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Smart Street Lighting System using IoT

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ABSTRACT: The internet of things (IoT) are able to implement transparently a very large amount of heterogeneous end systems, while digital service provides open access to sub set of data. The focus of this paper is smart street light system. In this system the street light systems are automatically ON and OFF according to the situation. This smart light system automatically detects the movements of the object on the street. In the traditional system IR sensor is used to detect the object. The microcontroller is used to control the process involve the net. This paper is focused on the controlling intensity of the light considering the object movement near the light. Two different sensors named light sensor and photo electric sensor are used. Once if the sun light goes under the visible region then this system automatically switches ON light. As soon as the sun light is visible then automatically switches OFF lights. This Smart light system is used to reduce energy consumption. In this smart system the system uses some of the sensors. This smart system is used to avoid unnecessary usage of electricity. The entire smart system is designed to operate using artificial energy source. The PIR sensor and LDR sensors are used to sense the human being and light intensity of a particular area and transmits the data in wireless to the EB section. This smart system is best suited for street lighting in remote urban and rural areas where the traffic is very low.

KEYWORDS: IR Sensor, IR LED, Internet of Things, Raspberry-pi 3.

General Terms

1. INTRODUCTION

Based on the new technology the cities are upgraded to in al aspects into smart city. Solutions for managing the underlying physical sensing and actuation resources infrastructure are required. . So many solutions of this kind, mainly at a lower (communication) layer, may be found within the Internet of Things (IoT). In a city the expensive energy expenses is street lighting. The smart street lighting system (SSLS) can reduce municipal street lighting into 50%. The smart street lighting system is the one which automatically ON and OFF the lights according to the situation. It automatically senses the movements of the object within a particular limit. This SSLS proposes the installation of the wireless based system to remotely track and control the original energy consumption of the street lights and take appropriate energy consumption reduction measures through power conditioning and control.

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.

2. RELATED WORK

Many works deal with resources and infrastructure issues and solutions related to smart cities and connection with IoT and the cloud. This paper describes [1] the managing urban services that include convenience, health, safety and comfort is proposed. The other paper describes the cloud computing infrastructure I 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. One more

author concentrated on is fog computing [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 papers [5,6,7] are describing how data can be managed in clod. The commercial offering xively [8,9] smart Things [10] and Open Cloud [11] 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.

Figure1. Smart street lights

In the intelligent management sensors, lamps, power supply are merged to implement the smart street lighting system [12]. The solution is very effective in terms of costs and reliability. A smart street lighting system is proposed using this concept [13].

A survey of networking solutions for smart lighting is provided in [14], including up-to-date sensing and networking technologies.

This paper describes [15] 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 [16] 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.

3. PROBLEM DEFINITION

In most of the cities, the street lights are ON when it is not need and It is OFF when is not 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.

ARCHITECTURE

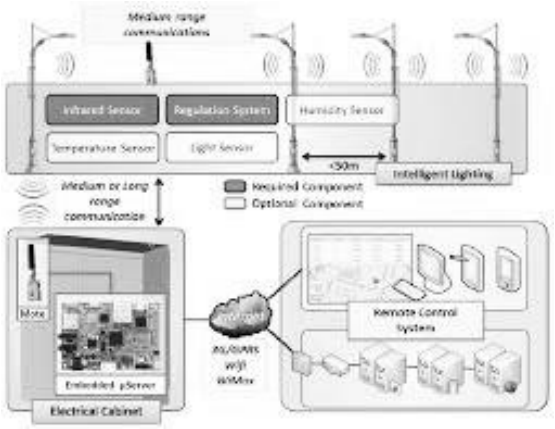

Figure 2.System of Architecture

This Smart Street Light System provides good energy efficiency. It reduces cost and gives more reliability. This diagram consist sensor, light, power system. This architecture is used to sense the vehicles and act accordingly. In this diagram street lights control by the sensors. It get the data from object. When vehicles appear to sensor then automatically lights ON. That the object moved on from sensors lights turn OFF. In this diagram its represents the works of Smart Street Lighting System. When objects or vehicles appear to the sensors it is detect movements of the objects and street lights automatically ON. Then objects crossed to the sensors lights go to turn OFF. It is used to save the power energy.

