BRAINY STREET LIGHTS

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Abstract: The street lights are consuming a remarkable portion of electricity in present scenario. The need for conservation of energy has become the most important domain in current research as the demand for non-conventional resource is increasing. The existing street lights are based on old technologies and therefore are not efficient, optimized and lead to the consumption of more power. Because of this, we find the street lights glow even when there is no automobile movement or pedestrians etc. on the road. The idea enlightens an intelligent method for optimizing street light intensity to reduce CO2 emission which pollutes the environment. This system brings out a new technique to implement the project with certain pattern of installing the sensors and other equipment to make it cost effective. Hence this in turn would save energy as well as reduce the environmental pollution.

Index Terms **- LDR, Arduino, IR Sensor, LED, Resistor.**

I. INTRODUCTION

Nowadays, consumption and conservation of energy has become very important in our life. After several surveys, it has been known that street lights consume most of the energy as compared to other sources such as business places, offices and household areas. Most of the time, it is found to be glowing all day. This leads to more emission of carbon dioxide into the atmosphere which further results into global warming. The manual street light system consumes a lot of energy; hence an automated and smart street light system is required. In our paper, we introduced a smart technique to get avoid above problems. Introduction of LED's consumes low power instead of bulbs and fluorescent lamps, enabling the IR motion sensor to sense the motion of the objects such as human body, pedestrians, etc. And enabling automatic turning ON/OFF or dimming the lights when required. The effort is made to reduce consumption and conserve the energy, reducing global warming. Section II details about the literature survey done by analyzing various papers. Section III describes the working of the system and section IV details the conclusion of the project.

II. LITERATURE SURVEY

This section describes about the various work done by different people about the topic. In Brainy Streets-An Automatic lighting system, Dev V. Savla, Dev V. Savla [1] introduced a smart lightning system. They used Arduino UNO as a microcontroller, IR sensor as a motion sensor, LDR to detect the intensity of day light and low power LEDs. The system either completely switches ON/OFF the lights during the presence of moving objects at night.

A Smart Street – light Intensity Optimizer [2] describes a smart way of consuming energy. The components used were Arduino UNO as a microcontroller, LDR for detecting the intensity of daylight, proximity sensor to find any obstacle if present, RTC to have the timing and LCD to show the time. Combination of relays were used to administer the intensity of street light.

Smart street light system with energy saving function based on the sensor network [3], Yusaku Fujii and others developed a technique in which lights are kept ON when required and OFF when not. They used LED lights, a motion detector, a brightness analyzer and a short-range communication network. With the use of XBee and sensor the arrival of pedestrians or vehicles are detected, and lights are turned ON/OFF accordingly.

XBee network has been utilized for controlling the lights using various frameworks and network mode. They consider energy on power adjustable LEDs, motion and intensity detectors as well as XBee based communication modules to detect and control light.

Energy efficient Intelligent Street Lighting System using Zigbee and Sensors [4], XBee network has been utilized for controlling the lights using various frameworks and network mode. They consider energy on power adjustable LEDs, motion and intensity detectors as well as XBee based communication modules to detect and control light.

Sensor Based Smart Lighting: A Survey [5] have surveyed on smart lighting which provokes the idea to advance low cost, adaptable, easy to implement, wireless sensor based smart lighting system which involuntary adjust the level of intensity for the conservation of energy which satisfies the user.

Low Power Consumption of LED Street Light Based on Smart Control System [6] have proposed a led street light build upon smart control system working on pulse width modulation which can be administered by user or environmental condition like sunlight condition, traffic conditions etc. The limitation of this system is that the lights would be switched on during the night time even if there are no vehicles or pedestrians on the streets.

Smart Streetlight Using IR Sensors [7] have implemented automated street lightening system using motion sensors which detects the movements of objects. Using this they developed an idea to switch ON the street lights when any movement is detected and remain OFF which makes power consumption efficient. The drawback of this system is that it also keeps the lights ON during the day (in the presence of sunlight) which should be avoided.

