Solar Tracking with GSM Notification Highway Information System: Review

[1]Janvi Panwar, [2]Kajal Saini, [3]Kavita Sharma

Abstract

In earlier days, use of street light system operated manually. Thus result in the more requirement of manpower and large demand of energy consumption and also this mechanism is less reliable. So the answer is renewable energy in form of solar energy which is presently used in domestic as well as corporation. Due to the reduction of remote areas and enhancement of urban sectors and population most of the people approach to become the digitalized. So that some changes taken just like LED lamps are replaced by HID and solar high pumps installed. Also Automatic Street light is taken into picture. In this paper, automation of street has emerged. This project concerns the reduction of electricity consumption and the reduction of road human resources. It contains use specific sensors, LDR and microcontroller to control the street light circuit day and night. Someone knows that high intensity light is unnecessary at peak times, even when there is no traffic or when they are in a hurry. In this case we will lower the intensity in the morning. Energy can be saved to a certain extent. Collect solar energy with the help of solar cells and batteries, the daily charging time and this energy will be used for street lights. In addition, at night, using the solar tracker system; you can get the greatest energy from the sun. This project describes a system that automatically controls the intensity of street light using design microcontroller and LDR.

Keywords: LDR(Light Dependent Resistor),LED(Light Emitting Diode),IR(Infrared) sensor, HID(High Intensity Discharge),GSM(Global System For Mobile) Modem.

Introduction

Basically, street lighting is one of the important parts of the city. The main function is to illuminate city lighting infrastructure in the darkest time of the day. Street light is relatively simple due to Urbanization; the number of streets will increase rapidly as high traffic density. This paper design presents appraisal of a street light controlling system using sun tracking solar system. Solutions when applied to many fields such as industrial residential, commercial, etc. Smart system has an autonomous operation to detect changes in the environment with the help of sensors etc. Fixing work of electronic parts and consideration to the environment it is the best way to reach the continually execute. To use road lights, the time during the day is to improve the quality of human life. The latest technology being used today is a light based optical system (LED based system), which is used as energy. It is a reliable and reliable optical technology to make it possible to reduce the cost of light and energy by 75%of ow energy. Carbon dioxide emission and other dangerous gases are also a cause of shortages.

DEVICE AND METHOD

As shown in figure 1, It contain solar tracker, filter and regulator, battery, LDR sensor, analog to digital converter, GSM modem, reset and crystal circuit ,a servo motor, microcontroller ,LCD 7 segment display, LED driver and street LED lights. Solar plate is used to absorb solar energy and with the help of solar tracker, filter and regulator convert sun energy

