AUTOMATIC STREET LIGHTS USING LDR

A Socially Relevant Project Report

submitted

in partial fulfillment of the requirements for

the award of the degree of

Bachelor of Technology

Electronics & Communication Engineering

(JNTUA, Anantapuramu)

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CERTIFICATE

This is to certify that the Socially Relevant Project Report entitled **AUTOMATIC STREET LIGHTS USING LDR** is the bonafide record of the Socially Relevant Project Report carried out under my Guidance and Supervision by

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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% 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 Dependant Resistor (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.

LIST OF FIGURES

CHAPTER-1

INTRODUCTION

CHAPTER – 1
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 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.

INTRODUCTION

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.

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.

We need to save or conserve energy because most of the energy sources we depend on, like coal and natural gas can't be replaced. Once we use them up, they're gone forever. Saving power is very important, instead of using the power in unnecessary times it should be switched off. In any city “STREET LIGHT” is one of the major power consuming factors. Most of the time we see street lights are ON even after sunrise thus wasting lot of

energy. Over here we are avoiding the problem by having an automatic system which turns ON & OFF the street lights at given time or when the ambient light falls below a specific intensity. Each controller has an LDR which is used to detect the ambient light. If the ambient light is below a specific value the lights are turned ON.

CHAPTER-2

AIM, SCOPE, OBJECTIVE

CHAPTER- 2

2.1 AIM:-

Aim of this project is to control the street light using LDR. When the light falling occur means resistance value will be change. There is no light then the resistance value is change. From this resistance change the voltage variation can be obtained.

2.2 SCOPE OF THE PROJECT:-

The main scope of the project is to save energy by automatic system of street lights. When the light falls on the LDR the lights off due to low resistance. When the dark fall on the LDR the lights are ON due to high resistance.

2.3 OBJECTIVE:-

- To provide lighting to the streets such that minimum possible power is consumed during nights.
- To manage the traffic flow smoothly and efficiently during night.
- To replace the conventional halogen lamp with the power LED's in the lighting system.

CHAPTER-3

LITERATURE SURVEY

CHAPTER – 3
LITERATURE SURVEY

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 percent 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 (LDR) which senses the light actually like our eyes. It automatically switches OFF lights whenever the sunlight comes, visible to our eyes.The existing system is commonly used in all streets of street light system. But in this method there is a loss of heavy electricity in the whole night. And also the street light is not necessary when there are no human movements in the street. A real local time is received from the GPS data and a sunrise and sunset time associated with the geographic location can then be determined. Street light is poorly designed and inadequately maintained, there are large number of burned out lamps which leads to insecurity. There is a complaint register in every zonal office street light section. It is being maintained by the line inspector. The complaint received from public, councillors and corporation officials either over phone is in person being recorded in the complaint register.

The complaint thus entered is being handed over to the fieldwork man so as to rectify the complaints. the field staff will have the rounds in the respective areas twice in a week and the complaints about non burning are also being attended then and there. But this is not the immediate remedy on complaints and has many disadvantages like the repair work takes days/even months instead of taking few hours which results in delay, telephone line may be busy, sometimes no response. The switches of street lights are switched ON/OFF manually by the workman in all the zones. This leads to the rise of man power and time. As it is human operation it is prone to the errors.

LITERATURE SURVEY

In any city STREET LIGHT is one of the major power consuming factors. Most of the time we see street lights are ON even after sunrise thus wasting lot of energy. Over here we are avoiding the problem by having an automatic system which turns ON OFF the street lights at given time or when the ambient light falls below a specific. intensity.

CHAPTER-4

BASIC PRINCIPLE

CHAPTER – 4

BASIC PRINCIPLE

The automatic streetlight control system operates on 9v 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.

CHAPTER-5

LIST OF COMPONENTS

CHAPTER – 5

LIST OF COMPONENTS

The list of components involved in the automatic street lights using LDR are as follows

- Light Dependent Resistor (LDR)
- Printed Circuit Board (PCB)
- Transistor – BC547
- Resistors
- Light Emitting Diode (LED)
- Battery
- Wires

CHAPTER-6

SPECIFICATION OF COMPONENTS

CHAPTER – 6
SPECIFICATION OF COMPONENTS

6.1 Light Dependent Resistor (LDR):-

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 1000000 ohms, but when they are illuminated with light resistance drops dramatically. Electronic onto sensors are the devices that alter their electrical characteristics, in the presences of visible or invisible light. The best-known devices of this type are the light dependent resistor (LDR), the photo diode and the phototransistors.

