Solar Powered Auto Intensity Control of Street Light with SMS Feedback System

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Abstract:
The use of power solar system in generation of electricity for streetlights nowadays is widely used. Generally, many of this kind of streetlight is using one solar panel system to power its lamp. We use dual power solar system and mains power for street light. If there is a fault in solar system, then street light continue glow to the other source (main source). The problem that can be arise for this kind of streetlight is how to control and guarantee the optimal system. The use of current sensor and voltage sensor using voltage divider circuit with GSM communication system allows monitoring street light. The information from street light when fault occur then processed by a microcontroller. This microcontroller then sends the data through a GSM communication system to a server, via short message service (SMS). This server then processed the data by parsing the information from the SMS, and sends the data to a web server database. This information then can be accessed by operator. The expected outcome of this monitoring system is a system that can be used in monitoring small solar power plants system as the street lights

I. INTRODUCTION

Basically, street lighting is one of the important parts of a city’s infrastructure where the main function is to illuminate the city’s streets during dark hours of the day. Previously, the numbers of street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density.

There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective and the reduction of crime.

GSM based street light monitoring & control system is an automated system designed to increase the efficiency and accuracy by automatically timed controlled switching of street lights.

GSM based street light monitoring & control system consists of a microcontroller which on setting of time switches ON/OFF the street lights and dims at 12mid night for reducing power consumption and when any movement is detected it bright. This is smart way of managing street lighting systems. There are basically two modules which include the client side and the server side. The client side consists of the GSM modem which is further connected to the microcontroller.

The server side consists of the cell phone it has a core engine. There are LEDs for indication of bulb. Solar street lights are immensely useful as standalone source of light on streets and in premises, gardens and industrial appliances. Solar Street is also available in power LED version.

Automatic dimming due to LDR system according to the sunlight is optionally provided. LEDs are automatically put on dimming mode after high intensity of sunlight. This saves on panel and battery cost.

BLOCK DIAGRAM

Figure 1. block diagram of the system

POWER SUPPLY

In this project we use dual power supply solar system and mains power for street light. 5V regulated power supply is required for microcontroller, LED, IR (infrared) sensor GSM (global system for mobile) is obtained from solar panel and 220V AC mains. 220 AC mains is converted it to a lower voltage with the help of 12V step-down transformer, rectification by diode D1, D2, D3, & D4, pulsating DC is filtering by a capacitor 1000uf/50V, and finally regulation is achieved by 7805 regulator IC.

Figure 2. circuit diagram of regulated power supply
II. RECHARGEABLE BATTERY

In this project we use Ni-Cd rechargeable battery. A rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminals. Rechargeable batteries allow for multiple usages from a cell, reducing waste and generally providing a better long-term investment in terms of dollars spent for usable device time. This is true even factoring in the higher purchase price of rechargeable and the requirement for a charger. A rechargeable battery is generally a more sensible and sustainable replacement to one-time use batteries, which generate current through a chemical reaction in which a reactive anode is consumed. The anode in a rechargeable battery gets consumed as well but at a slower rate, allowing for many charges and discharges. In use, rechargeable batteries are the same as conventional ones. However, after discharge the batteries are placed in a charger or, in the case of built-in batteries, an AC/DC adapter is connected.

ARDUINO

8051 is the name of the big family of arduino. The device used in our project is Arduino which is a typical 8051 microcontroller manufactured by ATML. The heat of the GSM based solar powered auto-intensity control of street light is the Arduino. The arduino has 4 different ports, each one having 8 input/output lines providing a total of 32 input/output lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the arduino have ‘dual function’ meaning that they can be used for two different functions. The first one is to perform input/output operations and second one is to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called ‘register’, each bit being connected to a different input/output pin. There are two different memory types: RAM and EPROM. Shortly, RAM is used to store variable during program execution, while the EPROM memory is used to store the program itself, that’s why it is often referred to as the ‘program memory’. It is clear that the CPU that will read the program from the FLASH memory and execute it by interacting with the different peripherals.

Diagram above shows the pin configuration of the arduino, where the function of each pin is written next to it, and, if it exists, the dual function is written between brackets. Note that the pins that have dual functions can still be used normally as an input/output pin. Unless the program uses their dual functions, all the 32 input/output pins of the microcontroller are configured as input/output pins.

RELAY

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it). You can think of a relay as a kind of electric lever: switch it ON with tiny current and it switches on (leverages) another appliance using a much bigger current. Why is that useful? As the name suggests, many sensors are incredibly sensitive pieces of electronic equipment and produce only small electric currents. But often we need them to drive bigger pieces of apparatus that use bigger currents. Relays bridge the gap, making it possible for small current to activate larger ones. That means relays can work either as switches (turning things ON and OFF) or as amplifiers (converting small currents into larger ones). In our project relay is used to switch power supply in case of fault take place in solar power supply.

SENSORS

A sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be light, heat, motion, moisture, pressure, or any one of a great number of other environmental phenomena. The output is generally a signal that is converted to human readable display at the sensor location or transmitted electronically over a network for reading or further processing. In our project sensors used are LDR (light dependent resistor), IR (infrared) sensor.

LIGHT SENSOR:

LDR (light dependent resistors) is also known as photo resistors, are light sensitive devices most often used to indicate the presence of light, or to measure the light intensity. In the dark, their resistance is very high, sometimes upto 1MB ohm, but when the LDR sensor is exposed to light, the resistance drops dramatically, even down to a few ohms, depending on the light intensity. LDRs have a sensitivity that varies with the wavelength of the light applied and are nonlinear devices. They are used in many applications but are sometimes made obsolete by other devices such as photodiodes and phototransistors.

IR SENSOR

We have already discussed how a light sensor works. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold. Since the sensor works by looking for reflected light, it is possible to have a sensor that can return the value of the reflected light. This type of sensor can then be used to measure how “bright” the object is. This is useful for tasks like line tracking.

Figure 3. pin diagram of ARDUINO

http://ijesc.org/
OUTPUT
This section consists of various devices like LEDs for indication of bulb. Solar street lights are immensely useful as standalone source of light on streets and GSM sends information to the operator from street light when fault occur on the street light.

III. CONCLUSION

We have discussing about solar street light system using arduino. It is to save energy and automatic street light control is used to control the street lights (turn ON/OFF based on the light). It can also be interfaced to a LDR to follow the switching operation precisely. When solar system fails to give supply to the system or any fault occur then relay switch it to mains supply 220V AC. Any fault occur in street light then arduino sense the fault and give information to GSM and GSM send it to the operator by SMS(short message service).

IV. FUTURE SCOPE

In future these system is used in public places, hospitals and malls with sms feedback system. Auto intesity of light control is used in automobiles headlight system.

V. REFERENCE


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