SOLAR BASED POWER SAVING MECHANISM FOR OUTDOOR LIGHTING

Prof. S.M.Karodi[1], Akash Dhasade[2], Ganesh Gangane[3], Vishal Bhat[4]

1 Assistant Professor, Dept. of Electrical Engineering, AISSMS'S IOIT, Maharashtra, India
2 Student (B.E.), Dept. of Electrical Engineering, AISSMS'S IOIT, Maharashtra, India
3 Student (B.E.), Dept. of Electrical Engineering, AISSMS'S IOIT, Maharashtra, India
4 Student (B.E.), Dept. of Electrical Engineering, AISSMS'S IOIT, Maharashtra, India

ABSTRACT

The objective of this project is to design a system which works on microcontroller, which provides automatic control of the system which will help to reduce excess consumption of light. With the use of microcontroller there is no human interference in the system. The present system available is like street lights will be switched ON in the evening before sunsets and will be switched off in the next day morning after there is sufficient light on the roads. In this project we are proposing a simpler, multipurpose, cost-effective design to control the on-off mechanism of street lights.

Keyword: *PIR [Passive Infrared Motion sensor], Light Dependant Resistor [LDR], GSM module, Microcontroller, Streetlight controlling.*

1. INTRODUCTION

The idea of designing a new system for the street light is to help conserve energy and illuminate large areas with the highest intensity of light. Providing a street light is of the most important responsibility in the city. A well-designed, street lighting system should permit vehicles or people to travel at night with good visibility, in safety and comfort by reducing any malfunction that occur during night and enhance the appearance of the neighborhood.

The proposed system is designed in such a way that a light sensor is placed above the centralized circuit which is responsible to switch ON and OFF of street light automatically. Once the lights are switched ON, current sensors placed at every light pole will report problem status to the centralized system with the help of GSM module attached with the circuit. With the status available in the centralized system, the working personal can easily locate the faulty LED and can repair it. So the time of fault detection and repair is minimized.

2. LITERATURE SURVEY

The following literature survey was revived:
"Proposed system is all about to control the power consumptions at the streets and eliminating manpower. This includes controlling circuit of street lights with specific Sensors, LDR and Microcontrollers during day and night. This requires three basic components i.e. LDR, Sensors and microcontroller. During daytime there is no requirement of street lights so the LDR keeps the street light off until the light level is low or the frequency of light is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Thus the street lights do not glow".

3. PROPOSED SYSTEM FEATURES

- Remote on/off, Dimming and on-site Status Check.
- 24-hours online Monitoring.
- Reduce energy use by up to 40%.
- Reduce maintenance by up to 50%.
- Increase bulb life by up to 25%.