Light dependent resistor as the name suggests depends on light for the variation of resistance.

- LDR are made by depositing a film of cadmium sulphide or cadmium selenide on a substrate of ceramic containing no or very few free electrons when not illuminated. The longer the 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 10K ohm to 15K ohm and is called the dark resistance.

Depending on the exposure of light the resistance can fall down to value of 500 ohms. The power ratings are usually smaller and are in the range 50mw to .5w. Though very sensitive to light, the switching time is very high and hence cannot be used for high frequency applications. They are used in chopper amplifiers. Light dependent resistors are available as discs 0.5cm to 2.5cm. The resistance rises to several Mega ohms under dark conditions.

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 on 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 a preset value. The LDR devices configurations are the height of the LDR devices from the horizontal surface (measured in cm), the facing angle of the LDR device to the illuminated light on the horizontal surface (measured in degrees) and 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 0 degrees. To study the response of the LDR to LED lighting stimulus, the LDR connection structure is designed as a voltage divider circuit which composed by one 10 kΩ 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.

The below figure shoes that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it is shown in figure.

Fig: 6.1.1: LDR.

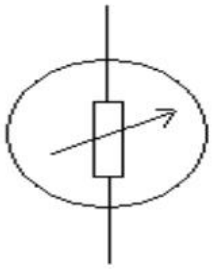


Fig. 6.1.2: Symbol for LDR.

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 snakelike 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 10mm. practical LDR is shown in below figure.

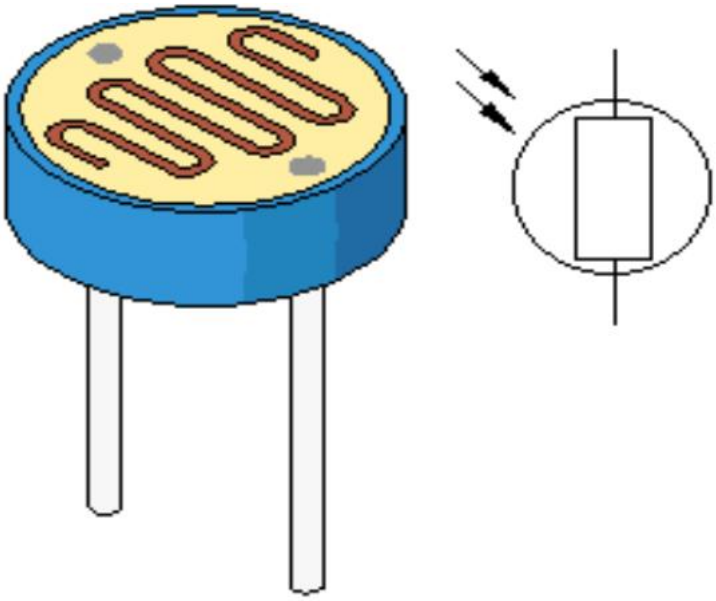


Fig. 6.1.3: Practical LDR.

6.2 Printed Circuit Board:-

A printed circuit board (PCB) mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate. PCBs can be single sided (one copper layer), double sided (two copper layers) or multi-layer. Conductors on different layers are connected with plated-through holes called bias. Advanced PCBs may contain components - capacitors, resistors or active devices - embedded in the substrate.

A printed circuit board (PCB) or printed wiring board (PWB) is a laminated sandwich structure of conductive and insulating layers. PCBs have two complementary functions. The first is to affix electronic components in designated locations on the outer layers by means of soldering. The second is to provide reliable electrical connections (and also reliable open circuits) between the component's terminals in a controlled manner often referred to as PCB design. Each of the conductive layers is designed with an artwork pattern of conductors (similar to wires on a flat surface) that provides electrical connections on that conductive layer. Another manufacturing process adds vias, plated-through holes that allow interconnections between layers.