into electrical energy.LDR which used to sense the light. Battery is used to store the electrical energy and Analog To Digital converter to used to convert the analog signal into digital signal .GSM modem used to send a message to the control room when any fault occur in connection of street light. Microcontroller is interface with GSM modem, relay, LDR sensors and IR street LED light sensor.LDR driver responds to the changing needs of the LED or LED circuits by providing constant quantity of power to the LED as its electrical property change with temperature. Reset and Crystal circuit used to reset the whole system .A Servo Motor used in the sola tracking system to rotate the solar plate according to the maximum intensity of the sunlight.
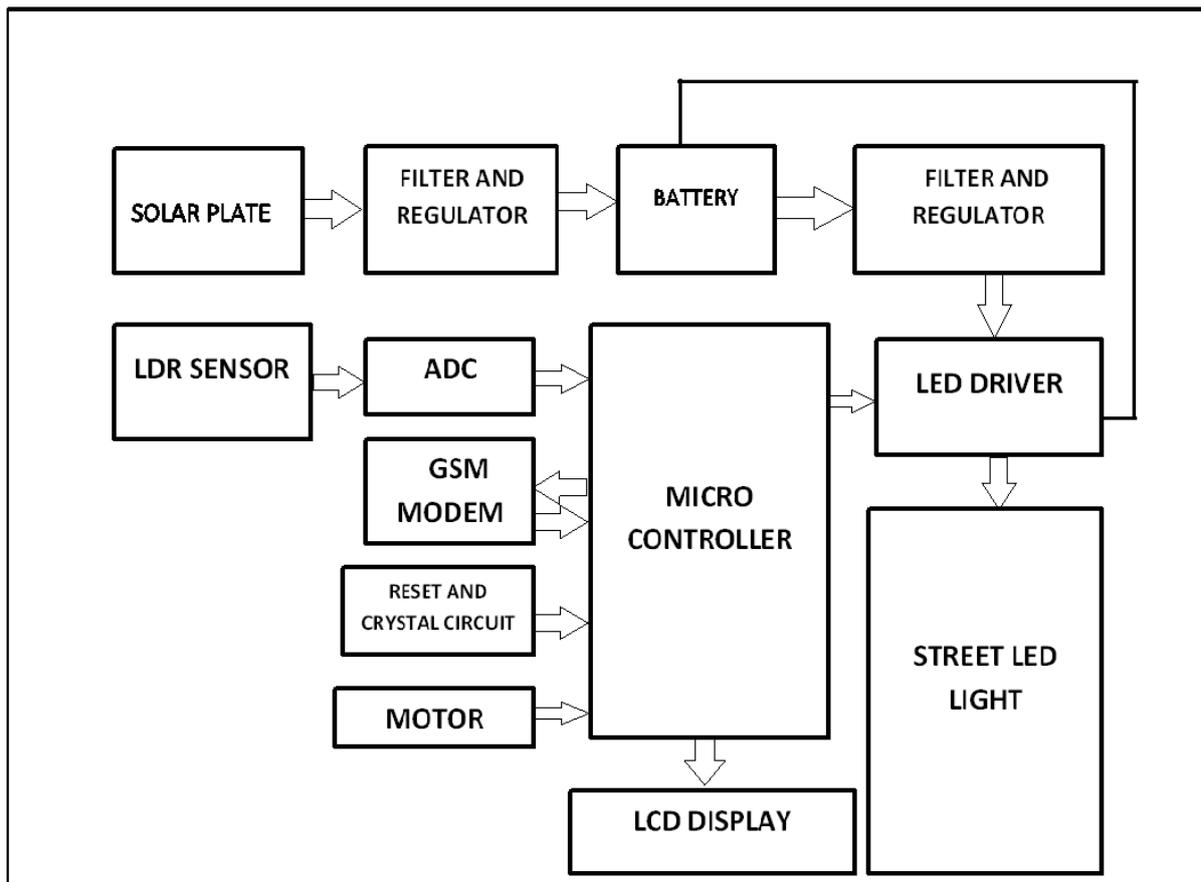
FIGURE:-1 BLOCK DIAGRAM

In solar tracking system the solar tracker is used along with the solar panel, battery and servo motor. The servo motor is used for the rotation of solar panel according to the position and intensity of the sun light. When the intensity of sun light is high then the power is store in the battery. LDR on solar panel detect the light according to the morning, afternoon and evening. After evening the LDR's are closed and come back to the initial position. When the LDR is in on condition then it store the power into battery and during off condition is supply the power to the street light. On street light there is an LDR and IR sensor which sense the light and according to which the output will vary. When all the street light are in working condition then interfaced GSM modem with microcontroller will send the message to the control room. If there is any fault in the connection wires of street light LED's then IR sensor does not sense, then GSM modem will report or send message to the control room.
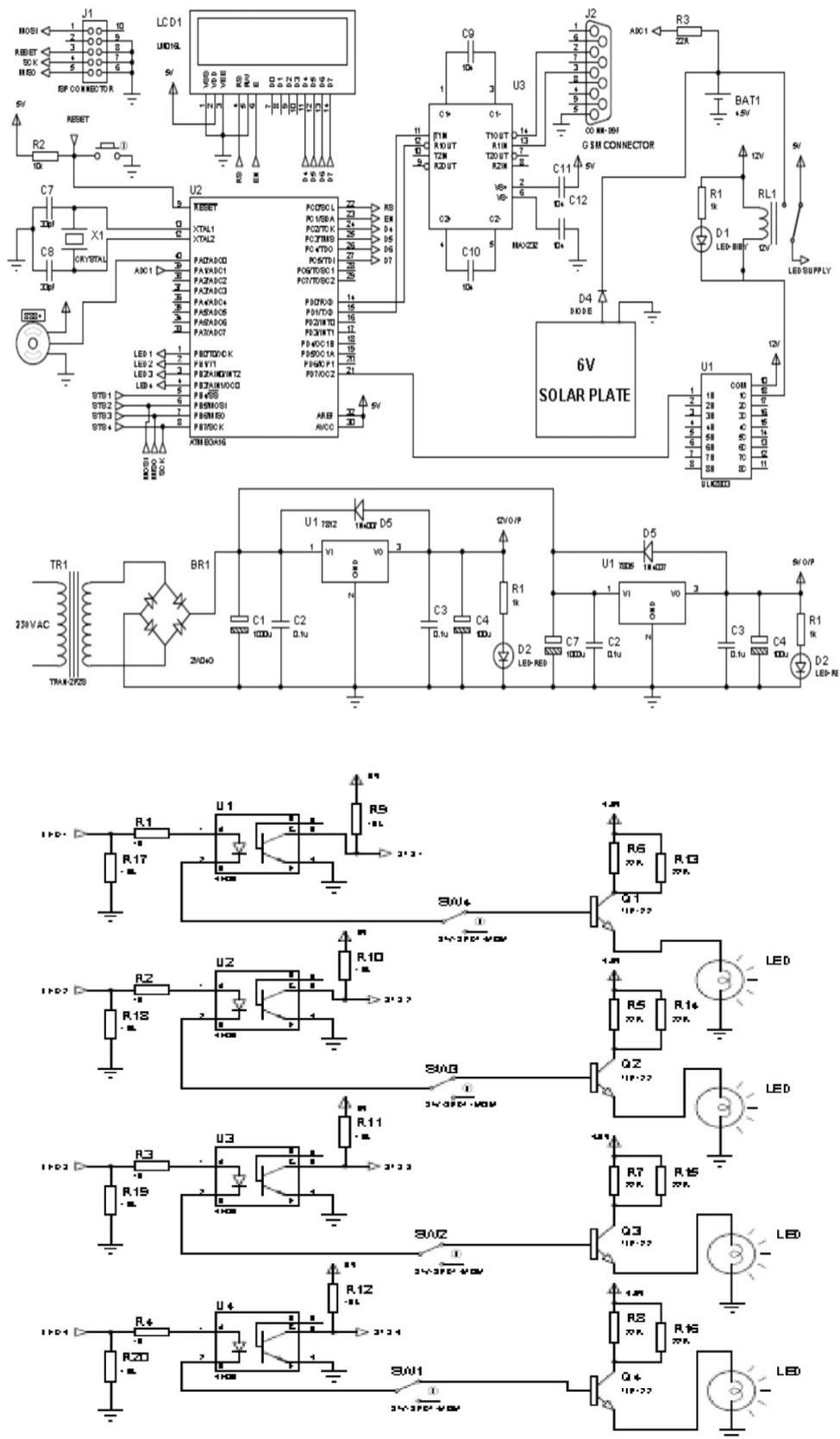
FIGURE: 2 CIRCUIT DIAGRAM

