Automatic Street Light On/OffSystem

Prof. P.G. Bhende[1] , Abhishek Chitlangia[2] , Hemant Sharma[3] , SakshiWankhade[4]

[1]*Prof., Electrical Department, Manav School of Polytechnic And Engineering, Maharashtra, India*
[2,3,4] *Student, Manav School of Polytechnic And Engineering, Maharashtra, India*

ABSTRACT

Automatic Street Light ON/OFF System is a simple yet powerful concept, which uses transistor as a switch. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. This is done by7 a sensor called Light Dependent Resistor (LDR) which senses the light actually like our eyes. A street light that automatically switches ON when the night falls and turns OFF when the sun rises. In fact we can use this circuit for implementing any type of automatic night light. The circuit uses a LDR to sense the light. When there is light the resistance of LDR will be low. So the voltage drop across POT R2 will be high. This keeps the transistor Q1 ON. The collector ofQ1 (BC107) is coupled to base of Q2(SL100). So Q2 will be OFF and so do the relay. The bulb will remain OFF. When night falls the resistance of LDR increases to make the voltage across the POT R2 to decreasebelow 0.6V. This makes transistor Q1 OFF which in turn makes Q2 ON. The relay will be energized and the bulbwill glow.

1. INTRODUCTION

In these modern days power consumption has been the need of the hour. Because day by day we are utilizing most of the natural resources and the time taken to reproduce is much longer. so if we reduce the consumption and the wastage, Even in one field then it will be of a great use. So we can now go for "Automatic street light control". Street light are helpful in nights all over the world and their usage cannot be ignored. But we observe that these are switched on during daytimes also. Even though when the light is pured these are switched on. so to avoid power wastage we are using automatic street light control. italso used in homely purpose also.

Street lights are the major requirement in today's life of transportation for safety purposes and avoiding accidents during night. Despite that in today's busy life no one bothers to switch it off/on when not required .

The project introduced here gives solution to this by eliminating manpower and reducing power consumption. 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 transistor. Thus the street lights do not glow. As soon as the light level goes high or if light falling on thedevice is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance. Now the circuitrygoes in on condition and the block diagram represented here starts working.

The idea of designing a new system for the streetlight that do not consume huge amount of electricity and illuminate large areas with the highest intensity of light is concerning each engineer working in this field. Providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typical cities worldwide. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability.

Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy efficient technologies and design mechanism can reduce cost of the street lighting drastically. Manual control is prone to errors and leads to energy wastages and manually dimming during mid night is impracticable. Also, dynamically tracking the light level is manually impracticable. The current trend is the introduction of automation and remote management solutions to control street lighting.

2. BASIC PRINCIPLE

The automatic streetlight control system operates on 12 V 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 LEDAs 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 (pin3) hence the output at the pin6 is low so thetransistor goes into the cut off state which means LED or bulb will not.

3. REQUIRMENTS

SR. No.	PARTS	RANGE	QUANTITY
1	Transistor	BC -547 NPN	2
2	LDR		1
3	Resistor	1k, 300 ohm	3
4	LED		8
5	Battery		1
6	Switch		1
7	Wires		1
8	Black Paper		1
9	Card Board		1
10	Yellow Paper		1
11	White Tape		1
12	Black Tape		1
13	White Paper		4

4. CONSTRUCTION

4.1   Transistor :- BC547 is an NPN bi-pola junction transistor. A transistor, stands for transfer or resistance commonly used to amplify current. A small current at its base controls a larger current at collector & emitter terminals. BC547 is mainly used for amplification and switching purposes. It has a maximum current gain of 800. Its equivalent transist The transistor terminals require a fixed DC voltage to operate in the desired region of its characteristic curves. This is known as the biasing. For amplification applications, the transistor is biased such that it is partly on for all input conditions. The input signal at base is amplified and taken at the emitter. BC547 is used in common emitter configuration for amplifiers. The voltage divider is the commonly used biasing mode. For switching applications, transistor is biased so that it remains fully on if there is a signal at itsbase. In the absence of base signal, it gets completely off.

Fig -1 Transistor

4.2   LDR:- A Light Dependent Resistor (LDR) is also called a photo resistor or a cadmium sulfide (CDS) cell. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases.
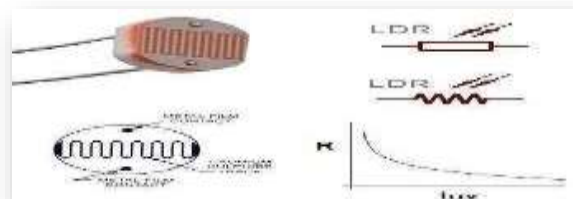