ZigBee Based Remote Control Automatic Street Light System [8] implemented a ZigBee depended Remote Control Street Light System. The system is developed using the ZigBee modules which helps in controlling the lights and detecting the defective lights. It also describes about a smart way that makes automatic decisions for ON/OFF examining the automobile movement or pedestrian and the surrounding environment using PIR sensors.

III. ARCHITECTURE FOR BRAINY STREET LIGHTS

The proposed architecture has four main components viz. LDR, IR motion sensor, Arduino microcontroller and LED street lights. The details of all the components along with their interactions has been described.

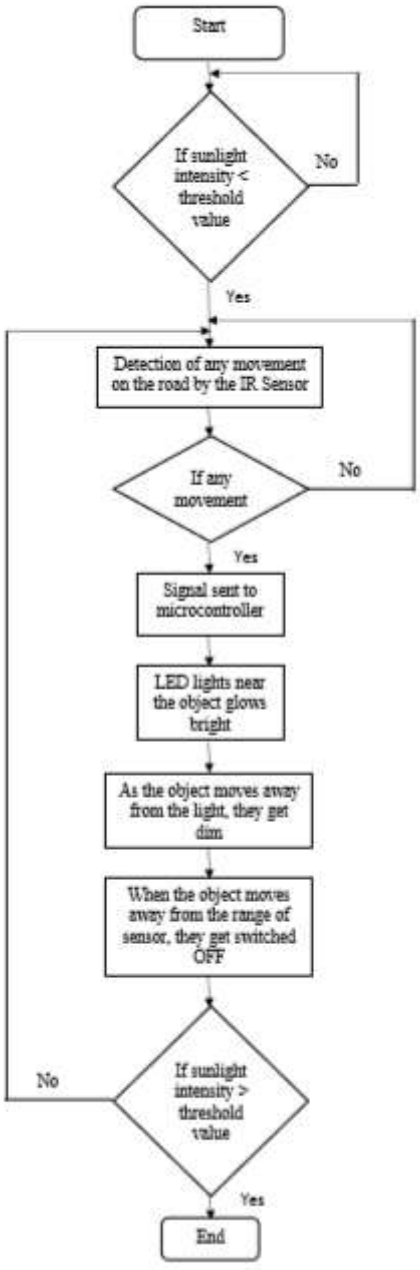

Fig. 3.1: System Architecture for Brainy Street Light

3.1 LDR

LDR is used as brightness sensor. The toggling action of light is depended on intensity of light. The brightness is measured by LDR. When there is enough light the resistance of LDR will be high and when the intensity gets low that is when it turns dark, the resistance gets low. The value which is manually set by the user determines when the street lights are required to be turned ON. The lights glow till the sunlight intensity gains. This reduces a lot of energy consumption.

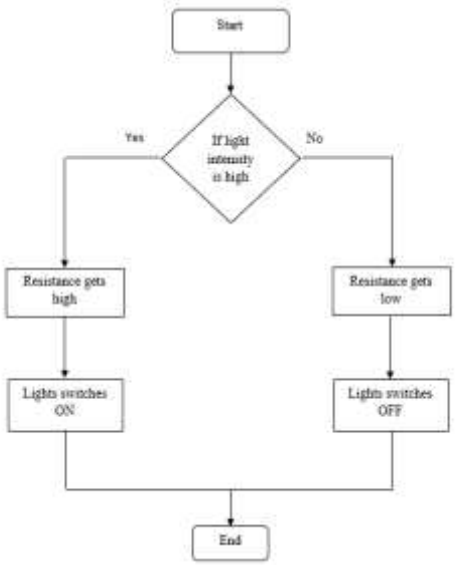

Fig. 3.2: Block Diagram for LDR Module

3.2 IR – motion sensor

The IR motion sensor detects if there is some object movement on the road. When there is sunlight, if at all there is any movement of object, the lights remain OFF as it is not required. During the night, if the sensor senses motion, it switches ON the light and the brightness of light depends upon the distance of the object from the sensor. The dimming of light takes place depending upon the distance of object from the sensor.