4. 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.

Raspberry-Pi 3

The Raspberry-Pi 3 has been adopt ensure high computing power and interconnectivity with other devices such as the IR sensors. Raspberry-Pi 3 is a minimal-cost (≈25 €) basic computer contained 4* USB ports, Full size HDMI,CSI camera, HD video, SD card. The computer runs fully on open-source software. It runs lot off applications such as high-definition video playback, games, word press.

Figure3. Raspberry Pi 3

IR Sensor

An infrared is an electronic device. It is used to sense the object by infrared radiation. It is calculating temperature of an object and emitting movement of the object. We cannot see the infrared waves. IR sensors works with particular light sensor to find a select light wavelength in the IR spectrum. Using an LED gives the equal wavelength as what the sensor is looking for, you can see the intensity of light. When object is near to the sensor, the LED light reflect the object into the light sensor. The concept of IR Sensor used to detect the obstacles to transmit an infrared signal. This IR signal reflect from the object and the signal is get at the infrared receiver.

IR LED

An IR LED (Light-emitting diodes) is an important LED that used to transmits infrared rays .This kind of LED's are made by gallium arsenide. It is also have IR receivers too. Generally used as sensors. Infrared LED and LED lights are look like same features. Infrared LEDs have to adjust the voltages. LED adapted to various operating voltages.

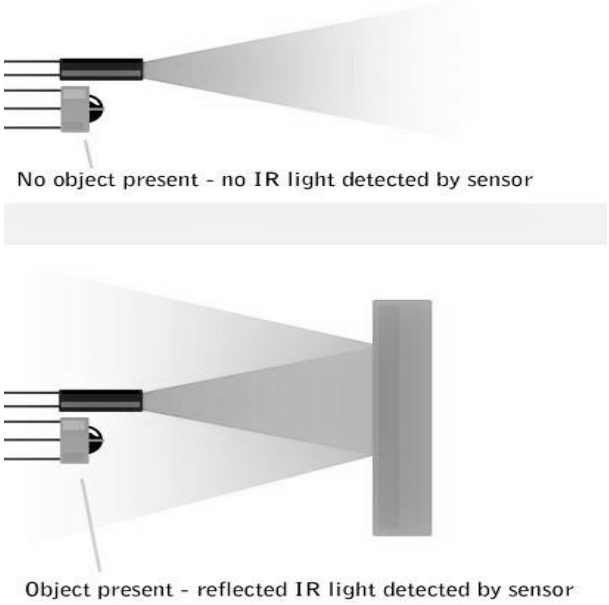

Figure 4.process of IR sensor

Wi-Fi

Wi-Fi is the famous wireless network technology that used to provide high-speed Internet and network connections. The term Wi-Fi is short for "Wireless Fidelity". They transmit at frequencies of 2.4 GHz or 5GHz. The maximum frequency allows the signal to get more data. Wi-Fi is also available in Raspberry Pi 3.

Figure5. Raspberry-pi 3 Wi-Fi connectivity

5. IMPLEMANTATION

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 IR sensor. Relay are used as a switch to switch on/off the street light bulb.

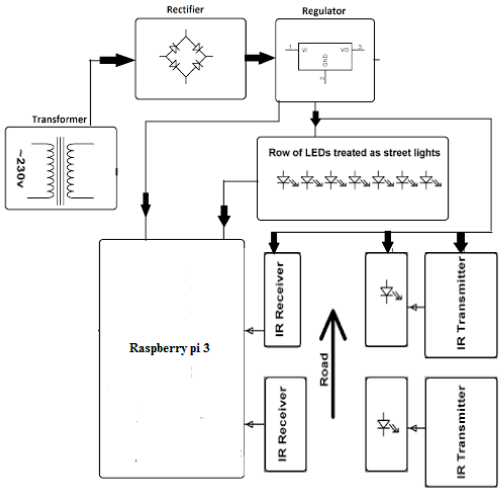

Figure6. Process of SSLS

6. 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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