



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 8, August 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Automatic Solar Street Light for a Smart City

S.P.Kanniyappan¹, S.Pushkar², A.Akash Arul³, P.Nakul⁴

Assistant Professor, Department of Civil Engineering, R.M.K. Engineering College, Kavaraipettai, Tamilnadu, India¹

U.G Student, Department of Civil Engineering, R.M.K. Engineering College, Kavaraipettai, Tamilnadu, India^{2,3,4}

ABSTRACT: This project is based on the idea of maintaining maximum utilization and minimum loss of available energy. The plenty of solar energy available during the day time is stored in a solar cell and the stored energy is used to glow the street lights during the whole night. Also the system provides a power saving mode of operation by adapting the method of automation. A dark sensor and a light sensor provides the automatic “ON”/“OFF” facility to the street lights, so that it will glow automatically when it is required (i.e. when the surrounding will be dark) and it will be turned “OFF” automatically if sufficient light is available in the surrounding. Again the auto intensity control mechanism has been applied by the help of a IC555 to control the light intensity of the luminaries as per the requirement. Hence the loss of energy due to unnecessary glow of the street lights can be avoided.

KEYWORDS: Solar, Energy, LED, Battery, Light.

I. INTRODUCTION

In this Project we show when day start and sunlight came on solar panel then solar panel convert the sunlight into electricity and electricity store in the battery, so battery charge that storage electricity power we use night time when sunlight not available, In this Project we show when sunlight go and darkness come means Night Start, The LDR sensor sense the darkness and turn on the street light electricity button so street light on and start glowing and mangle road darkness , So this is best working project for showing solar charging base automatic on-off street light system and this is 100% full working project so this project idea we can use in real life , our project idea is best for showing working project.

II. METHODOLOGY

This paper proposes an effective scheme for controlling the wastage of electricity due to streetlights. It reduces the manual effort by automating the streetlight on the basis of light intensity. The electricity wastage can be reduced by glowing the light on the basis of movement detection. Here three parts have been included under this topic for completed this study. Design architecture is the main block function for the proposed design. While, the hardware specification will detail out the components involved in this design from the sensor components until the controller selection. Software development based on the proposed design will be detail out in software part where the flow of the system operation will be detailed out elaborated. The automatic streetlight control system operates on 12V DC supply. The automatic streetlight controller has a photoconductive device whose resistance changes proportional to the extent of illumination, which switches ON or OFF the LED with the use of transistor as a switch. Light dependent resistor, a photoconductive device has been used as the transducer to convert light energy into electrical energy. The central dogma of the circuit is that the change in voltage drop across the light dependent resistor on illumination or darkness switches the transistor between cut-off region or saturation region and switches OFF or ON the LEDs we know property of LDR that during the time of day resistance is low therefore voltage at the inverting input (IE pin 2) is higher than the voltage at the non-inverting input (pin 3) hence the output at the pin6 is low so the transistor goes into the cut off state which means LED or bulb will not glow.

III. HARDWARE REQUIREMENTS

a) Capacitors

A capacitor (originally known as condenser) as shown in figure 1 is a passive two terminal electrical component used to store electrical energy temporarily in an electric field. The forms of practical capacitor vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e., an insulator that can store energy by becoming polarized). The conductors can be thin film, foils or sintered beads of metal or conductive electrolyte, etc. The non-conducting dielectric acts to increase the capacitors charge capacity.

Materials commonly used as dielectrics include glass, ceramic, plastic film, air, vacuum, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuit in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy. Instead a capacitor stores energy in the form of electrostatic field between its plates. An ideal capacitor is characterized by a single constant value, its capacitance. Capacitance is defined as the ratio of the electric charge Q on each conductor to the potential difference V between them. The SI unit of capacitance is the farad (F), which is equal to one coulomb per volt (1 C/V). Typical capacitance values range from about 1 pF (10^{-12} F) to about 1 mF (10^{-3} F). Capacitors are widely used in electronic circuit for blocking direct current while allowing alternating current to pass. In analogue filter networks, they smooth the output of power supplies. In resonant circuit they tune radios to particular frequencies. In electric power transmission system, they stabilise voltage and power flow.