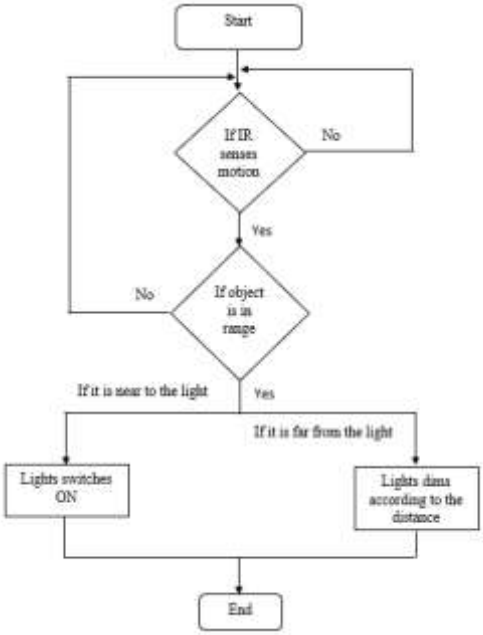

Fig. 3.3: Block Diagram for IR Module

When there is no movement of objects, the lights remain OFF. The sensors are placed in such a way that it is not necessary to place the them on consecutive street light. The range of the sensor is normally 4-5 meters. Hence installation of no other sensor is required for every 5m. And a sensor is required at the junction of the road. One sensor would decide the brightness of the subsequent street light in its range. As the object reaches near the sensor, it glows for the maximum intensity and after a particular distance each

subsequent light glow with different intensity. The intensity gets maximum when the object approaches each street light and decreases when it moves away from it. And finally switches OFF when it goes out of its range.

3.3 Arduino UNO microcontroller

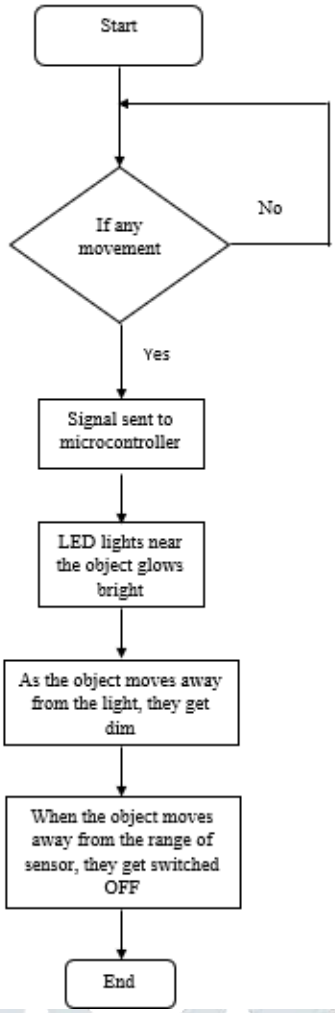

Fig. 3.4: Block Diagram for Arduino Module

Arduino acts as a heart of the system. It is responsible for the toggling and dimming action of street lights. When any object movement is detected, the signal is sent by the sensor to the microcontroller that is Arduino UNO. The Arduino UNO then in turn switches the lights ON and dimming is decided based on the distance of the object from the sensor. While no detection of movement, it keeps the lights OFF as no signal is sent by the sensor to it. And instead of detection of movement by the sensor during daylight, the board controls the light and keeps them OFF.

3.4 LED Lights

While LED Lights are used to reduce the over consumption of energy. It also conserves huge amount of energy compared to all other lights. The consumption of energy is very less compared to all other lights. It has long service life with best efficiency. It has efficiency of 80% to 90% as compared to incandescent, meta halide or mercury lamps, fluorescent lamps, CFL, HID (High intensity discharge lights), LPS (Low Pressure Sodium) and HPS (High Pressure Sodium).

