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DESIGN OF AUTOMATION SYSTEM TO CONTROL THE BRIGHTNESS OF LED USING ARDUINO UNO AND IOT

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Abstract-Nowadays, LED lamps are used everywhere. The major challenges in using LED are power consumption and lifetime. In this project, we propose a system to control the brightness of LED for less power consumption and reduce heat for increasing the lifetime. Existing technique uses a ON/OFF system based on brightness and darkness only, which does not reduces much power. In our proposed system, we use a intensity controlled system which lowers the intensity when there is no one in the vicinity and increases the intensity when there is the presence of individuals in the surrounding. This result in less power consumption. Also we use a cooling system to reduce the heat of LED and thereby increasing its lifetime. We also propose a IoT in our system to control the lights anywhere in the system. Also the faults are identified for replacement.

Index Terms: *Arduino UNO, IR Sensors, IoT*

INTRODUCTION:

Street lights play a vital role in our municipal service delivery sector and also plays a critical role in providing light for safety during night time travel on our roads. Maintenance and service for millions of street lights become a nearly impossible task. Intelligent Street Lighting is all about fully automated control of street lights across your street based on daylight. This design eliminates the need for any manual intervention of switching street lights ON/OFF. This is so possible with the help of an LDR (Light Dependent Resistor) module which is interfaced to Arduino board. Depending on the intensity of light falling onto LDR Street lights are turned on and off. Also, High Intensity Discharge street lamps has been replaced with LEDs, so that the power consumption is reduced. This paper proposes the use of a smart street lighting system which provides an intelligent method of conserving energy and monitoring street light faults with the use of communication over the power line.

Street Light Automation system based on IOT consists of smart lights which mainly have four features,

- Automatic ON/OFF bulbs according to surrounding Light intensity.
- Adjusting the brightness when the motion is detected.
- Controlling the lights remotely.
- Detecting the faulty lights.

Street light automation system is smart and provides a safe night time environment for all road users including pedestrians. It discusses an intelligent system that takes automatic decisions for ON/OFF/DIMMING considering movement of vehicle or pedestrian and surrounding light intensity. The Street light Automation system helps in reducing the energy consumption and maintenance costs and also helps to reduce crime activities and accidents up to certain limit. The Street light Automation system also detects the faulty lights and controls it. Using these smart lights, one can also control the ON/OFF remotely using android sets or WIFI connected to system. These smart street lights are designed with the help of PIR and LDR sensors.

The traditional light system has been limited to two options: ON and OFF only, which are not efficient because these kinds of operations meant power loss due to continuing to work on maximum voltage. With the negligence of the operator or by some other technical problems, streetlights are continuously kept 'ON', even when there is no light required on the streets and this leads to the wastage of electricity. Hence, the wastage of power from street lights is one of the noticeable power losses, but with

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the use of automation, it leads to many new methods of energy and money saving. In this regard, controlling the lighting system using a light dependent resistor (LDR) [2], infrared radiation (IR) obstacle avoidance sensor [3], and Arduino [4,5] together are proposed in the past [6,7]. In previous literature, the street light systems are based on LDR [8,9], and most of them are passive infrared receiver-based systems that are controlled with timers and analogue circuits. Sun tracking sensors [10] are also used to power OFF the streetlights by the detection of the sunlight luminance. Furthermore, streetlight control with the use of solar energy [11], and ZigBee based system to control streetlights [12] have also been implemented. Distinguished from turning the electricity ON/OFF, another approach is introduced to DIM (half of the maximum brightness) the light [13] during the hours where traffic is sparse, which might be useful for reducing the power consumption, but with the electric bulbs under a continuous usage condition.

Apart from traditional home automation, the term "internet of things" (IoT) [14,15] is also important for connecting electrical appliances with internet that made it feasible to remotely control items from anywhere and anytime. After the introduction of IoT, the wireless systems provided a great help for automation systems by using cloud networks and Wi-Fi etc. Similarly, many wireless systems are made by using Bluetooth and smart phones connections [16] that can only be used by a particular person, because the mobile phone is not assumed to be always at home. In addition, the recent version of Bluetooth appears to be under a good agreement for low-power home automation devices. Meanwhile, a new automation system was introduced, in which both Bluetooth Low Energy (BLE) devices are used instead of smartphones, with a limited number of specifications, but with a good and secure transfer rate. Most precisely, the choices of these systems are hard to implement in a real case with real roads and real streetlights, due to its very low range of wireless connectivity. To the best of our knowledge, a need still exists for the design of a sunlight-based system that supports the DIM light concept, connecting the power ON/OFF with the objects' detection, monitoring objects passing through the road, and controlling the entrance door.