4. BLOCK DIAGRAM

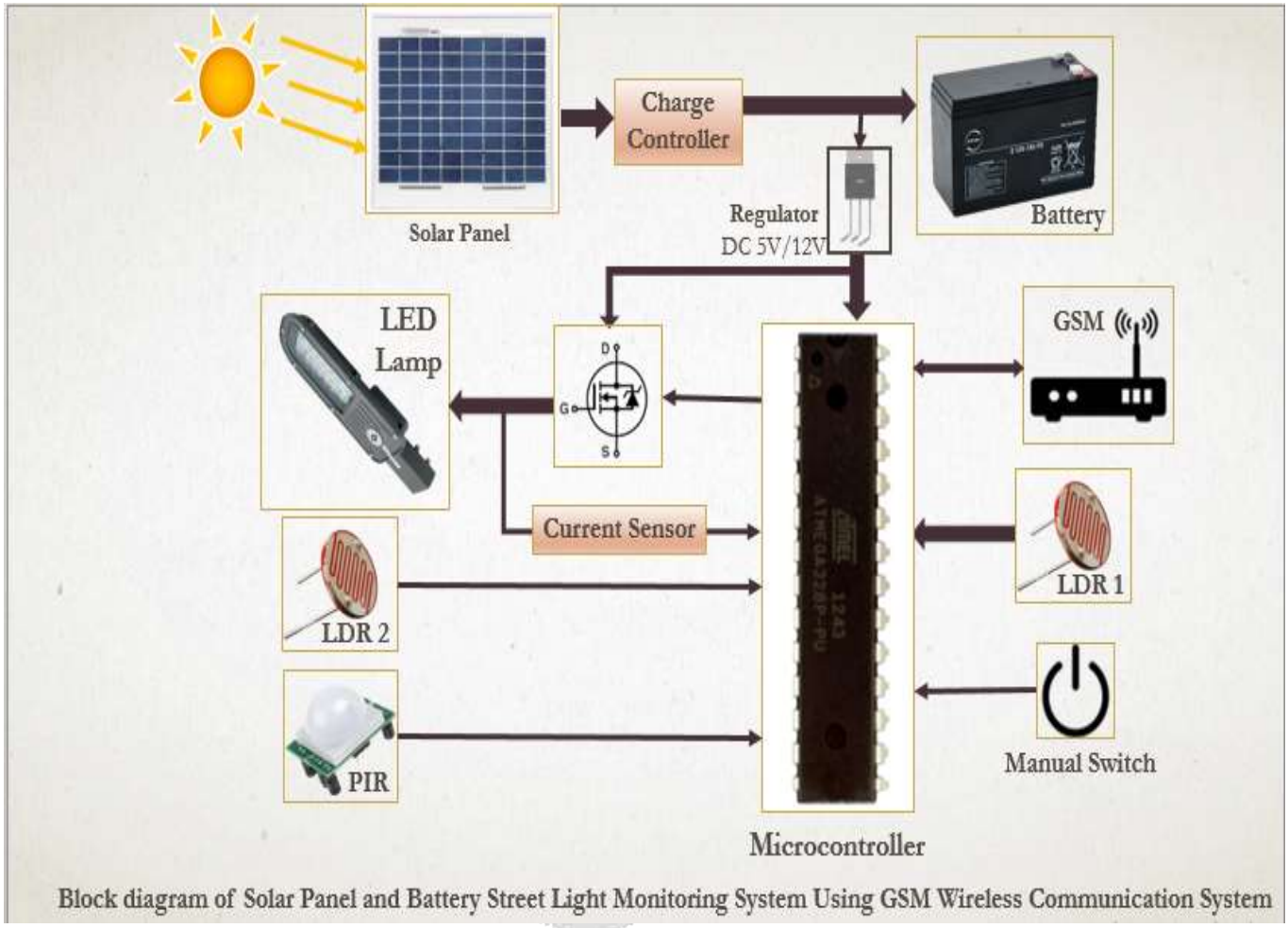

Fig: Block diagram of proposed system

COMPONENTS IN BLOCK DIAGRAM

4.1 LDR (Light Dependent Resistor)

Two cadmium sulphide (CDS) photoconductive cells with spectral responses similar to that of the human eye. The cell resistance falls with increasing light intensity. When the LDR detect light its resistance will get decreased, thus if it detects darkness its resistance will increase.

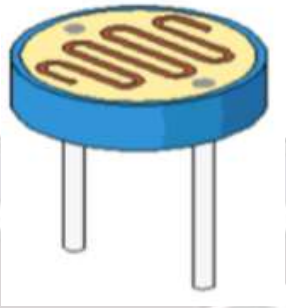

Fig -1: Light Dependent Resistor

4.1 PIR SENSOR

To detect the movement on the street, the motion sensors have been used in this project, where emitter and receiver are in one unit. Light from the emitter strikes the target and the reflected light is diffused from the surface at all angles. If the receiver receives enough reflected light the output will switch states. When no light is reflected back to the receiver the output returns to its original state. In diffuse scanning the emitter is placed perpendicular to the target. The receiver will be at some angle in order to receive some of the scattered (diffuse) reflection.

Fig -2: PIR Sensor

4.3 REGULATED POWER SUPPLY

Usually, we use an unregulated power supply ranging from 9 volt to 12 volt DC. To make a 5 volt power supply, voltage regulator IC. Simply connect the positive lead form unregulated DC power supply(anything from 9VDC to 24VDC) to the input pin, connect the negative lead to the common pin and then turn on the power, a 5 volt supply from the output pin will be received.

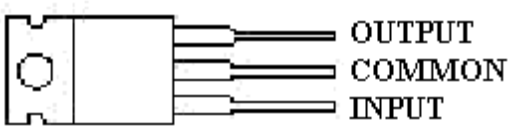

Fig -3: Regulated Power Supply

4.4 MICROCONTROLLER

Arduino Nano is a surface mount version with integrated USB port. It is a smallest, complete, and breadboard friendly. It comes with 8 analog input pins and onboard +5V AREF. Nano don't have power jack. The Nano is automatically sense and switch to the higher positive voltage source of power.