BATTERY

In this project, the solar tracking system is used by this solar tracking system we store electrical energy in battery in in chemical form. This battery provides supply to microcontroller, LED, LDR and IR sensor, GSM Modem to switch ON, operate and to perform appropriate function.

SOLAR TRACKING SYSTEM

Solar Plate:-Solar plate absorbs sunlight as a source of energy to generate electricity. It is connected with servo motor and the LDR sensor. Through which it rotate according to the high intensity sunlight by sensing LDR sensor and then absorb sunlight in its wafers and then convert into electrical energy and this energy store in mechanical form in the battery.

Servo Motor:-It obeys the principle of Pulse Width Modulation (PWM). It used to rotate an object at a particular angle or distance. It is just a motor which run through a servo mechanism. This motor is used for both AC and DC power that's why it is called AC servo motor and DC servo motor respectively. Here the servo motor is used to rotate the solar plate as it interface with the LDR microcontroller so that it rotate according to the maximum intensity of light.

FIGURE 3: SERVOMOTOR

LDR SENSOR:-It stands for Light Depending Resistor which is made up of high resistance semiconductor. This intensity sunlight falling on the photo resistor cause the plate rotates according to intensity of sun during day hours. During hour of darkness (at evening time) it automatically turns OFF.
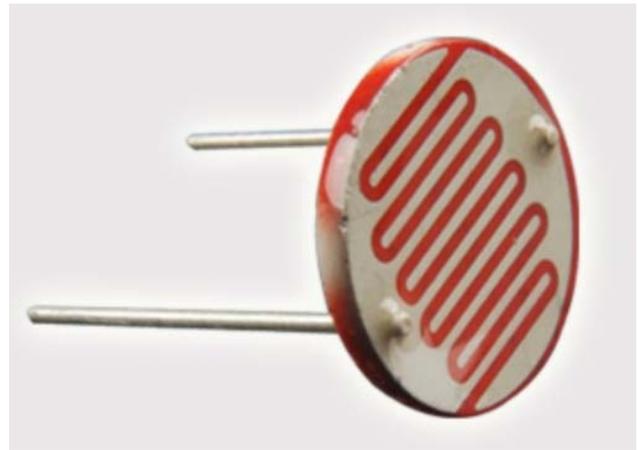