Fig: 6.2. Printed Circuit Board (PCB)

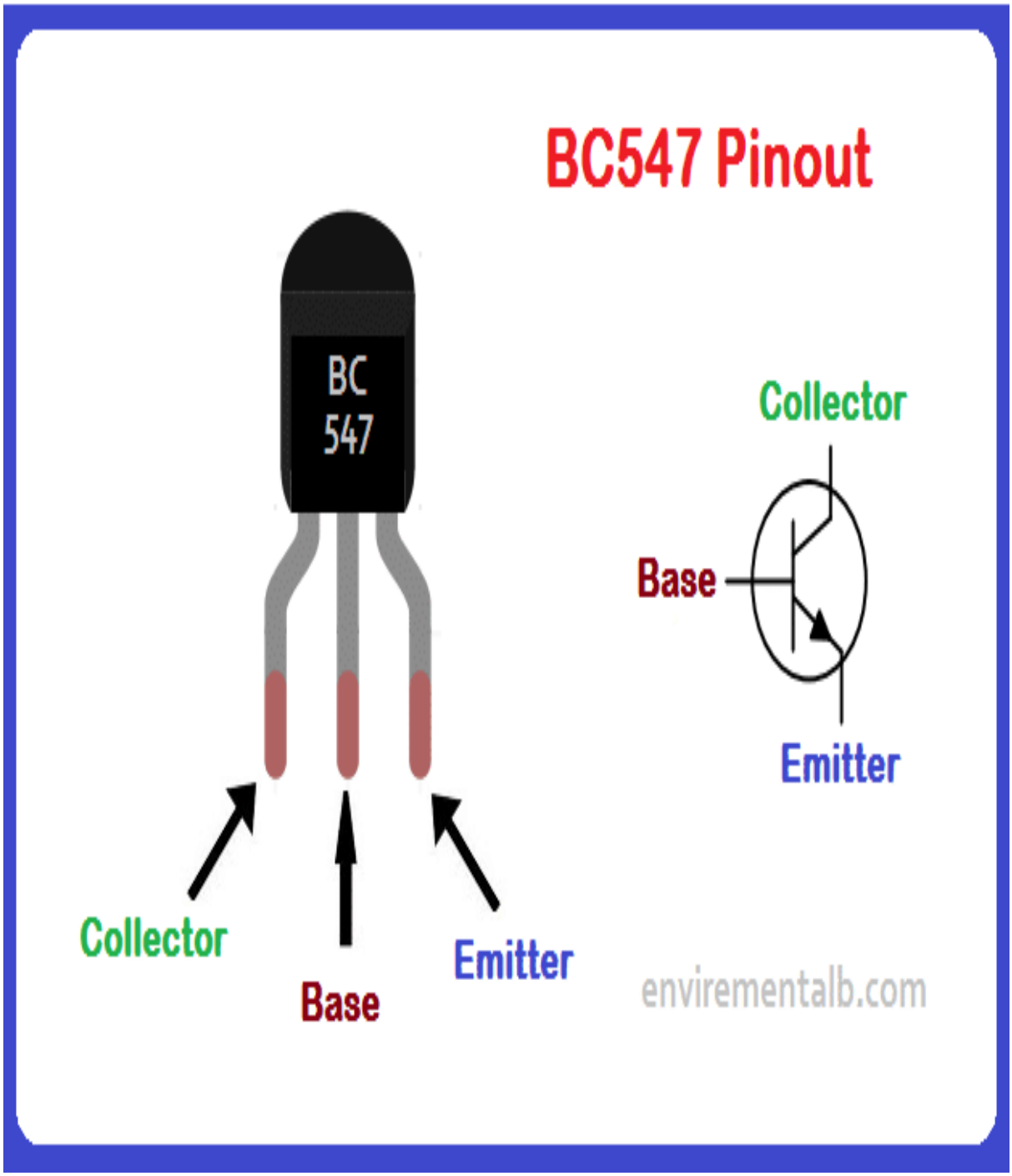
6.3 Transistor:-

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 transistor.

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 its base. In the absence of base signal, it gets completely off.

BC547 transistor has a gain value of 110 to 800, this value determines the amplification capacity of the transistor. The maximum amount of current that could flow through the Collector pin is 100mA, hence we cannot connect loads that consume more than 100mA using this transistor. To bias a transistor we have to supply current to base pin, this current (I_B) should be limited to 5mA.

Fig: 6.3.1 BC547 Transistor


BC547 Pinout
BC
547
Collector
Base
Emitter
Collector
Base
Emitter
envirementalb.com

6.4 Light Emitting Diode:-

A light emitting diode (LED) is a two-lead semiconductor light source that resembles a basic p-n 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 color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

LEDs have many advantages over incandescent light sources, including lower power consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. In exchange for these generally favourable attributes, disadvantages of LEDs include electrical limitations to low voltage and generally to DC (not AC) power, inability to provide steady illumination from a pulsing DC or an AC electrical supply source, and lesser maximum operating temperature and storage temperature. In contrast to LEDs, incandescent lamps can be made to intrinsically run at virtually any supply voltage, can utilize either AC or DC current interchangeably, and will provide steady illumination when powered by AC or pulsing DC even at a frequency as low as 50 Hz. LEDs usually need electronic support components to function, while an incandescent bulb can and usually does operate directly from an unregulated DC or AC power source.

