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Smart Street Lamp System

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Abstract: Smart Street Lamp System uses IOT hence they are fully automated. In most of the states in India, Street Light system are controlled manually. In our proposed project the condition for street lamps is determined by surrounding light conditions. Using surrounding conditions, it is determined whether the street lamp should be powered ON or OFF. The primary objective of Smart Street Lamp System is to preserve the amount of energy that is being consumed by the traditional street lamps. When the IoT based Smart Street Light system is in well-lit environment it adjusts the lamps to shut down automatically, and power them ON when it detects less lightning conditions. The light intensity is adjusted by the environment to match the conditions. The energy is also conserved at night time also. As our project will be using IR sensor, which will detect movement of any objects or cars or vehicles in the surrounding, then the system will allow the lamps to glow more than usual. The intensity will be increased automatically by detecting the environmental conditions such as peoples, cars, animals, etc. When no one will be around at night, the LED lamps will glow in dim light Thus, the energy is conserved and it does not distribute the energy where it is not needed.

Keywords: IR sensor, LDR Sensor, LED Bulbs, Arduino kit. IoT

I. INTRODUCTION

Essentially, street lighting is one of the most important parts of the city's infrastructure. The main task of a street light system is to light up city streets during the dark hours of the day. Previously, the number of roads in the city and town was very small, but now due to increase in population and technology, the infrastructure of country needs to be increased. Therefore, automated street lights are extremely important.

There are a number of factors that need to be considered in order to build a IoT based Smart street lighting system such as night-time security of public and road users, providing affordable lighting system, reducing use of energy resources and reducing the impact on the environment. Initially, street lights were handled manually where every street lamp would have a control switch. It was called the first generation of road lightning. After that, another method used was the optical control method which uses a large sodium lamp in their system. It is evident that optical control method is widely used in the world today. Due to technological advances in modern times, street lighting can be categorized according to the installation, operation and use of it. For example, traffic light, street lighting and lighting of urban areas and public facilities. The drawback of traditional street light system is that in many places lights are illuminated until the sun rises, even when they are not really needed, causing wastage of the electricity IoT based Smart Streetlight system works by implementing the visual control system with the use of a sensitive light dependent resistor (LDR) which controls the street lamps and are powered ON or OFF automatically at the evening and dawn respectively and during night times the IR sensor is used to control LED lamps. IR sensor will scan the surrounding by infrared rays and if any objects, person or vehicle is found, the LED will glow dark. Whole system will work automatically without any human interference. After setting up the IoT based Smart Street light system the government will be able to monitor the log report of the Smart Streetlight system for any security or technical purpose.

A. General Objective

To layout and obtain a project on "Smart Street Lamp System."

B. Specific Objective

To layout and obtain a project that will monitor surrounding data using IR sensor and monitor day and night using LDR sensor

C. Problem Statement

1. To covert traditional street light system automated
2. To save energy by reducing the use of electricity in day and night

The paper consists of different sections, in which each section defines differently about the project. So, (section II.) includes the proposed methodology in which the design of the project is discussed, the (section III.) includes the system requirements, in which the component names are described, the (section IV.) includes the hardware requirements, in which there in information about each component used in the project, the (section V.) includes the software

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requirements, the (section VI.) includes the comparative study, which specifies the comparison in between the reference papers and the project, the (section VII.) includes the results, the (section VIII.) includes the discussion and future scope of the project, the (section IX.) includes the conclusion of the project and the (section X.) includes the references.

II. COMPARITIVE STUDY

To sustain energy in street lights we need new and more intelligent systems that will provide us with the necessary lighting conditions and simultaneously reduce the energy consumption. Review of papers based on conservation of energy, solar powers-based lights, PIR sensor-based lights, more energy consumptions-based system, etc. are been reviewed below:

According to research paper [4], they made use of solar energy, to power up streetlamps. The paper suggests that with the use of light dimmer and other sensors approximately 15% -20% energy is saved. As human interference has been reduced the roads have become much safer. With the use of LED, the cost of repairs and rapid replacement of standard lights have also been reduced. The current sensor measures the current change and a comparative study of a single traffic light is performed. With the exhaustion of non-renewable resources, the negative impact on the environment and the need for automation, there is a need for a new range of Smart LED Street lights. The model proposed here is just the beginning. Using clean energy can be added to a solar panel that will provide power when the power is out. We can switch to solar panels to provide power during the night. A central monitoring system can also be introduced where all data from the sensors can be stored and used