FIGURE 4: LDR SENSOR

MICROCONTROLLER

The proposed system consist AtMega16 AVR microcontroller is connected with LDR, IR, Servo motor, Relay ,GSM SIM900 and other component. We can use AtMega328 microcontroller. It has 14 input-output pins in which 6 can be used as PWM output, 16 MHZ ceramic resonator, 6 analog inputs a power jack, USB connection, a reset button and ISP header. The PWM output pin is connected with servo motor or USB connection or battery is connected with USB cables. The most popular module based on SIMCOM SIM 900(GSM Modem) with Arduino need to make three connections between them. There are two ways to connect Arduino with GSM modem in case of communication. In case of serial communication between Arduino and GSM Modem we suppose to connect serial pin of Arduino TX is connected with RX pin of GSM Modem and TX pin of GSM Modem is connected with the RX pin of Arduino. Microcontroller interface with the IR sensor by connect the negative wire on the IR sensor to GND on the Arduino. For connection of LDR to microcontroller, LDR used to connect to the analog input pin 0(zero) on the Arduino. Relay controlled by low voltage like 5 volt which is provided by the Arduino pin in microcontroller.
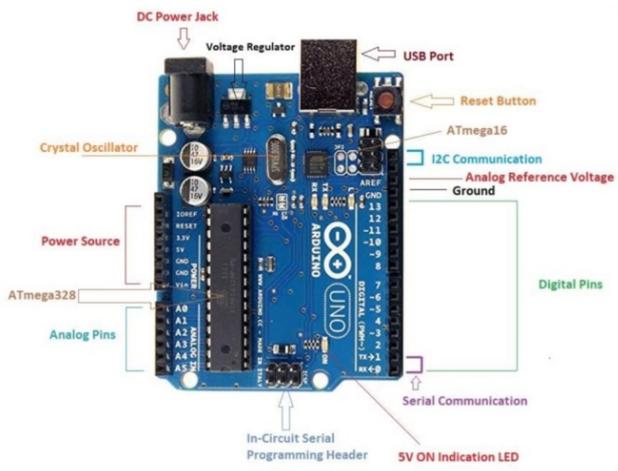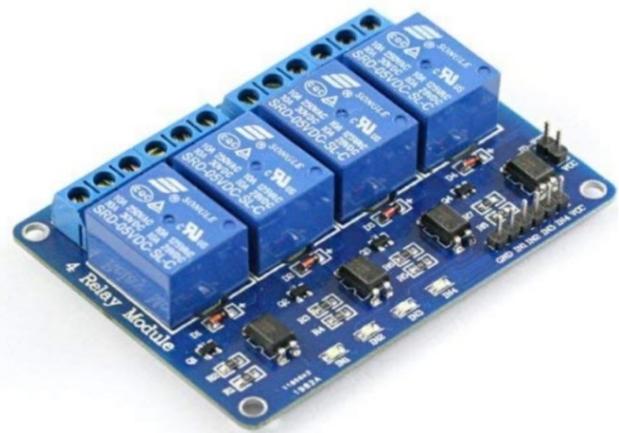
FIGURE 5: MICROCONTROLLER (ARDUINO)

FIGURE 6: RELAY (NUMERICAL RELAY)

RELAY

A relay is an electrically operated switch that can be turn ON and OFF when current is go through or not. Relay module has various types of channels like one channel, two channel, four channel and eight channel (blue cubes).The relay module consist 6 pin on left side and high voltage applied on it(NO,NC,COM).And the pin on the right side connect the low voltage which is provided by Arduino pins.

COM:-Common pins,

NC:-By default ,this configuration used for closed the relay if current flow unless a signal is send from Arduino to the relay module to open the circuit and stop the current.

NO:-This configuration work the other way around in which the relay always open so that a circuit broken unless you send a signal from Arduino to close the circuit.

GSM MODEM

A GSM Modem is a special type of modem or module which accepts a SIM card and operates over a subscription to a mobile operator just like a mobile phone. GSM stands for Global System for mobile communication. It developed by a European Telecommunication Standards Institute(ETSI).In proposed system the main work of this GSM system to send the message to control room by taken a response from relay microcontroller, when any fault is occur in connecting wire of LED's.

