

Article

IOT Based Smart Street Light System

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A B S T R A C T

In today's society powered by Information Technology, automation systems make life easier and more convenient for people than ever before. Internet of Things is one of those technologies which is widely used to automate several routine activities. One phenomenon that is gaining momentum is the smart home device allowed by IOT.¹ The Internet of Things connects living things and non-living things. Enables interpersonal contact. Physically or electronically, the contact happens. This capability can be used to automate systems that have a social relevance, such as smart homes or precision agriculture. It is observed that the IOT was extensively used for the construction of smart homes. Smart home means automation of such tasks as lighting power, heating, ventilation and air co-operation.¹

Keywords: IOT, Home Automation, IR Sensor, LED, Raspberry Pi

Introduction

The Internet of Things interconnects physical devices, houses, vehicles and many other objects embedded with electronics, actuators, sensors, software and network connectivity that allow objects to collect and exchange data. In 2013, the Global Standards Initiative on the Internet of Things described the IOT as an information society global infrastructure that allowed services by interconnecting things based on interoperable information and communication technologies.² The IOT allows objects to be sensed or controlled remotely around the existing network infrastructure and creates an opportunity for the direct incorporation of the physical world into computer-based systems.¹

The smart street lighting system can reduce street lighting by 50 percent. The smart street lighting system is the one that ON and OFF the lights automatically depending on the situation. It senses the object's movements automatically within a given limit. This System proposes the installation of a wireless system to remotely monitor and control the original energy consumption of street lights and to take appropriate measures to reduce energy consumption

through power conditioning and control.⁵ The smart street light controller must be installed on the light pole consisting of a microcontroller with a variety of sensors and wireless modules. The smart street light controller installed on the street light pole will control LED street lighting depending on the movement of the object in the street. The collected data can be moved to base station where the energy is stored to track the smart device using wireless technology. The smart machine can be automatically or manually controlled. The control system can turn the street lights on and off at appropriate times and may also vary the intensity of the street light depending on the need.⁴

Problem Statement

The street lights are ON in most cities when it's not needed and it's OFF when it's not needed. The enormous energy costs for a city get wasted because of this situation. Typically the lights are ON until sunset in the evening, it continues to be ON until the sun rises in the morning of the next day. This paper focuses on reducing energy by switching Street Lights ON and OFF automatically.¹ Once vehicles arrive on the street/ road the sensor detects the vehicle's movements then automatically lights ON. Otherwise, the lights OFF automatically.¹

Architecture

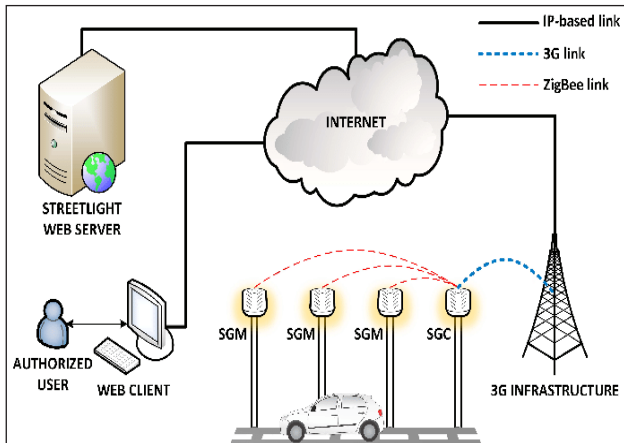


Figure 1. System Architecture

This Smart Street Light system delivers good power efficiency. It cuts costs and gives greater reliability. This diagram consists of sensor, light, electrical system. Using this architecture, the vehicles are sensed and act accordingly. In this diagram, the sensors control street lights. It gets object info.^{2,3} And automatically lights ON when vehicles connect to sensor. That the object is turning OFF on from the sensor lights. Its represent the works of the Smart Street Lighting System in this diagram. When objects or vehicles appear to the sensors it automatically detect object movements and street lights ON. Then objects that are crossed to the lights of the sensors go to turn off. It is used for the energy savings.⁵ Figure 1.

Methodology

Smart Street Light System has been an important component of a smart city system in recent days. The important function is to illuminate the streets of the city using Sensor's to save the current or power resources. It takes a greater amount of time and costs too. So use LED lamps to save low power at the current. The use of IOT-type system is worldwide. It is used to seeing the towns of all kinds of areas.

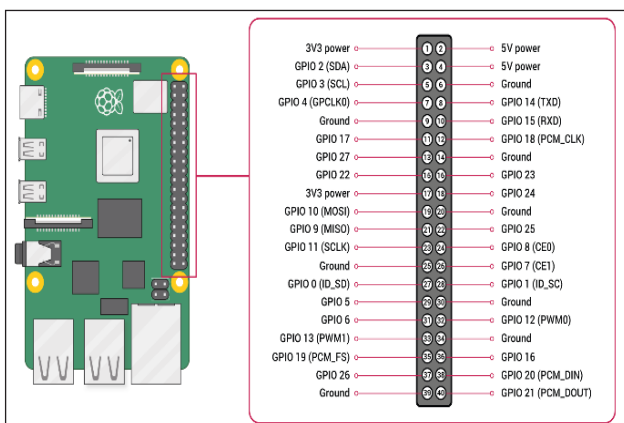


Figure 2. Raspberry – Pi 3

Raspberry-pi 3

The Raspberry-Pi 3 has been adopted with other tools such as the IR sensors to safeguard high processing power and interconnectivity. Raspberry-Pi 3 is a basic computer with 4* USB ports, full size HDMI, CSI camera, HD video, SD card at a minimum cost (almost € 25). The computer runs on open source software to the full.⁵ It runs a lot off applications like video playback in high definition, sports, word news, Figure 2.