Fig -2 LDR

4.3 Resistor :- Resistor is an electrical component that reduces the electric current. The resistor's ability to reduce the current is called resistance and is measured in units of ohms (symbol: Ω).If we make an analogy to water flow through pipes, the resistor is a thin pipe that reduces the water flow. A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, 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 loadsfor generators. Fixed resistors have resistances that only change slightly withtemperature, 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.
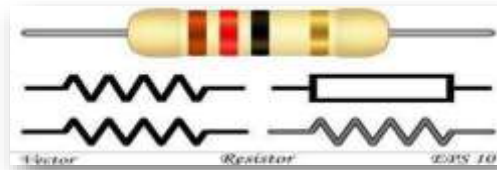

Fig -3 Resistor

4.4 LED:- A **light-emitting diode** (**LED**) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to crossthe band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device. Appearing as practical electronic components in 1962, the earliest LEDs emitted low- intensity infrared (IR) light. Infrared LEDs are used in remote-control circuits, such as those used with a wide variety of consumer electronics. The first visible-light LEDs were of low intensity and limited to red. Early LEDs were often used as indicator lamps, replacing small incandescent bulbs, and in seven-segment displays. Recent developments have produced LEDs available in visible, ultraviolet (UV), and infrared wavelengths, with high, low, or intermediate light output, for instance white LEDs suitable for room and outdoor area lighting. LEDs have also given rise to new types of displays and sensors, while their high switching rates are useful in advanced communications technology with applications as diverse as aviation lighting, fairy lights, automotive headlamps, advertising, general lighting, traffic signals, cameraflashes, lighted wallpaper, horticultural grow lights, and medical devices.

Fig -4 LED

4.5 Battery:- A **battery** is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower- energy products, and the free- energy difference is delivered to the external circuit as electrical energy.

Fig -5 Battery

4.6 Switch:- In electrical engineering, a **switch** is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another. The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits. When a pair of contacts is touching current can passbetween them, while when the contacts are separated no current can flow.
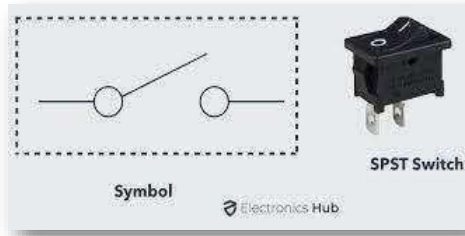

Fig -6 Switch

4.7 Wires:- A **wire** is a single usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire iscommonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term 'wire' is also used more loosely to refer to a bundle of such strands, as in "multistranded wire", which is more correctly termed a wire rope in mechanics, or a cable in electricity.Wire comes in solid core, stranded, or braided forms. Although usually circular in cross- section, wire can be made in square, hexagonal, flattened rectangular, or other cross-sections, either for decorative purposes, or for technical purposes such as high-The Wire is an Indian nonprofit news and opinion website which publishesin English, Hindi, Marathi, and Urdu. It was founded in 2015 by Siddharth Varadarajan, Sidharth Bhatia, and M. K. Venu and is organized as a nonprofit organization named the Foundation for Independent Journalism.The publication's reporters have won several national and international awards, including three Ramnath Goenka Excellence in Journalism Awards and the CPJ International Press Freedom Award. The website has been subject to several defamationsuits by businessmen and politicians, some of which have been described as strategic lawsuits against public participation.
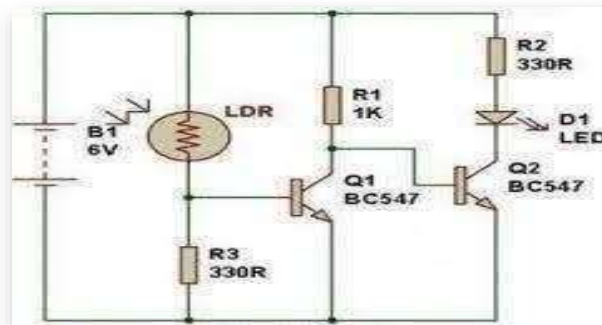
5. CIRCUIT DIAGRAM

Fig -7 Circuit Diagram of automatic street light controller

6. WORKING

Circuit of a compact and true solid-state automatic lawn light is described here. The circuit can be used toswitch on incandescent garden light bulbs at desk and switch off them at dawn. A10 mm encapsulated light dependent resistor (LDR) here works as the twilight detector. The whole circuit can be housed in a very small plastic cabinet. For powering the circuit AC household supplyis needed. With a little skill and patience, you can easily modify this circuit to drive a number of white LED strings,instead of the incandescent bulb load at the output. When ambient light is normal, transistor T1 is reverse biased by the low resistance of LDR. Multiturn plastic trimpotP1 sets the detection sensitivity. If ambient light dims, transistor T1 turns on to drive the triac T2. Now the lamp load at the output of T2 energises. When the ambient light level restores, circuit returns to its idle state and light(s) switched off by the circuit.