FIGURE 7: GSM MODEM (SIM900)

IR SENSOR

IR sensor is an electronic sensor that measure infrared light radiating from lighting source or from objects in its field of view. All the objects with temperature absolute zero emit heat energy in the form of radiation which is not visible by human eyes because its wavelength is at infrared wavelength. For detection of this wavelength the electronic device are designed (IR sensor).The IR is connected below the LED highway street light to sense the radiation coming out from the LED's and if any LED is not working due to any fault it doesn't sense any radiation and relay sense if there is any fault. After this interfaced GSM modem send message to control room.
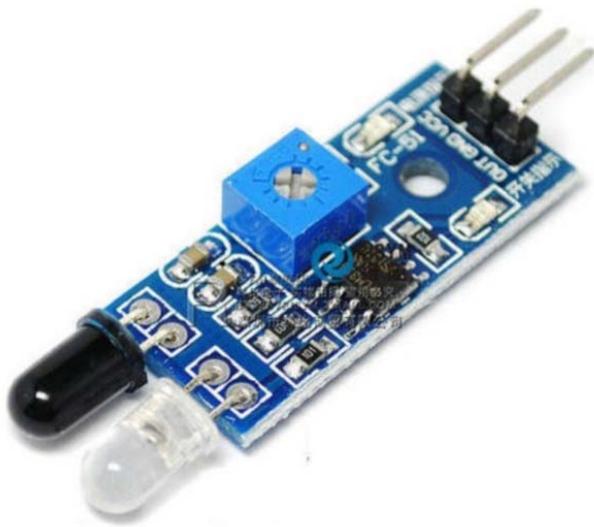

FIGURE 8: IR SENSOR

IC's like 7805, 7812, MAX232, ULN2803, TIP122, etc.

CONCLUSION

We are discussing a solar street light system using microcontroller. It is for saving energy and used for automated street light control .That it can also be linked to the LDR to track the switching operation. When smart supply system cannot supply power to system or if there is any mistake, switch on the 220V AC power with the relay. When street light fails, Arduino looks at the obstacle, GSM returns information and sends to the GSM operator SMS (Short Message Service).This project is cost effective, environmentally friendly, and is the safest and wise way to save energy. This obviously reduce s the

number of the problems the world faces today, energy savings and disposal of incandescent lamps are very efficient. According to with statistical data, you can save up to 75% of the electrical energy currently consumed on highways. Main drawbacks of this project are initial cost and maintenance with the help of technology and good resources of advances.

References

[1] Kunjal Nanavati, UG Student, Uka Tarsadiya University, Bardoli, India. "Street Light Control System Using Sun Tracking Solar Panel –Review" International Journal Of Innovative and Emerging Research In Engineering. Volume 3, Issue 4, 2016.

[2] Vikas Chauhan Student Assistant Professor, YITM, Rajnandgaon, India. "Solar Powered Auto Intensity Control of Street Light with SMS Feedback System" 2017 IJESC, Volume 7 Issue No.4.

[3] pdfs.semanticscholar.org(Internet Source)

[4] ijireeice.com(Internet Source)

[5] Submitted to TAR University College(Student Paper)

[6] Submitted to Higher Education Commission Pakistan(Student Paper)

[7] Submitted to iGroup(Student Paper)

[8] Submitted to Universiti Tenaga Nasional(Student Paper)

[9] Submitted to Universiti Teknikal Malaysia Melaka(Student Paper)

[10] www.nuv.ac.in

[11] S M Shaful Alam,"Design And Construction Of an Automatic Solar Tracking System"Member,IEEE dept. of EEE.

[12] M.Mendalka ,"WSN for Intelligent Street Light System", in Proc. of the 2nd ICIT2010,Gdansk,Poland.

[13] Prof.K.Y.Rajput,"Intelligent Street Lighting System Using GSM".

[14] Gustavo W.Denardin,"Control Network For Modern Street Lighting Systems",IEEE symposium on Industrial Electronics(ISIE),(2011).

[15] Wu Yue,"Design of new intelligent street light control system"8th IEEE international Conferences on Control and Automation (ICCA), 2010.

[16] P. Aravind Choudary,"Street Lights that glow on detecting vehicle movement".

[17] Archana,"LED Powered intelligent street lighting system with automatic brightness adjustment based on climatic conditions and vehicle movement".International Journal of Advanced Research in Electrical,Electronics and instrumentaion Engineering Volume 3.Special issue 2(2014).

[18] SAAD, MUSTAFA et al."Automatic Street Light Control System using Microcontroller". Mathematical Methods and Optimization Techniques in Engi ISBN: 978-960-474-339-1(2014).

[19] Saganya.S., Sinduja.R., Somiya.T. And Senthi kumar.S. "Street Light Glow On Detecting Vehicle Movement Using Sensors",IJAERT,ISSN 2320-6802,ICIRET-2014.

[20] Sinhmar. P. "Intelligent traffic light and density control using IR sensors and microcontroller",IJATER,ISSN NO: 2250-3536,vol.2,March 2012.

Author's Profile

[1,2,3]Scholar, Dept. Of Electrical Engineering, Poornima College of Engineering, Sitapura, Jaipur,INDIA, Email: [1]janvisingh7615@gmail.com, [2]kajalsaini8530@gmail.com, [3]kavitasharma@gmail.com