Arduino Nano got a pin layout that works well with the Basic Stamp (TX, RX, ATN, GND on one top layer, power and ground on the other). This version comes with Atmel's high performance, low power 8-bit AVR ATMega328 microcontroller in a pint-sized TQFP (Thin Quad Flat Package) package which is brain of this chip. Atmega328P offer more programming and data memory space.

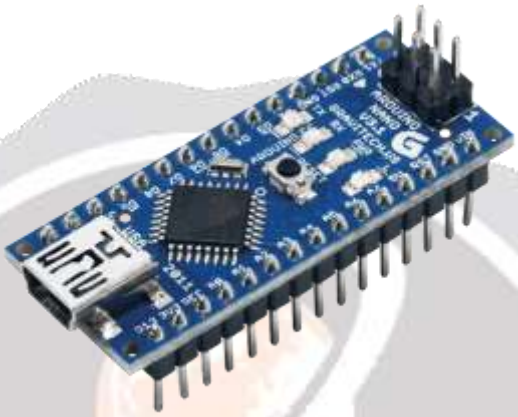

Fig -4: Microcontroller

4.5 GSM Module

GSM module we used in this project to inform centralized system in fault condition. If there is fault in Lamp or lamp not working properly then LDR detects the there no light falling from lamp, then it give instruction to microcontroller, which will inform GSM module to send SMS on centralized system mobile.

Fig-5: GSM Module

5. Working

Solar panel is connected to MPPT, charge controller and to the battery. Now battery is charged by output of solar panel through MPPT and charge control at its charging voltage 13.7 V and charging current 2.1 A. Work of MPPT is to provide constant output of 13.7 V. If battery is fully charged then the supply to battery from solar panel is disconnected by charge controller. Battery supply is given to voltage regulator. Two voltage regulators are used giving one voltage output of 5 volts which is directly given to microcontroller as V_{cc} and another voltage regulators output i.e. 12 volts is given to GSM module.

Three LDRs are used in this prototype model. One is connected directly to the microcontroller for day night sensing and other two LDRs are placed below LEDs to sense the condition of LED (faulty condition). PWM driver is use to control the intensity of the LEDs. Closed loop control is used in this model. In feedback loop, current sensor is used to sense the current taken by the LED during its working. If current sensor senses zero current then through GSM module, message is sent to the operating personal about the faulty condition of the LED

PIR sensors are also used in this model. Function of PIR sensor is to detect the movement below the Street light. As the motion is sensed by the PIR sensor, signal is sent to the microcontroller to increase the intensity of the light using PWM driver.

6. ADVANTAGES

- Switch on and off automatically.
- Street light false detection.
- Alert notification and automatic off for particular street light if there is any abnormal consumption of power to avoid short circuit or any such related problems, also message to the respective workman.
- Can be deployed on any street light circuit.
- Reduces power consumption.
- Reduces human resource.
- Increases the life time of the street light.

7. CONCLUSION

In the proposed system automatic light system is described, that integrates new technologies offering ease of maintenance and energy savings, the proposed system is appropriate for street lighting in remote as well as urban areas where traffic is low at times. Along with energy saving it also tackles with the problem of power theft. It is capable of taking corrective actions in case of unprecedented events of climatic changes.

8. REFERENCE

- S.V.Viraktamath, Dr.G.V.Attimarad (2011), "*Power Saving Mechanism For Street Light Using Wireless Communication*", Dayanand Sagar College of Engineering Banglore, Karnataka, India.
- Mustafa Saad, Abdalhalim Farij, Ahamed Salah(2012), "*Automatic Street Light Control System Using Microcontroller*", Dept.of control Engineering , College of Electronic Tech./Baniwalid-Libya.
- Abdul Latif Salim, Raja Sagar R, Sachin Datta N S ,Sachin H S (2015), "*Street Light Monitoring And Control System",* Dept.of Computr Science and Engineering, NIE Institute of Tech., Mysore,India.(Vol-1 Issue 2 Mar-Apr 2015).
- Omkar Natu, Prof. S A Chavan(2013), *"GSM Based Smart Street Light Monitoring And Control System",* Dept. of Computer Science, PVPIT Pune, India(Vol-5 No. 03 Mar 2013).
- Akash R B, Holabasappa K, Kiran Kumar DM, Kiran Mardi(2015), *"Street Light Monitoring And Controlling System",* ISE , National Institute of Engineering, Mysore.