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AUTOMATIC STREET LIGHT CONTROL WITH SOLAR

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ABSTRACT

Automatic Street Light Control System is a simple yet powerful concept, which uses transistor as a switch. By using this system manual works are 100% rem
oved. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. This is done by a sensor called Light Dependant Resistor (LDR). (LDR) which senses the light actually like our eyes. It automatically switches OFF lights whenever the sunlight comes, visible to our eyes. By using this system energy consumption is also reduced because nowadays the manually operated street lights are not switched off even the sunlight comes and also switched on earlier before sunset. In this project, no need of manual operation like ON time and OFF time setting. This project clearly demonstrates the working of transistor in saturation region and cut-off region. The working of relay is also known.

Keywords

Street light, solar panel, solar energy is converted into electrical energy, zener diode, solar battery, amplifier, switch, resistors, LDR sensor, LED are connected.

1. LITERACTURE VIEW

Street light controllers are smarter versions of the mechanical or electronic timers previously used for street light ON-OFF operation. They come with energy conservation options like twilight saving, staggering or dimmin. Also many street light controllers come with an astronomical clock for a particular location or a Global Positioning System (GPS) connection to give the best ON-OFF time and energy saving.

Automatic Street Light Control System is a simple and powerful concept, which uses transistor as a switch to switch ON and OFF the street light automatically. By using this system manual works are removed. It automatically switches ON lights when the sunlight goes below the visible region of our eyes.

It automatically switches OFF lights under illumination by sunlight. This is done by a sensor called Light Dependant Resistor (LDR) which senses the light actually like our eyes By using this system energy consumption is also reduced because now-a-days the manually operated street lights are not switched off properly even the sunlight comes and also not switched on earlier before sunset.

In sunny and rainy days, ON time and OFF time differ significantly which is one of the major disadvantage of using timer circuits or manual .

This project exploits the working of a transistor in saturation region and cut-off region to switch ON and switch OFF the lights at appropriate time with the help of an electromagnetically operated switch.

A street light, lamppost, street lamp, light standard, or lamp standard is a raised source of light on the edge of a road or walkway, which is turned on or lit at a certain time every night.

Modern lamps may also have light-sensitive photocells to turn them on at dusk, off at dawn, or activate automatically in dark weather. In older lighting this function would

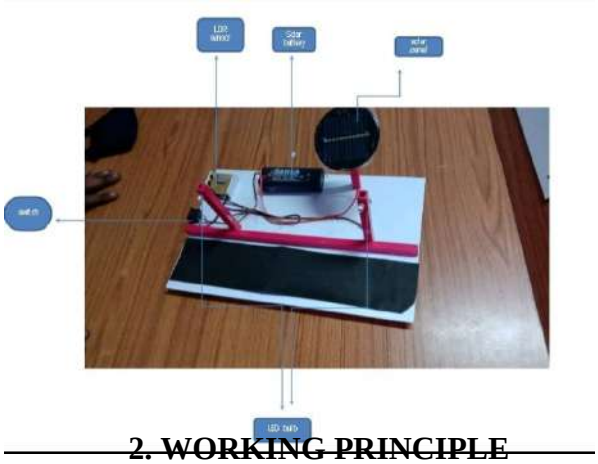
have been performed with the aid of a solar dial.

It is not uncommon for street lights to be on poles which have wires strung between them, or mounted on utility poles.

This project exploits the working of a transistor in saturation region and cut-off region to switch ON and switch OFF the lights at appropriate time with the help of an electromagnetically operated switch Automatic Streetlight needs no manual operation of switching ON and OFF.

The system itself detects whether there is need for light or not. When darkness rises to a certain value

Photography



2. WORKING 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 the transistor goes into the cut off state which means LED or bulb will not glow.