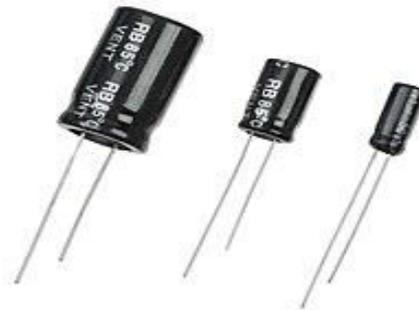


Fig. 1. Capacitors

b) Resistors

A resistor is a passive two terminal electrical component that implements electrical resistance as a circuit element as shown in figure 2. In electronic circuit, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission line among other uses. High power resistors, that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.



Fig. 2. Resistors

c) Light Dependent Resistor (LDR)

Light dependent resistors as shown in figure 3 are very useful especially in light or dark sensor circuits. Normally the resistance of an LDR is very high, but when they are illuminated with light, resistance drops dramatically. Electronic sensors are the devices that alter their electrical characteristics, in the presence of light. The best known devices of this type are the light dependent resistors, the photodiode and phototransistors. As the name suggests, depending on light the resistance value varies. LDR are made by depositing a film of cadmium sulphide or cadmium selenite on a substrate of ceramic containing no or very free electrons when not illuminated. The longer strip the more the value of resistance. When light falls on the strip the resistance decreases. In the absence of light the resistance can be in the order of 10Kohm to 15Kohm and is called dark resistance. Though LDR is very sensitive to light, the switching time is very high and hence cannot be used for high frequency applications.

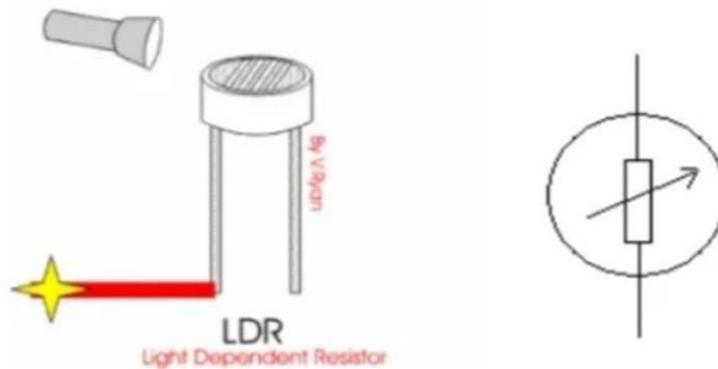


Fig. 3. Light Dependent Resistor

The basic construction and symbol for LDR are shown in above figures respectively. The device consists of a pair of metal film contacts separated by a snake like track of cadmium sulphide film, designed to provide the maximum possible contact area with the two metal films. The structure is housed in a clear plastic or resin case, to provide free access to external light. Practical LDRs are available in variety of sizes and packages styles, the most popular size having a face diameter of roughly 10 mm.

d) Diodes

In electronics, a diode is a two-terminal electronic component as shown in figure 4 that conducts primarily in one direction (asymmetric conductance); it has low (ideally zero) resistance to the flow of current in one direction, and high (ideally infinite) resistance in the other. A semiconductor diode, the most common type today, is a crystalline piece of semiconductor material with a p-n junction connected to two electrical terminals. The diode can be viewed as an electronic version of a check valve. This unidirectional behaviour is called rectification, and is used to convert alternating current to direct current, including extraction of modulation from radio signals in radio receivers these diodes are forms of rectifiers. A semiconductor diode's current-voltage characteristic can be tailored by selecting the semiconductor materials and the doping impurities introduced into the materials during manufacture. These techniques are used to create special – purpose diodes that perform many different functions.

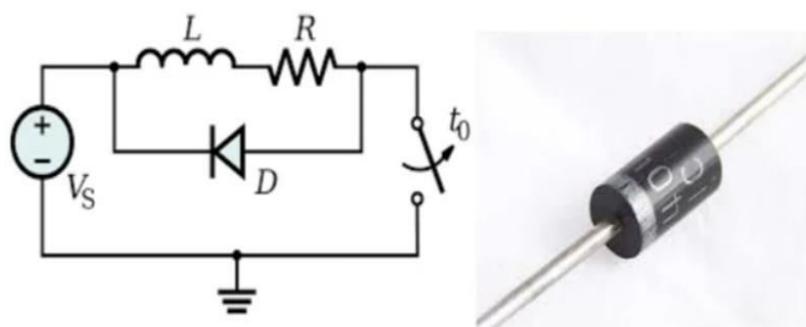


Fig. 4. Diodes

e) Printed Circuit Board (PCB)

Printed Circuit Board (PCB) as shown in figure 5 is piece of art. The performance of an electronic circuit depends on the design and layout of the PCB. A PCB mechanically supports and connects components by conductive pathways, etched from copper sheets laminated on to insulated substrate. PCB are used to rotate electrical currents and signals through copper tracks which are firmly bonded to an insulating base.