According to research paper [3], it aims to demonstrate the evaluation and analysis of the proposed system. A feasibility study by the team describes the needs and constraints considered in the design of the system, as well as an overview of the solution. In addition, the successful implementation of a particular type supports the major development of the project. Lastly, it aims to introduce a holistic view of a profitable and green solution to the energy-saving problem set by street lighting. Urban areas around the world are facing increasing energy consumption and carbon emissions, which have a known impact on climate change. Due to insufficient blurring and low efficiency, the current light on the roads is detrimental in terms of energy use, accounting for a significant portion of government spending. Therefore, it has become a desirable and very important factor to design a new efficient and environmentally friendly lighting system.

According to research paper [1], street lighting system, where light is needed and illuminated when not needed. Currently, worldwide, most electric power is used by street lights, which are automatically turned on when it is dark and automatically turns off when it is light. This is a major pollution of the world and needs to be addressed. Our street lighting system consists of an LED light, a light sensor, a travel sensor and a short-distance communication network. The lights come on before pedestrians and cars arrive to turn off or turn off the electricity when no one is around. It will be difficult for pedestrians and motorists to separate our street lights from standard street lights, because our traffic lights turn on before they come.

According to research paper [5], The current research work is done to design and make high-quality improvements to embedded road energy saving systems. In India in many places a street lighting system is installed and maintained by the municipality. The evening before sunset the streetlights are on and off the next morning. Another feature of automatic timing is also the use of street lighting. In a few places after midnight all street lights are turned on. All of these situations end up wasting energy. To avoid problems associated with the street lighting system, a fully functional automatic system is recommended to perform ON and OFF functions only if required. And the system is smart enough to contact the municipal office if there is a need for adjustment. The proposed system is built using Arduino UNO and Bluetooth devices. Light Dependence Resistance (LDR) and Motion Sensors are used to design the system. The proposed plan has successfully achieved the design objective.

According to research paper [2], it shows use of PIR sensor which is costly. The paper also suggests that using these two ZigBee ideas and WSN's - PIR sensors can make energy more efficient, lower consumed street light systems. There is an easy saving and a high level of data transfer from the device to device in defined systems. ZigBee wireless communication technology communication between multiple devices in WPAN (Wireless Personal Network Network). Zigbee is used in devices where the data rate is low, long battery life, and secure communication is required. The Wireless Sensor Network (WSN) is a small collection of electronic devices containing a controller, IRF transceiver and sensors.

According to research paper [6], they monitor the activity of IoT devices which is installed in city such as traffic lights, CCTV cameras, etc. It reports on the results of the recently completed R&D project, SCALS (Smart Cities Adaptive Lighting System), which aims to build all components of urban lighting systems / software that allow municipalities to control and control public street lights. The system is able to independently control traffic lights on the basis of the presence of vehicles (buses / trucks, cars, motorcycles and bicycles) and / or pedestrians in certain areas or sections of roads / roads that are of interest to reduce energy consumption. The main contribution of Street Light System is to design a low-cost lighting system and, at the same time, to define IoT infrastructure where each lighting pole is a

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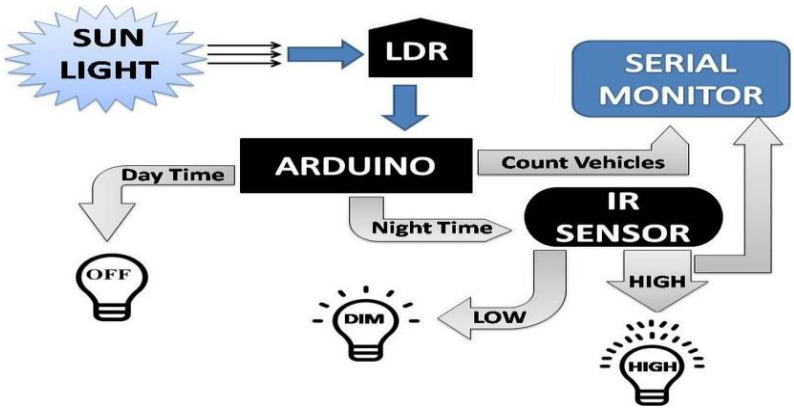
network object that can increase its size. In general, the proposed smart infrastructure can be seen as the basis for a comprehensive technology development that aims to provide value-added services to sustainable cities. Intelligent design includes a variety of sub-systems (local controls, motion sensors, video cameras, weather sensors) and electronic devices, each of which is responsible for performing specific functions: remote road sections, traffic management, video lighting to detect traffic flow and separation, wireless and wireless data exchange, power consumption analysis and traffic testing. Two experimental sites were created in the project where fine art was tested and verified in real-world situations. Test results show that energy savings of up to 80% are possible compared to the traditional street lighting system.

