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IoT using Smart Street Light System

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Abstract: *Street Lights. They are a part of our everyday life, so much so, that we don't even notice or acknowledge them sometimes. The only two things most people know about street lights is that during the night they light our sidewalks and roads and during the day they are shut off and unused. We may not look at or notice streetlights in our daily endeavors, however, as innovation speeds up, smart cities rise, and the growing need for energy efficient solutions increases, new technologies are enabling street lights to look at us and notice our movements and location. Modern street lighting systems are being asked to do more than ever before. In addition to fulfilling their primary purpose of casting light onto dark roadways, parking areas, and public spaces, these lighting systems are increasingly evaluated for how well they reduce energy consumption, improve safety for both pedestrians and drivers, and serve as the foundation for a range of Internet of Things applications, This smart system is best suited for street lighting in remote urban and rural areas where the traffic is very low.*

Key Word*: LDR Sensor, LED, Internet of Things, Atmega microcontroller*

I. Introduction

Today, digitalization has scaled up the functioning of lighting beyond illumination. Internet of Things (IoT) in lighting has enables the designer to produce fully integrated systems that can be connected seamlessly with a wireless network or Ethernet. The user can remotely monitor and control lighting systems with this connected system with advanced controls and sensors. This has led to the emergence of smart street lighting, playing a significant role in the development of smart cities of the future. Upgradation of regular street light to connected smart street lights, which can be remotely accessed, controlled and managed, thus optimizing operations offers benefits like reduction in energy consumption by 50 per cent, minimizing maintenance costs, lowering CO2 emissions and curbing light pollution.

IoT in street lights ensures that street lights are automatically switched on once the sun sets and switched off after dawn. The system also sends alerts for each light that needs attention, to reduce failure and the need for sudden repair. Therefore, the avoided generational capacity can be ascertained from the reduced consumption of electricity. The system also helps note the exact consumption of energy, which is used to define the cost to be paid.

The smart street light controller must be installed on the light pole which consist of microcontroller along with various sensor and wireless module. The smart street light controller installed on the street light pole will control LED street lighting depending on movements of the object in the street. The captured data cane transferred to base station where the energy gets stored using wireless technology to monitor the smart system. The smart system can be operated either manually or automatically. The control system will switch ON and OFF the street lights at needed timings and can also vary the intensity of the street light according to the necessity.

II. Related work

The first paper describes[1] the managing urban services that include convenience, health, safety and comfort is proposed. The other paper describes the cloud computing infrastructure in the recent years [2,3] found

useful for smart city concepts, but this deals with only technology to support the processing and storage of captured data. The other author focused on concepts of cloud and IoT and, in particular, the solutions to the real time applications. Paper [4] which will support for smart city concepts both IoT and cloud computing concepts are hybrid together to render the new location-based, reduced latency and improved QoS pervasive and ubiquitous services. The paper [5] describes how data can be managed in cloud. The commercial offering xively [6] smart Things [7] and Open Cloud [8] are already available for technology support to smart city. All these discussed information are to support Smart Street Light System to reduce the energy in cloud and IOT. In the intelligent management sensors, lamps, power supply are merged to implement the smart street lighting system [9]. The solution is very effective in terms of costs and reliability. A smart street lighting system is proposed using this concept [10].

A survey of networking solutions for smart lighting is provided in [11], including up-to-date sensing and networking technologies.

This paper describes [12] the circuit and switches which are used for street light ON and OFF according to the movements of objects. This also describes the ON/OFF of light during night and day time. The other paper which concentrated on the automated street light system merged with embedded system concepts. A sensor is used to identify the movements of the object on the road. This paper gives a solution to the controlling the intensity of the light considering the movement on the road. This [13] paper describes how to enable and disable the street lights on the road to switch ON and OFF the street lights. Two different sensors are used they are light sensor, photo electric sensor. The adaptive control of street light using Daylight Time savings suggested by [16], with PIC18F has base system. Hence daylight savings with additional boosting parameters for IoT enabled street light will helps to reduce the energy consumption.

III. Problem definition

In most of the cities, the street lights are ON when it is not need and It is OFF when is needed. Because of these situation the huge energy expenses for a city gets wasted. Usually, the lights are ON in the evening after the sunset, it continuous to be ON till the sun rises in the next day morning.

This paper focuses on reducing the energy by automatically switching ON and OFF-street lights. When vehicles come to the street/road the sensor will capture the movements of the vehicles then lights automatically ON. Otherwise automatically OFF the lights.

Disadvantages of Existing System:

- Manual Switching off/on of Street Lights.
- More Energy Consumption.
- High expense.
- More manpower.

Advantages of proposed System:

- Automatic Switching of Street lights.
- Maintenance Cost Reduction.
- Reduction in CO_2 emission
- Wireless Communication.
- Energy Saving.
- Reduction of manpower.