Working voltage for the circuit is derived directly from the AC supply input through components R1, R2 and R3. This obviates the requirement of a bulky. If you wish to operate the, light bulb(s) on a little reduced power, just

replace the triac T2with a suitable silicon-controlled rectifier (SCR). This may give a long life to the incandescent load. Finally, the LDR should not be mounted to receive direct sunlight. It may be mounted at the top of the enclosure, pointing to the sky say southwards. LDR offers Very high Resistance in darkness. In this case the voltage drop across the LDR is more than 0.7V.This voltage is more sufficient to drive the transistor into saturation region. In saturation region, IC (Collector current) is very high. Because of this IC. The relay gets energized, and switches on the lamp. LDR offers Very low Resistance in brightness. In this case the voltage drop across the LDR is less than 0.7V. This voltage is not sufficient to drive the transistor into saturation region. Hence, the transistor will be in cut-off region. In cut-off region, IC (Collector current) is zero. Because of this IC, The relay will not be energized, and the lamp will be in ON state only. Diode is connected across the relay to neutralize the reverse EMF generated.

7. CONCLUSION

The Streetlight controller using LDR based Light intensity & traffic density, in the todays up growing countries will be more effective in case of cost, manpower and security as compare with today's running complicated and complex light controlling systems. Automatic Street Light Controlling System puts up a very user friendly approach and could increase the power.

This paper elaborates the design and construction of automatic street control system circuit. Circuit works properly to turn streetlamp ON/OFF. After designing the circuit which controls the light of the street as illustrated in the previous sections. LDR sensor and the photoelectric sensors are the two main conditions in working the circuit. If the two conditions have been satisfied the circuit will do the desired work according to specific program. Each sensor controls the turning ON or OFF the lighting column. The street lights has been successfully controlled by microcontroller. With commands from the controller the lights will be ON in theplaces of the movement when it's dark. furthermore the drawback of the street light system using timer controller has been overcome, where the system depends on photoelectric sensor.

This paper elaborates the design and construction of automatic street control system circuit. Circuit works properly to turn street lamp ON/OFF. After designing the circuit which controls the light of the street as illustrated in the previous sections. LDR sensor and the photoelectric sensors are the two main conditions in working the circuit. If the two conditions have been satisfied the circuit will do the desired work according to specific program. Each sensor controls the turning ON or OFF the lighting column. The street lights has been successfully controlled by microcontroller. With commands from the controller the lights will be ON in theplaces of the movement when it's dark. furthermore the drawback of the street light system using timer controller has been overcome, where the system depends on photoelectric sensor. Finally this control circuit can be used in a long roadways between the cities.

8. REFERENCES

[1] S.Suresh,R.Nagarajan, L.Sakthivel, V.Logesh, C.Mohandass, G.Tamilselvan ,"Transmission Line Fault Monitoring and Identification System by Using Internet of Things", IJAERS, Vol-4, Issue-4, Apr- 2017 , ISSN: 2349-6495

[2] Sarthak Sanjeev Koli, Iliyas S. Mull ,Vaibhav H. Kamble ,Shreenivas D. Chougule, Dnyandev E. Patil, Prof. M.A. Mulla, "Transmission Line Monitoring by Using IoT, " IJASRET Volume 4,Special Issue 5 2020, ISSN (Online) 2456-0774

[3] A. Jothimani, Sourabh Sahil, Durgesh Sahu, Mayank Mishra,"Transmission Line Falling Detection using IoT" , IJESC, Volume 10 Issue No.4, 2020, ISSN 2321 3361

[4] Sajal Menon, Don Tommey, Rejoice Thomas Paul, Krishnapriya Vinod , Rajalakshmi Menon, "Automatic Fault Detection and Location of Transmission Lines using IoT" , GRDJE , May 2019 , ISSN: 2455-5703

[5] Minal Karalkar, Sushrut Adlok, Ankit Ramteke, Sumit Parchake, Rajat Tawade, Sujata Manwar, Shubham Wankhade, "Transmission Line Fault Detection using IoT ",Ijresm, Volume-2, Issue-3, March-2019 , ISSN (Online): 2581-5792

[6] N. Dhanalakshmi and Dinesh Reddy Sunkari ," Design Of Iot Based Transmission Line Fault Monitoring System ", IJEET, Volume=12&Issue=6, June 2021, pp. 336-345, ISSN Online: 0976-6553

[7] Pei Zhang, Next-Generation Monitoring," Analysis, and Control for the Future Smart Control Centre", IEEE, vol-1 no-2, pp 186 - 192 October 2010

[8] Jain, Amit, T. C. Archana, and M. B. K. Sahoo, "A methodology for fault detection and classification using PMU measurements." IEEE, Dec 2018.