III. PROPOSED METHODOLOGY

The main objective is to make traditional light system into automated system. we found that most of the existing smart light systems uses a network sensor, which detects movements and transfers the information to all the connected lamps in the network, which results in unnecessary electricity usage by the lamps where object was never even detected. To overcome that we propose to implement the sensors individually around the lamps. Thus, ensuring that only the necessary amount of energy is being utilized.



(Fig. 3.1: System Architecture of circuit)

This method uses two sensors namely LDR and IR. The LDR (Light Dependence Resistance) sensor is used to detect the intensity of the natural light through which we can discover whether the lamps should be powered on or not. And the IR (Infrared) sensor is used to detect the presence of any moving object in the vicinity. These two sensors controls how and whether the lamps should be illuminated.

Automatic Street Light Control System is a simple and powerful concept, which uses LDR as a switch to switch ON and OFF the street light automatically. By using this system manual works are removed. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. It automatically switches OFF lights under illumination by sunlight.

This project is used to detect the movement of a vehicle on highways or roads to turn ON the lights when the vehicle is ahead of the lights, and to turn OFF the glowing light when the vehicle passes away from the lights. By using this project we can conserve the energy. This system doesn't need a manual operation to turn ON/OFF the street lights. The street light system detects whether there is need of light or not

IV. SYSTEM REQUIREMENTS

A. Hardware Requirements:

1. **Arduino Uno**: Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button

(Fig.4.1: Arduino Uno ATmega328P)

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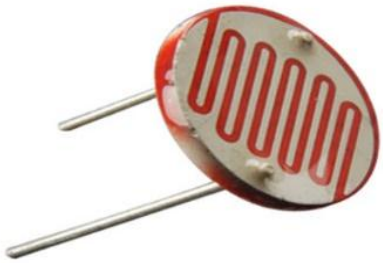
2. **LDR (Light Dependent Resistor):** A photoresistor or LDR (Light Dependent Resistor), as the name suggests will change it resistance based on the light around it. That is when the resistor is placed in a dark room it will have a resistance of few Mega ohms and as we gradually impose light over the sensor its resistance will start to decrease from Mega Ohms to few Ohms. This property helps the LDR to be used as a Light Sensor. It can detect the amount of light falling on it and thus can predict days and nights. So if you are looking for a sensor to sense light or to distinguish between days and nights then this sensor is the cheap and modest solution for you.



(Fig.4.2: Light Dependent Resistor)

3. **IR sensor (Infrared Sensor):** The IR sensor module consists mainly of the IR Transmitter and Receiver, Opamp, Variable Resistor (Trimmer pot), output LED in brief. IR LED emits light, in the range of Infrared frequency. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimeters to several feets, it depends upon the type of IR transmitter and the manufacturer. Some transmitters have the range in kilometers. IR LED white or transparent in colour, so it can give out amount of maximum light.

(Fig. 4.3: Infrared Sensor)

4. **Breadboard:** A breadboard is a solder less device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate. The breadboard has strips of metal underneath the board and connects the holes on the top of the board. The metal strips are laid out as shown below.
5. **Light Emitting Diode(LED):** Light Emitting Diodes are basically tiny light bulbs that fit easily into an electrical circuit. They can be found in dozens of applications including digital clocks, remote controls, and traffic lights. Unlike ordinary incandescent light bulbs, LEDs do not have a filament that will burn out, so they have a much longer lifetime. LEDs are illuminated by the movement of electrons in a semiconductor material
6. **Wires**: A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number

B. Software Requirements:

Arduino IDE: The Arduino Integrated Development Environment (IDE) is a platform independent application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.