Figure no 1.Street lights

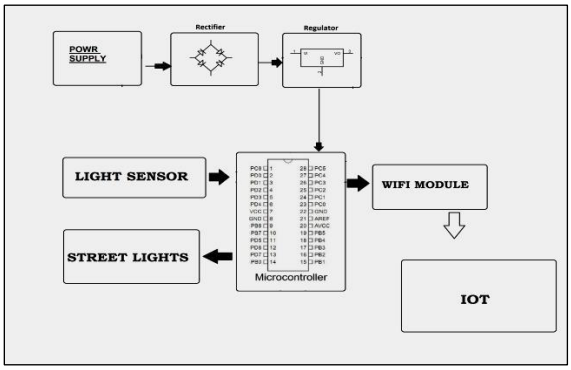

Figure No 2: System Architecture

This system propose an IOT based street light monitoring and controlling system as shown in figure 2 to ensure, low power consumption, consumption monitoring, instant faulty light detection and light dimming as per external lighting conditions. This proposed system consists of smart street lights that have external light sensing that automatically turns on at desired intensity based on amount of lighting needed. The system also allows the controller/monitoring person to check estimate power consumptions as per current intensity of light as well as predict monthly power consumption. Also each of the unit has load sensing functionality that allows it to detect if the light has a fault. It then automatically flags that light is faulty and this data is sent over to the IOT monitoring system so that action can be taken to fix it.

IV. METHODOLOGY

Recent days, Smart Street Light System is major component of a smart city Infrastructure. The important function is to lighting the city streets using Sensor's to save the current or power energy .In existing system using normal street lamps. It takes more current and costs too. So use LED lamps to save the current in low amount of power. Using IoT type system is all over the world. It is used to be watch all kind of areas in the cities.

Atmega microcontroller

ATMega Microcontrollers figure no 3, belong to the AVR family of microcontrollers and is manufactured by Atmel Corporation. An ATMega Microcontroller is an 8-bit microcontroller with Reduced Instruction Set (RISC) based Harvard Architecture.

Figure no 3: Microcontroller

LDR sensor

An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. The most obvious application for an LDR is to automatically turn on a light at a certain light level. An example of this could be a street light or a garden light. features. Infrared LEDs have to adjust the voltages. LED adapted to various operating voltages.

Wi-Fi module

The Arduino Uno WiFi is an Arduino Uno with an integrated WiFi module. The board is based on the ATmega328P with an ESP8266WiFi Module integrated. The ESP8266WiFi Module is a self contained SoC with integrated TCP/IP protocol stack that can give access to your WiFi network.

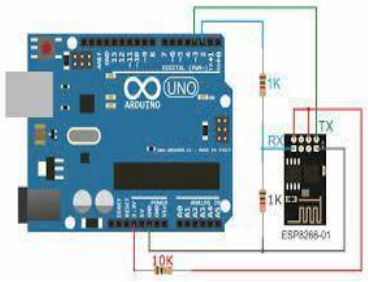

Figure No 4: WiFi Module

1) For over-speeding: if the vehicle crosses its regulation say 2 km/hour, using Motion sensor the buzzer will start to supply the sound indicating that the vehicle is crossing the regulation of the road which makes it easy to prevent the traffic.

2) For Intensity Adjustment: it increases or decreases the intensity of the lights to the accidental prone areas using the LDR sensor, if vehicle is present on the streets then intensity increases but if not then intensity decreases.

3) For Smoke detection: For Smoke Detection, it will detect the amount of pollution caused by the gases like CO2, sulphur dioxide, nitrous dioxide and carbon monoxide polluting the atmosphere within the parts per million (PPM), it'll display a true time graph on the IOT panel to manage the amount of the pollution.

4) For GSM switching: a true time SMS are going to be generated to ON/OFF the pole, if it's found that street lights are OFF and that they are continuously on for a extended period of your time, if the road lights are damaged then using message it can be quickly maintained.

ADVANTAGES:

- Major advantages of street lightning include prevention of the accidents and increase in the safety.
- Several decades ago when automobile crushes were way more common, street lightning was found to cut back pedestrian crashes by approximately 50%.
- Lightning system also reduces crime say murder, theft and plenty of more to a great- extend.

V. Implementation

The lighting comes from LED bulbs, which are trigger by multi sensors. A person, object/vehicle appears nearby the sensors, It capture the signals and turn ON the particular street lights. When object moves lights automatically works. SSLS used to save the energy, mainly helps to save the power. IR LED lights dependent devices whose resistance decreases when light falls on them and increases in the dark. When a light dependent resistor is kept in dark, its resistance is very high. The vehicle which passes by the street light is detected by sensor. Microcontroller is used to switch on/off the street light bulb.

VI. Conclusion

The important aim of this paper is to save the current. It is mainly used to protect the power efficiently. Using sensors to save the power energy without any waste. Safe street lighting for peaceful vehicle movements. This SSLS suits for Small Street to highway roads. This system can be used in public places also like hotels, industries, etc.

It is control the overflow of current. Manpower not required in this system. This SSLS are mainly used in urban areas and highways to reduce the power wastage to save the current.

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