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ELECTRICITY SAVER SMART STREET LIGHT

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Abstract: Electricity Saver Smart Street Light Control System is a simple yet powerful concept, which uses transistor as a switch. By using this system manual works are 100% removed. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. This is done by a sensor called Light dependent resistor 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 and OFF time setting. This project clearly demonstrates the working of transistor in saturation region and cut off region working of relay is also known.

Keywords: LED, street lights, sensors-LDR

I. INTRODUCTION

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 dimming 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 Dependent 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 amps 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

1.1 LED:

Light-emitting diodes (LED) are semiconductors. When electrons pass through this type of semiconductor, it turns into light. Compared to incandescent and CFL bulbs, LED lights are more efficient at turning energy into light. Therefore, less of the energy radiates from the bulb as heat. LED stands for light emitting diode which is also known as a semi-conductor device which converts electrical energy into light energy. Semi-conductor is extrinsic type semi-conductor where impurities are added to form a p-n junction. The diode emits electrons, photons in the form of light energy when it is forward biased.

Figure: LED Light.

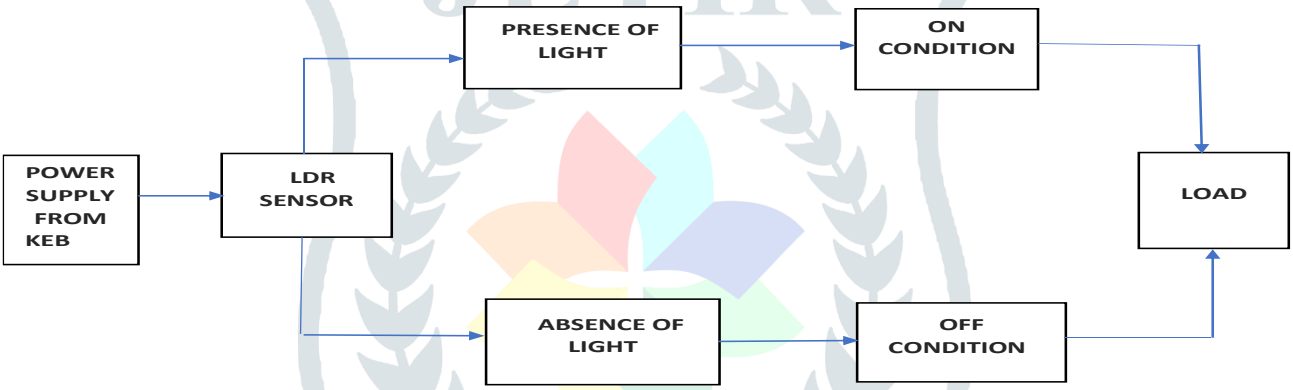
1.2 LDR (Light Detecting Resistor):

LDR Circuit is used as light sensor to sense the ambient light. Street lights are to be automatically switched On or OFF depending on the intensity of the sun light in LDR. As the intensity of sunlight reduces, the resistance of LDR increases. This resistance value decides when the street lights are required to switch ON. As the resistance value will be maximum in the nights, the LDR will switch the street lights to higher intensities and it will remain at high until real time clock reaches the present value. The LDR devices configurations are the height of the LDR devices from the horizontal surface (Measured in CM), the facing angle of LDR device to the illuminated light on the horizontal surface (measured in degrees) & the distance between LDR device with the LED source (Measured in CM). For the Facing angle, we assume that LDR facing Downwards to the horizontal Surface as zero Degrees. To study the response of the LDR to LED lightning Stimulus, the LDR connection structure is designed as voltage divider circuit which composed by one 10kilo ohms series resistor, one LDR and Power supply 5V. The voltage response of the LDR is measured by the voltage drop on the series resistor using a multi meter.

Figure: LDR Sensor

II. PROPOSED SYSTEM

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.



Block Diagram

III. WORKING PRINCIPLE

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 triacT2. Now the lamp load at the output of T2 energies. 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 triacT2 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. 2aaThis 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.

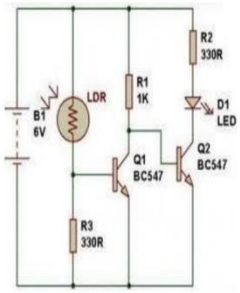


Figure: Circuit diagram of Electricity Saver Smart Street Light Controller

IV. ADVANTAGES

By using this automatic system for street light controlling, we can reduce energy consumption because the manually operated street lights are not switch off properly even the sun light comes and also not switched on earlier before sunset

- Low cost
- Automated operation
- Low power consumption
- Very flexible
- Easy to manufacture

V. FUTURE SCOPE

We can save the energy for the future use and we can control the losses of the power. We can implemented this project for the home lamp or night lamp of the room. This is also used for the signals.

VI. ACKNOWLEDGEMENT

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