3. PROCEDURE

1. Insert first transistor Q1-BC547 (NPN) on PCB board shown in the circuit diagram
2. Connect another transistor Q2-BC547 (NPN) on PCB board shown in the circuit diagram.
3. Connect wires across emitter pin of both transistor and negative terminal of battery on the PCB board.
4. Connect a wire across collector pin of transistor Q1 and base pin of transistor Q2.
5. Connect a resistor 1k across positive terminal of battery on the PCB board and collector pin transistor Q1.
6. Connect LDR (Light Dependent Resistor) across positive terminal of the battery and base terminal of transistor Q1
7. Insert a transistor 330 ohm across base pin of transistor Q1 and negative terminal of battery.

APPLICATION

- These solar street lights are able to automatically sense
- outdoor light with the help of a sensor. They can this way
- smartly save power & give light on successive nights even when sunlight is unavailable for a couple of days.

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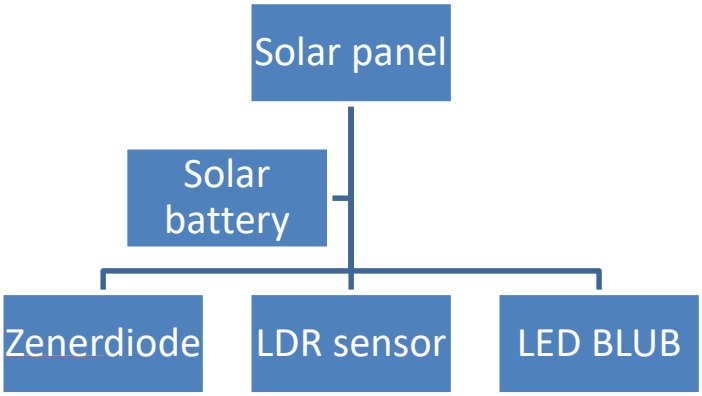
Block diagram



LDR (LIGHT DEPENDENT RESISTER)

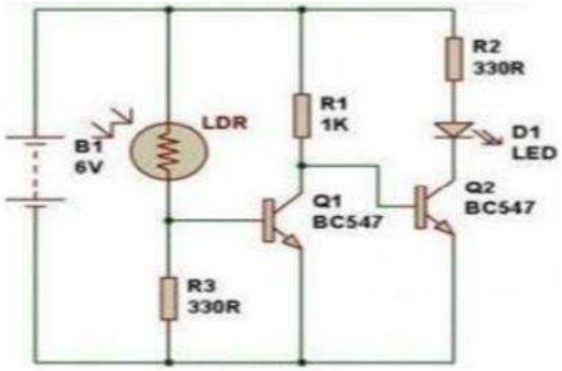
- LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits.
- Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.
- When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light.

RESISTORS

- 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 A light-emitting diode (LED) is a two-lead semiconductor light source that resembles a basic pn junction diode, except that an LED also emits light. When an LED's anode lead has a voltage that is more positive than its cathode lead by at least the LED's forward voltage drop, current flows. Electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the colour of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

Circuits diagram

- water flow through pipes, the resistor is a thin pipe that reduces the water flow.



LED (LIGHT EMITTING DIODE)

List of components

- 1. LDR sensor (1)
- 2. RESISTOR (2)
- 3. LED (1)
- 4. PCB (2)
- 5. solar panel (1)
- 6. solar battery (1)
- 7. diode(1)
- 8. switch (1)

EXPLANATION

Circuit of a compact and true solid-state automatic lawn light is described here.

The circuit can be used to switch on incandescent garden light bulbs at desk and switch off them at dawn. A 10 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 supply is 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. Multi turn 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 energizes.

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 T2 with 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 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

Advantages

- There are lower chances of the automatic street light system overheating & risk of accidents is also minimized.
- Cost of operating automatic solar street lights is far less when compared to the conventional street lights.

The automatic street light system is eco-friendly & hence helps in reducing the carbon footprint

Disadvantages

- Rechargeable batteries of the automatic street light system are required to be replaced a few times.
- Snow, dust or moisture can accumulate of PV panels which can hinder energy production.

Conclusion

Light is one of the most important need in human life. This project is a booming concept, which is the future of this young generation. New Innovations are done to make this project an advanced one. (Eagle company.

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