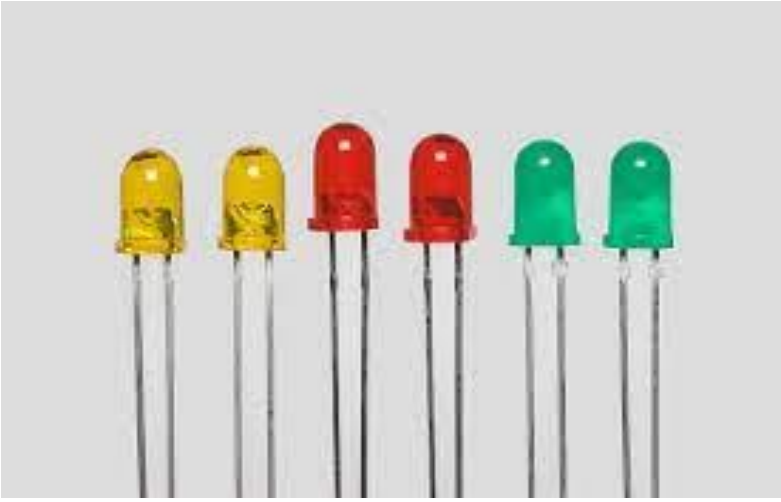


Fig: 6.4. Light Emitting Diode (LED)

6.5 Battery:-

An electric battery is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices. Batteries come in many shapes and sizes, from miniature cells.

When a battery is supplying 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. Historically the term "battery" specifically referred to a device composed of multiple cells; however, the usage has evolved to include devices composed of a single cell.

The 9v battery, is an electric battery that supplies a nominal voltage of 9 volts. Actual voltage measures 7.2 to 9.6 volts, depending on battery chemistry. Batteries of various sizes and capacities are manufactured; a very common size is known as PP3, introduced for early transistor radios. The PP3 has a rectangular prism shape with rounded edges and two polarized snap connectors on the top. This type is commonly used for many applications including household uses such as smoke and gas detectors, clock and toys.

Fig: 6.5. Battery(9v)

6.6 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 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 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.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

Fig: 6.6. Resistors

6.7 Wires:-

A wire is defined as one electrical conductor, while a cable is defined as a group of individually insulated wires (conductors) encased together in sheathing. Sheathing is a non-conducting material with protective properties to shield the conducting part of the wire/cable. Although wire is a good conductor, it can still have some resistance. Wires and cables can be made from various materials, such as copper, gold, and aluminium.

The materials each have different resistances. Thick wire will have a lower resistance than thin wire made from the same material. Resistance of the wire can change proportionally with change in temperature or length of the wire. Wire size indicates the diameter of the metal conductor of the wire. When choosing the size of wire, you must consider the gauge of the wire, wire capacity, and what the wire will be used for. If the wire is too small, too much current will be sent through, causing the wire to drop more power, in the form of watts, because there is such high resistance.