It has improved safety and is physically small with great color rendering index. They generate directional emissions with tremendous design flexibility. These are solid state lights with dimming capability. These do not have issues with frequent switching and provides instantaneous turning ON. They are environmentally safe and produce virtually zero ultraviolet emissions and operates well in hot and cold temperatures with low voltage.

IV. RESULT ANALYSIS

The proposed system is an implementation for real world problems. It is found that the current consumption of the simulator is minimum. The current consumption of energy of proposed system is compared with the existing system. It is found that the energy is conserved more than three times as that of the existing system.

The extra energy used by the existing system can be used in other purposes as well. This also reduces the evolution of harmful carbon dioxide in atmosphere and therefore reduces global warming. It gives an optimized solution for the conservation of energy. The use of LED further reduces the consumption of light and produces an effective result.

Illustration 1 - Considering 25% Traffic Density In this example we consider that automobile traffic and pedestrians are present for only 25% of the overall time.

Table 4.1: Power Consumption for 25% Traffic Density

Time	Our Proposed System	Traditional Street Light System
15 mins	20	100
30 mins	40	200
45 mins	60	300
1 hour	80	400

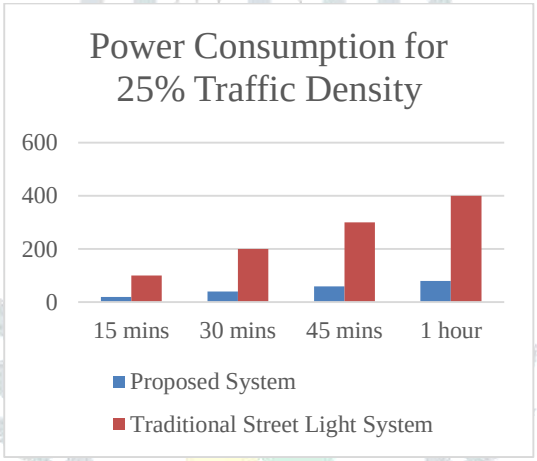

Fig. 4.1 Power Consumption for 25% Traffic Density

Illustration 2 - Considering 50% Traffic Density In this example we consider that automobile traffic and pedestrians are present for only 50% of the overall time.

Table 4.2: Power Consumption for 50% Traffic Density

Time	Our Proposed System	Traditional Street Light System
15 mins	40	100
30 mins	80	200
45 mins	120	300
1 hour	160	400

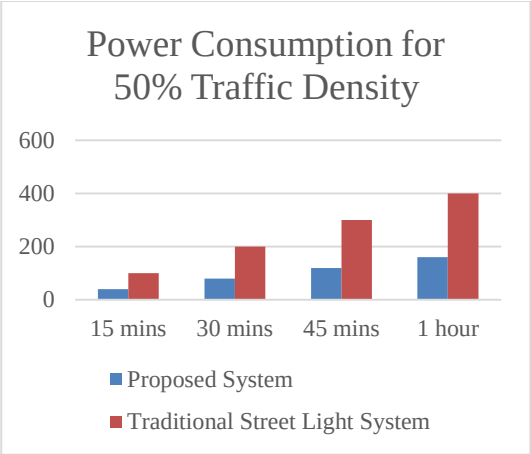

Fig. 4.2 Power Consumption for 50% Traffic Density

Illustration 3 - Considering 75% Traffic Density In this example we consider that automobile traffic and pedestrians are present for only 75% of the overall time.

