

IOT BASED SMART LED STREET LIGHTING SYSTEM

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Abstract: Smart led street lighting system aims for designing and executing the advanced development in IOT for energy saving of street light, the best solution for electrical power wastage is automation of street light, the manual operation of the lighting system is completely eliminate. A method for modifying street light illumination by using sensor at minimum electrical energy consumption ,when object presence is detected, street lights glow at their brightest mode, else they stay in the dim mode during night time Internet of things (IOT) is used to visualize the real time updates of street processing and notifying the changes occur. This shall reduce heat emissions, power consumption, maintenance and replacement costs and carbon dioxide emissions.

Keywords: Arduino node mcu (ESP8266),IR Sensor, LDR sensor, bylnk application

I. Introduction

Streetlights are an integral part of any developing locality. They are present on all major road-ways and in the suburbs too. Every day, streetlights are powered from sunset to sunrise at full strength, even when there is no one around. On a global scale, millions of dollars are spent each day on these street lights to provide the required electrical energy. This paper gives the best solution for electrical power wastage. Also the manual operation of the lighting system is completely eliminated. The energy consumption in entire world is increasing at the fastest rates due to population growth and economic development and the availability of energy sources remains woefully constrained. We use the word “smart” because the system not only provide power to the street lights but also helps in detecting the direction of movement of the pedestrian and helps him by means of illuminating the path of movement till the near next street light. A simple and effective solution to this would be dimming the lights during off peak hours. Whenever presence is detected, the lights around it will glow at the normal (bright) mode. This would save a lot of energy and also reduce cost of operation of the streetlights. We can check the status of street light on internet using IOT (Internet of things) from anywhere in real time and solve the issues if happen during the processing.

RELATED WORK:

Intelligent wireless street light control and monitoring system Author :B. K. Subramanyam . K. Bhaskar Reddy, P. Ajay Kumar Reddy.

This paper proposes on intelligent wireless street light control, which integrates new technologies, offering ease of maintenance and energy savings. Using solar panel at the lamp post By using LDR it is possible to save some more power and energy, and also we can monitored and controlled the street lights using GUI application, which shows the status of the lights in street or highway lighting systems.[1]

Design of Wireless Framework for Energy Efficient Street Light Automation

Author:P.Nithya, N.Kayalvizhi

This paper suggested an Intelligent management of the lamp posts by sending data to a central station by ZigBee wireless communication. With the suggested system, maintenance can be easily and efficiently planned from the central station, allowing additional savings. This streetlight control system helps in energy savings, detection of faulty lights and maintenance time and increase in life span of system.[2]

II. EXISTING SYSTEM:

In the existing system, the street lights are switched on and off manually by the public itself, This involves a disadvantage in the way that at many times the public forget to switch it OFF, This is overcome in our proposed system.

III. PROPOSED SYSTEM:

In our proposed system, we make use of the property of LDR, which is its resistance varies with respective to the light intensity, In our proposed system the night and day is identified using LDR, Then during the day time the street light will be switched off and then during the night time street light will be switched on automatically, IR sensor is used to detect the presence of vehicle in the Road, If the crowd of the vehicle is low in the street then it will be sensed using IR sensor and light will be switched off, If the vehicle is present in the street then light will be turned on.

IV. ARCHITECTURE:

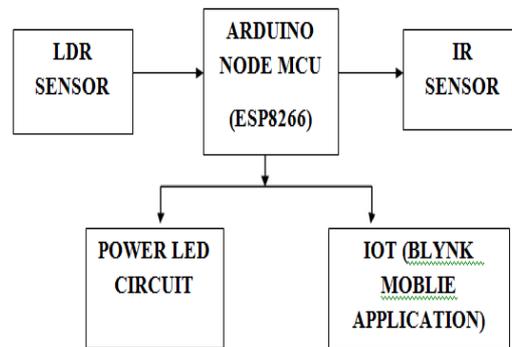


Fig 1.1 system architecture for IOT based smart street lighting system.

IR SENSORS:

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation is the region having wavelengths longer than visible light wavelengths, but shorter than microwaves. The infrared region is approximately demarcated from 0.75 to 1000 μ m.

LIGHT DEPENDENT RESISTOR (LDR):

A LDR or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it. When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band.

POWER LIGHT EMITTING DIODE (LED)

A high-power LED light source is a single LED power higher than 0.5W. At present, many manufacturers use low power LED, but it need use a lot of LED, and also lower power LED with higher light decay. So its trend to use high power LED source in commercial lighting.

High power LED is a light emitting diode with high rated current. Low LED power is generally 0.1W, operating current is 20mA but high power LED can reach 1W, 2W, or even tens of watts, operating current can be range from tens of mA to several hundred mA.

