICIRCA-2020), Sept 02,2020, 478-482.

[9] Dev V. Savla, Heet R, Savla, Krishna B. Kansara, Brainly Streets An Automatic Lighting System, International Conference on Inventive System and Control (ICISC 2018) ,16-21.

[10] Lavric Alexandru, Popa Valentin, Hardware Design of a Street Lighting Control System with Vehicle and Malfunction Detection, The 8th International Symposium on Advanced Topics in Electrical Engineering, May 23-25,2013.