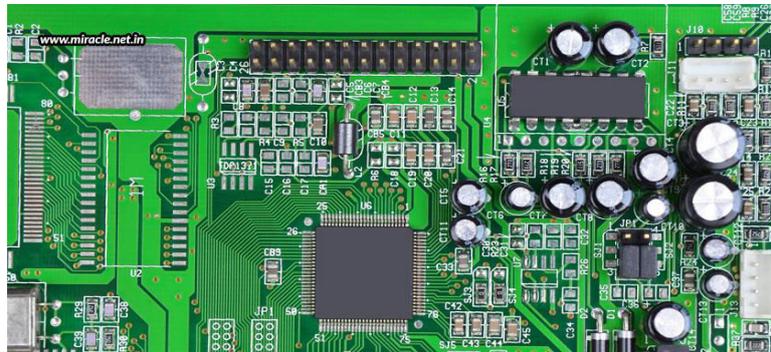


Fig. 5. Printed Circuit Board

f) Solar Sensor

An instrument, usually of the optoelectronic type, that determines the angle of deviation of an axis of some instrument, aircraft, or space vehicle from the direction of the sun. Solar sensors as shown in figure 6 are used in the orientation of astronomical instruments, in the solution of navigational problems in aviation and spaceflight, and as attitude sensors in some orientation systems. The design of a solar sensor depends on the requirements imposed on it with respect to, for example, accuracy, reliability, speed of response, and size of region viewed.



Fig. 6. Solar Sensor

g) Battery

A battery can be defined as an electrochemical device as shown in figure 7 (consisting of one or more electrochemical cells) which can be charged with an electric current and discharged whenever required. Batteries are usually devices that are made up of multiple electrochemical cells that are connected to external inputs and outputs.

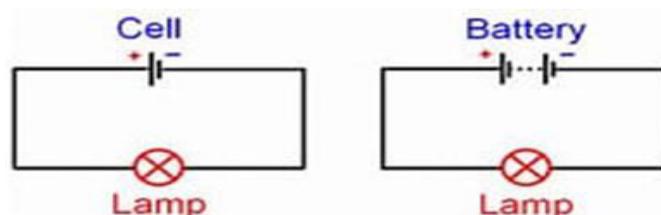


Fig. 7. Battery

h) IC 555

IC 555 timer is a well-known component in the electronic circles as shown in figure 8 but what is not known to most of the people is the internal circuitry of the IC and the function of various pins present there in the IC. Let me tell you a fact about why 555 timer is called so, the timer got its name from the three 5 kilo-ohm resistor in series employed in the internal circuit of the IC.



IC 555 timer is a one of the most widely used IC in electronics and is used in various electronic circuits for its robust and stable properties. It works as square-wave form generator with duty cycle varying from 50% to 100%, Oscillator and can also provide time delay in circuits.



Fig. 8. IC 555

i) Light Emitting Diode [LED]

Light-emitting diode (LED) as shown in figure 9 is a widely used standard source of light in electrical equipment. It has a wide range of applications ranging from your mobile phone to large advertising billboards. They mostly find applications in devices that show the time and display different types of data.