Table 4.3: Power Consumption for 75% Traffic Density

Time	Our Proposed System	Traditional Street Light System
15 mins	75	100
30 mins	100	200
45 mins	125	300
1 hour	150	400

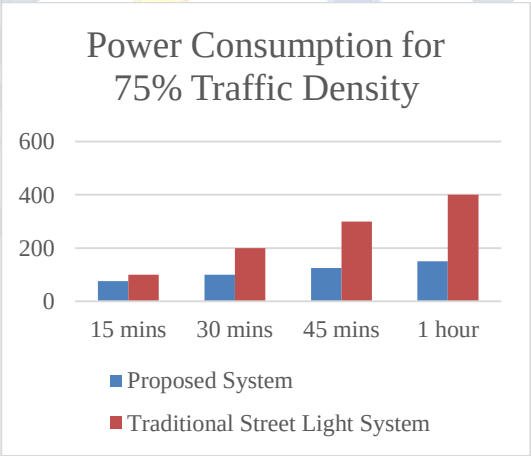

Fig. 4.3 Power Consumption for 75% Traffic Density

V. CONCLUSION

After analyzing several papers and after implementing our project, we are concluding that this is a cost effective, eco-friendly, practical and safest project which proves that a huge quantity of energy certainly can be conserved, and the consumption gets reduced. It provides a smart technique to optimize the intensity of light with minimum number of LDR and IR sensors. It is totally adaptable by the public and can be implemented in every city. The man - made problems of switching the lights is reduced here.

In future, we can further extend the project by implementing solar street lights using rechargeable batteries. The proposed theory is implemented for a linear or straight road and this in future will be updated for junctions and cross roads. The batteries would get charged in the existence of sunlight and the saved energy can be used at dark to glow the LED. This in turn would further reduce the energy consumption.

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REFERENCES

[1] Dev V. Savla, Heet R. Savla and Sr. Lecturer Krishna B. Sara, "Brainy Streets – An Automatic lighting system", SBMP, Mumbai, India devsavla@gmail.com, heetsavla99@gmail.edu, kansarakrishna@rediffmail.com, 978-1-5386-0807-4/18, IEEE 2018

[2] Bilam Roy, Aditya Acharya, Tanmoy K. Roy, Sudip Kulia and Jayita Datta," A Smart Street – light Intensity Optimizer", Department of Applied Electronics and Instrumentation Engineering, Guru Nanak Institute of Technology, Kolkata, West Bengal, India, jayita_datta63@rediffmail.com

[3] Yusaku Fujii, Noriaki Yoshiura, Akihiro Takita and Naoya Ohta, "Smart street light system with energy saving function based on the sensor network", Department of Electronic Engineering, Department of Information and Computer Sciences, Gunma University, Saitama University, Japan

[4] Richu Sam Alex, R NarcissStarbell "Energy efficient Intelligent Street Lighting System using Zigbee and Sensors", International Journal of Engineering and Advanced Technology (IJEAT), Vol-3, Issue 4, April 2014.

[5] Vinutharani A1, C.K Vanamala, Sensor Based Smart Lighting: A Survey, International Research Journal of Engineering and Technology (IRJET), Vol.03, Issue04, April 2016

[6] Prof. V. K. Bhangdiya Dept. of Electronics and Telecommunication, Low Power Consumption of LED Street Light Based on Smart Control System, International Conference on Global Trends in Signal Processing, Information Computing and Communication, Issue-2016

[7] SindhuA.M, Jerin George, Sumit Roy, Chandra J Dept. of Computer Science, Smart Streetlight Using IR Sensors, IOSR Journal of Mobile Computing & Application (IOSR-JMCA), vol.3, Issue2, March-April 2016.

[8] Srikanth M, Sudhakar K N, ZigBee Based Remote Control Automatic Street Light System, International Journal of Engineering Science and Computing (IJSEC), Issue-June 2014

[9] http://www.instructables.com/id/AuotmaticStreet-lights-control-using-LDR-and-Ardu/

[10] M. Popa, C. Cepiúca, "Energy Consumption Saving Solutions Based on Intelligent Street Lighting Control System", U.P.B. Sci.Bull., Vol. 73, April 2011, PP. 297-308.

[11] D. A. Devi and A. Kumar, Design and Implementation of CPLD based Solar Power Saving System for Street Lights and Automatic Traffic Controller, International Journal of Scientific and Research Publications, Vol. 2, Issue11, November 2012.