An automation system based on night time detection of objects is proposed in this project. In the proposed automation system, the streetlights will be automatically turned OFF during day-time, otherwise the lights will remain DIM at night-time and turn ON (maximum brightness) at the object's detection. This work is accomplished with the proper arrangements of the microcontroller Arduino Uno, the IR obstacle avoidance sensor, LDR, and resistors. It is noticed that the DIM state in the proposed design also means the continuous working of electric appliances over the whole night. To overcome this issue, the previously designed system is further extended to construct a system based only on the detection of objects. In this regard, the streetlights will turn ON automatically based on the detection of objects, otherwise the streetlights will remain OFF. Meanwhile, an automatic door system is also introduced in this object-dependent design that will operate with a motor and an IR obstacle avoidance sensor. The motor will automatically open the door when an IR obstacle avoidance sensor detects objects in front of the door, and shut it when no objects are detected. In addition, a counter is set to count the number of objects passing through the road, which will be displayed on the serial monitor of Arduino IDE. Thus, the proposed systems (both night and objects' detection; object-dependent) are designed and demonstrated using a lab-scale prototype to show that the proposed designs can be easily implemented in large-scale in near future.

In this project, IoT is also included to monitor the LED from anywhere in the world. The faulty lights are detected and alert message is

received. Also we can monitor how much power is saved.

The proposed method was enhanced by including the concept to capture the details regarding speed of the wind. If there is a cyclone formation immediately data will be sent through IoT and alert is given.

PROPOSED METHOD

On the other hand, the energy resources like petroleum, coal, natural gas, uranium and propane are called non -renewable resources, because their supplies are limited. Many environmental effects and day-by-day depleting energy resources warn us to save energy by using automatic room controller an Energy efficient lighting systems. Nowadays the wastage of electricity has become a routine thing for us, and the problem has become frequent at homes, schools, and colleges and even in industries. Sometimes we notice fans and lights keep on working even in the absence of people. This often happens in homes, offices and public places due to utter negligence of the inmates.

ADVANTAGE OF PROPOSED SYSTEM

- It is easy to integrate with lighting system such as automatic lighting system. It is used for energy consumption or energy management by automatic control of brightness level in mobile phones and auto ON/OFF of street lights based on ambient light intensity. LDR (i.e. photoresistor) based light sensors are available in different shapes and sizes. Light sensors need small voltage and power for its operation.
- Photoresistors are lower in cost, bi-directional and offer moderate response time. Photodiodes offer quick response time, lower in cost and provide digital output.
- Phototransistors are very fast and provide immediate output compare to photoresistors.
- Phototransistors generate high current compare to photodiodes.

WORKING

This is a system diagram of the Street light Automation system it has battery in the transmission side, it also has PIR LDR sensors Arduino UNO board with a Wi-Fi modem of range 2.4 gigahertz and in its receiver side it hasanother modem connected to a system with a same range. It has electrical power supply and the Arduino kit is directly connected to the street light arrays.

1. Hardware arrangements: First connect the required equipments(LDR PIR WIFI and other resistors) to the bread board.

2. Software and hardware connection: connect the breadboard to the arduino Uno which is further connected to the systemhaving arduino Uno IDE to upload the source code.

3. Testing: compile the source code and then run it.

4. Connection to Internet: Connect the internet of the system to the Blynk an android platform which helps in controlling the lights remotely. Note that both the android device and the system should have internet connections.

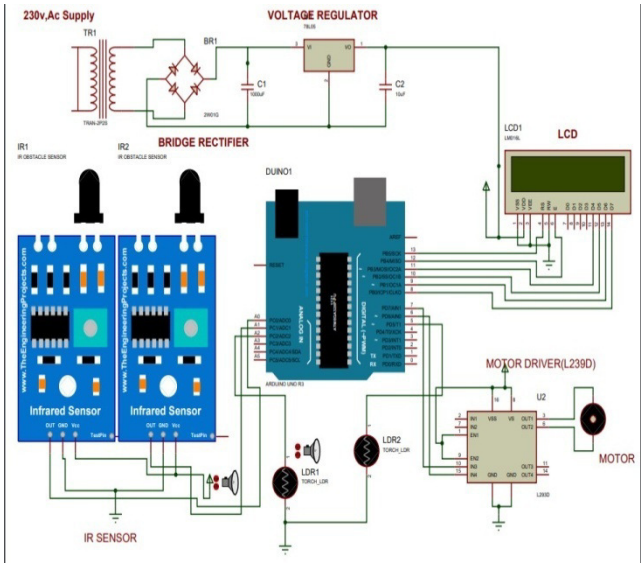

Fig. 1 Circuit Diagram of Proposed Method

CONCLUSION

Hence, by using the technologies of IOT,

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microcontroller this smart street light automation system is developed. This system controls the smart lights automatically which conserves manual power, electricity consumption. Also, the defective street lights tweets to the controller about the fault and replacement. These smart street lights can be controlled from any remote area. Thus fulfilling the requirement criteria and saving the energy.

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