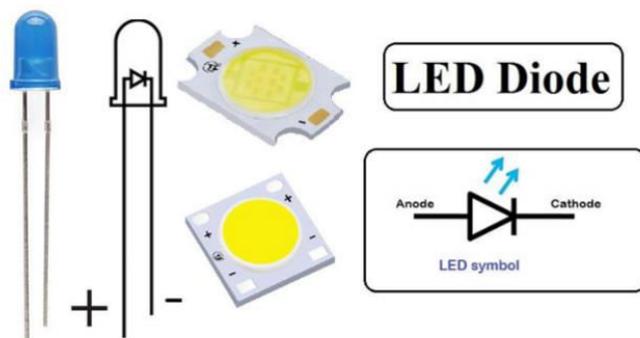


Fig. 9. Light Emitting Diode

j) Other components



Fig. 10. Other Components

IV. WORKING SYSTEM

In this Project working, We use two working system

1. Automatic Solar Charging System

Solar panels use the photons produced by sunlight to generate direct current (DC) electricity. When the photons hit the panel they are absorbed by the panel's semiconducting silicon material. During this process electrons separate from the atoms and move around the solar cell. This movement of the electrons is what generates Direct Current (DC) electricity. The DC electricity then flows to the circuit and circuit give the dc power to battery then battery start charge, So in this project we show battery charging system by solar penal ,this is best idea for storage electricity power without any pollution. In This Project We use 6V Solar Penal and 4.5V Battery For Charging.

2. Automatic ON/OFF Street Light System

In this project We show darkness come in road then LDR Sensor Sense the Darkness and give to signal IC 555 and IC 555 On the LED Bulb power supply and LED Bulb start glowing and mangle darkness in Road, and there are preset for switching LDR Sensor sensing Power Up and Down For and This Darkness Circuit Work as same as When Day is end and Night start, When Day start then this system turn off LED Bulb and when Night start then this system automatic turn ON LED Bulb and LED Bulb start Glowing automatic Night Time.

In this Project For giving Power We use 4V Chargeable Battery by solar penal.

How does a solar street light work?

Solar street lights are raised light sources which are powered by solar panels generally mounted on the lighting structure or integrated into the pole itself. The solar panels charge a rechargeable battery, which powers a fluorescent or LED lamp during the night.

The solar street lights comprise of, which absorb the solar energy during daytime. The photovoltaic cells convert solar energy into electrical energy, which is stored in the battery. At the nighttime the lamp starts automatically and it consumes the electricity already stored in the battery.

Do solar lights stay on all night?

How long do solar lights stay lit? If you're outdoor solar lights receive enough sunlight for a full charge (usually about eight hours), they will be able to illuminate all evening, starting when the light gets low, around sunset.

V. PROTOTYPE

This project of Automatic Street Lights (a Prototype as shown in figure 11) is a cost effective, practical, eco-friendly and the safest way to save energy. It clearly tackles the two problems that world is facing today, saving of energy and also disposal of incandescent lamps, very efficiently. According to statistical data we can save more that 40 % of electrical energy that is now consumed by the highways.

Initial cost and maintenance can be the draw backs of this project. With the advances in technology and good resource planning the cost of the project can be cut down and also with the use of good equipment the maintenance can also be reduced in terms of periodic checks . The project has scope in various other applications like for providing lighting in industries, campuses and parking lots of huge shopping malls. This can also be used for surveillane in corporate campuses and industries.





Fig. 11. Automatic Street Light Prototype

VI. CONCLUSION

The aim of this project was to design and implement an automatic street light using PIC16F883 microcontroller, which can be used to avoid manual operation for switching street light on and off. In order to save and conserve energy in an efficient manner, street lights are on only when a movement is detected by a movement detection sensors. This proposed system is in par with government's policy of energy conservation by reducing consumption of electricity and efficient use of energy, so it can be termed as an innovative project in street lightning that can be implemented in the roads like state and national highways.

In this Project we show solar charging base charging battery and automatic on/off darkness base street light system after making our project when we try to check our project working that time our project work without any problem, so our project working system is perfect, So we can use this idea in our real life.

REFERENCES

- [1] Easley Dizon, Bernardi Pranggono, "Smart streetlights in Smart City: a case study of Sheffield", *Journal of Ambient Intelligence and Humanized Computing*, (2022) 13:2045–2060.
- [2] Rakesh Roshan, Om Prakash Rishi, "Smart Solar Street Light Using WiFi, IR Motion Sensor and LDR for the Smart City", *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, Volume-8 Issue-6C, pp. 75–79, April 2019.
- [3] Kasa Sudheer, Duvvuru Madhurita, Amudala Chandana, Marella Thanesh, M Karunakar Babu, "Intelligent Street Light System For Smart Cities", *JASC: Journal of Applied Science and Computations*, Volume VI, Issue V, pp. 684–690, May 2019.
- [4] Revathy.M, Ramya.S, Sathiyavathi.R, B.Bharathi and V. Maria Anu, "Automation of Street Light For Smart City", *International Conference on Communication and Signal Processing*, April 6-8, pp. 0918–0922, 2017, India.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details