V. RESULT AND ANALYSIS

(Fig. 5.1: LED are dim when no object found near them during night)

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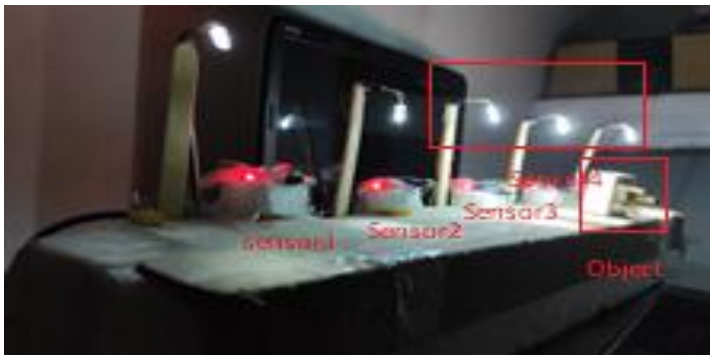

(Fig. 5.2: Last three LED glow at more intensity when object found near sensor4 during night)

(Fig. 5.3: LED1, LED2, LED3 glow at more intensity when object found near sensor2 during night)

VI. FEATURES AND APPLICATIONS

Features:

- Real time operations
- Reliable as well as flexible
- Easily understandable
- Design is simplistic
- Acts Faster

Applications:

- Street lights, public roads, express highways, etc.
- It can be used at shopping malls, restaurant, hotel lobby, driveway, etc.
- This system can save time, energy and decrease the electricity bill as well.
- Controlling the lights of house or commercial store or garage could also be possible.
- This project can be implemented at educational institutions.

VII. DISCUSSION AND FUTURE SCOPE

In future we suggest to use this technology in lighting solutions for public places especially, where unnecessary lighting remains on during night or in street lights which remain on when no one is around. Because integration cost is low. Maintenance cost of this technology is also very low, or may even be similar or less compared to the current manual or timer based High Intensity Lighting systems methods which are economically as well as efficiency or energy wise high billing. Thus this method can help reduce economic and environmental costs. In future we can add a vehicle speed calculating system using IR sensors which will able to measure the speed of vehicle and capture image using photo sensors and store it in memory device for monitoring purposes.

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VIII. CONCLUSION

In this project, the use of IoT in Street light System has been summarized. Although IoT is being used in all sectors of engineering, there is room for further improvement and research. The early identification of conservation of energy can help us to save more energy for future generations IoT can help in this regard. IoT based Street lamp systems can monitor the surrounding in real-time and make decisions according to surroundings. However, the IoT architecture must have the facilities to ensure the proper security of sensitive data. Also, the used sensors must be small in size so that they can be easily incorporated into various systems. Finally, the use of various algorithms might make the systems more accurate and robust. The idea of a smart street lamp system using the IoT architectures is a novel contribution in the field of social life and it will save energy in more efficient way.

REFERENCES

[1]. Yusaku Fuji, Noriaki Yoshiura, Akihiro Takita, Naoya Ohta, "Smart street light system with energy saving function based on the sensor network.", January 2013.
[2]. Chetna Badgaiya, and Palak Sehgal, "Smart Street Lighting System", July 2015.
[3]. Dr Javier Barria, Roxana Alexandru, Vijay Gami, Vivek Aggarwal, Jiaxi Sun, Pei Tu, Iulian Ionascu, Niccolo' Lamanna, "Smart LED Street Lighting", January 2014.
[4]. Ashutosh Gupta and Shipra Gupta, "Design of Automatic Intensity Varying Smart Street Lighting System", 2017.
[5]. Monali Y. Khachane, "Intelligent Street Lighting System", 2018.
[6]. Gianfranco Gagliardi, Marco Lupia, Gianni Cario, Francesco Tedesco, Francesco Cicchello Gaccio, Fabrizio Lo Scudo and Alessandro Casavola, "Advanced Adaptive Street Lighting Systems for Smart Cities", December 2020.