RESISTORS

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor. All other factors being equal, in a direct-current (DC) circuit, the current through a resistor is inversely proportional to its resistance, and directly proportional to the voltage across it. This is the well-known Ohm's Law.

CAPACITORS

Capacitor is a passive component used to store charge. The charge (q) stored in a capacitor is the product of its capacitance (C) value and the voltage (V) applied to it. Capacitors offer infinite reactance to zero frequency so they are used for blocking DC components or bypassing the AC signals. The capacitor undergoes through a recursive cycle of charging and discharging in AC circuits where the voltage and current across it depends on the RC time constant. For this reason, capacitors are used for smoothing power supply variations.

ARDUINO MODE MCU(ESP8266):

Node MCU is an open source [IoT](#) platform. It includes firmware which runs on the ESP8266Wi-FiSoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS-SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

INTERNET OF THINGS(IOT):

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play.

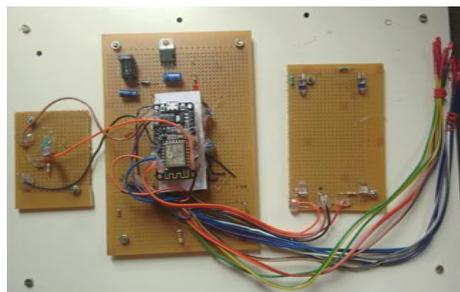
BLYNK MOBLIE APPLICATION:

Blynk is a Platform with iOS and Android apps to control Arduino Mode MCU(ESP8266) Mode MCU(ESP8266), Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets.

V. IMPLEMENTATION:**HARDWARE IMPLEMENTATION:**

All the components are to be connected with Arduino board. In this input module of the project, we used 2 IR sensors which are interfaced with Arduino Mode MCU(ESP8266) and work individually with respective to each other. In this we are connecting the output pins of IR sensor to pins D0,D1 of Arduino Mode MCU(ESP8266) to give status of IR sensor. IR sensor senses the presence of a vehicle or a pedestrian on the road and increases the intensity of LED street lamps on the road through output module.

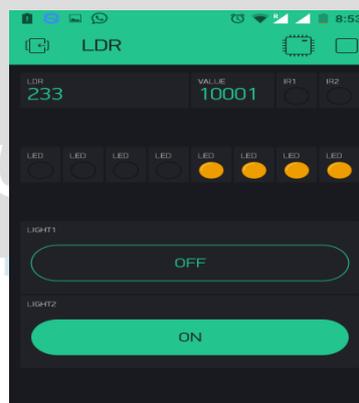
All IR sensor works on 5V and Arduino Mode MCU(ESP8266) is working on less than 5V supply (Battery or Laptop USB driver). two virtual switches are connected to arduino mode mcu though blynk application.

Implementation:

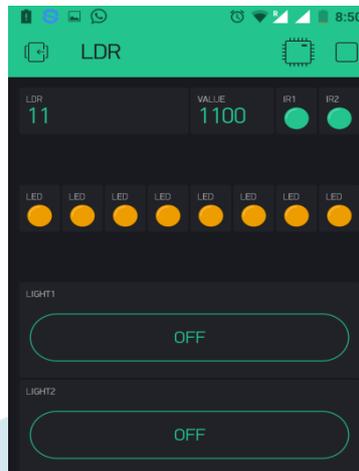
Implementation of IOT based smart led street lighting system.

VI. RESULTS:

The project aims were to reduce the side effects of the current lighting system and find a solution to save power. In this project the first thing to do is to prepare the inputs and outputs of the system to control the lights. The project shown in the figure has been implemented and works as expected and will prove to be very useful.



When switch 2 is turned on LED 5- LED8 will glow in brightest mode.



When obstacle is detected in both the IR sensor the LED will glow in the brightest mode.

VII. CONCLUSION:

The use of power electronics is increasing exponentially across various sectors of human life. The components used in the project, like Arduino Mode mcu and sensors are slowly becoming an indispensable part of our daily routines. So, it is only fitting that we use them to improve efficiency in every walk of life. Keeping in mind the urgent need for energy conservation, IoT based smart street lighting system is an excellent and effective solution. It combines safe lighting protocols with consumption of minimal amount of power. The energy savings, as discussed before are phenomenal. The future scope of this project expands into speed detection and customizable area of illumination.

An additional component which would lead to better functioning of the concept would be the use of LED bulbs. Despite their high initial costs, they are a viable option as they drastically reduce the power consumption. They will aid in further saving of energy and reduction in operational costs.

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