IR Sensor

An IR LED (light-emitting diodes) is an important LED used for transmitting infrared rays. Gallium arsenide is used to make this type of LED. It has IR receivers too. Typically used as sensors. LED and LED infrared lights look like the same apps. The voltages must be changed by infrared LEDs. LED adjusted to different operating voltages, Figure 3.

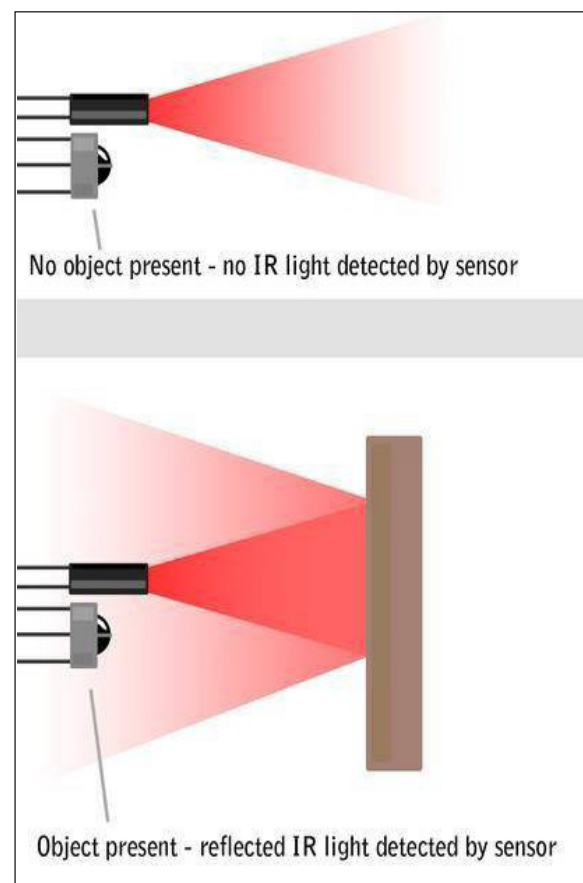


Figure 3. Working of IR

Wi-Fi

Wi-Fi is the popular equipment used to provide high-speed Internet and network connections. The word Wi-Fi is “Wireless Fidelity” for short. We broadcast on 2.4 GHz or 5GHz frequencies.² The optimal frequency allows more data to be collected through the signal. Raspberry Pi 3 also comes with Wi-Fi. Figure 4.

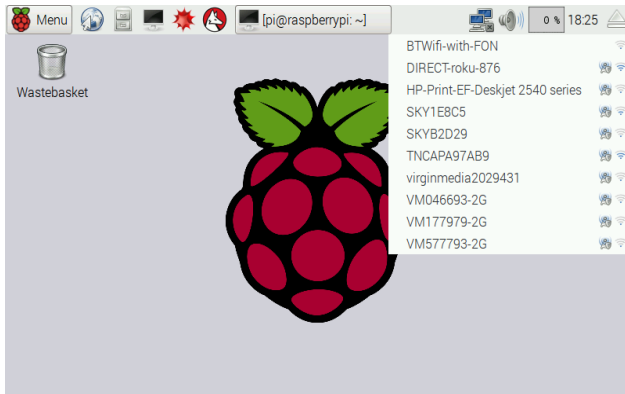


Figure 4. Raspberry- Pi 3 Wi-Fi Connectivity

Implementation

The illumination comes from LED bulbs that are multi-sensor activated. A person appears near the sensors, an object / vehicle absorbs the signals and switches the particular street lights ON. As object moves lights will work automatically. SSLS, which was used to conserve electricity, mainly helps save fuel.¹ IR LED lights based devices whose resistance decreases in the dark as light falls on them. When a light-dependent resistor is held in shadow, it has very high resistance. IR sensor detects the vehicle that passes through the street light. Relay is used to turn the street light bulb on/ off.⁵

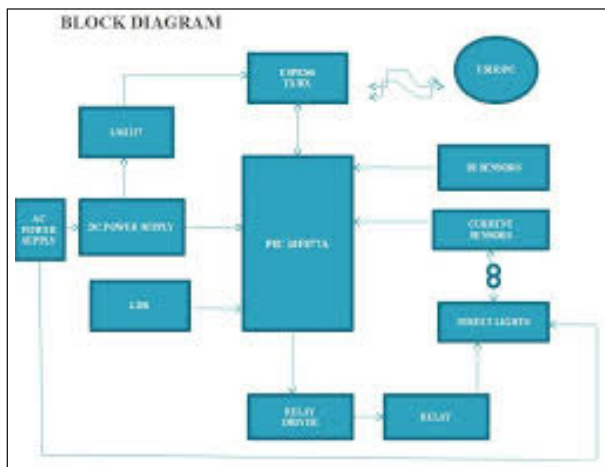


Figure 5. Block Diagram

Advantages

- Automatic switching of Street Lights
- Maintenance Cost Reduction
- Reduction in CO₂ Emission
- Wireless Communication
- Energy Saving
- Reduction of Manpower

Disadvantages

- Manual Switching the Street Lights over Weather conditions

- Initial investment is higher than conventional light system
- Risk of theft is higher as equipment costs are comparatively higher
- Batteries replacement time to time
- Moisture and certain conditions can provide issues over energy production

Conclusion

This paper's key aim is to save the current. It is mainly used for effectively protecting the power. Use sensors to save power without wasting any energy.³ Clear street lighting for peaceful movement of the vehicles. This Smart Lights suits to highway roads for Small Road. The method can also be used in public places such as hotels, factories and so on. It is management of existing excess. In this program manpower is not needed.² This SSLS is primarily used to reduce power wastage in urban areas and highways to save the energy.

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