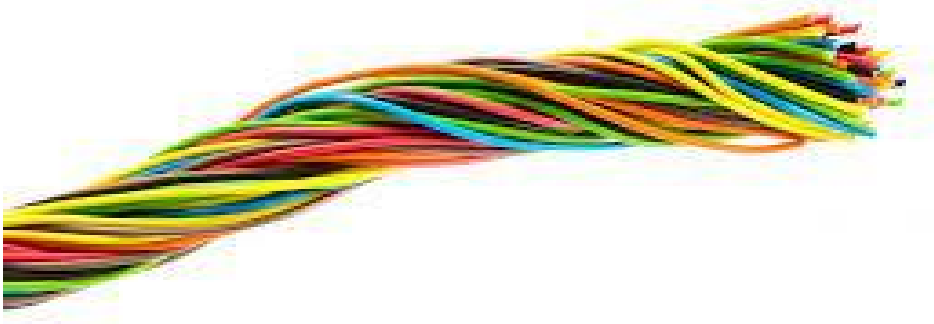


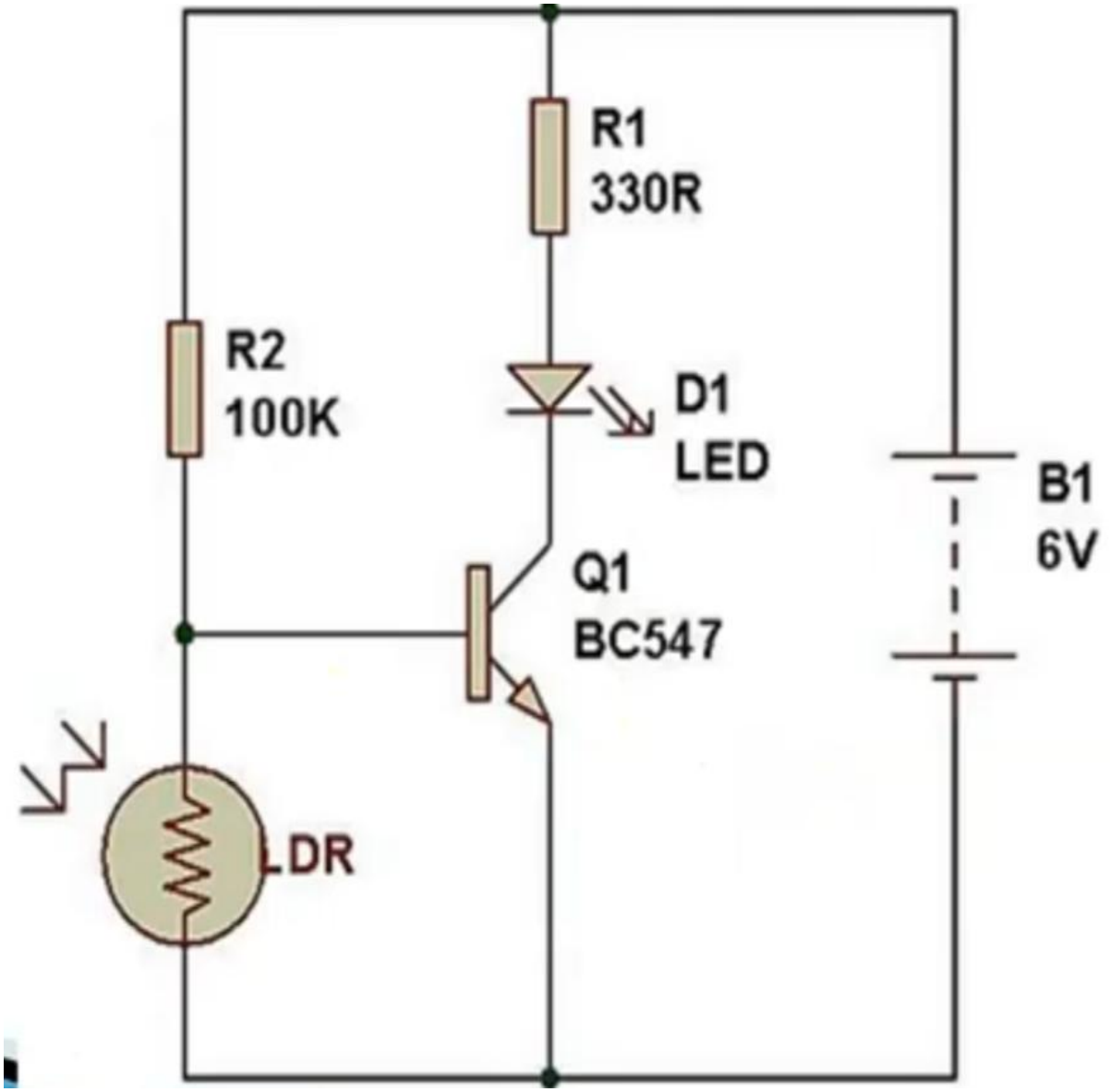
Fig: 6.7. Wires

CHAPTER-7

CIRCUIT DIAGRAM

CHAPTER-7

CIRCUIT DIAGRAM



CHAPTER-8

ADVANTAGES & DISADVANTAGES

CHAPTER-8
ADVANTAGES & DIADVANTAGES

8.1 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

- It saves the electricity by automatic switching of the lights.
- It gets automatically ON in dark weather conditions on rainy days.
- Circuit is not costly and can be commonly used.
- Easy to install and reduces human effort.
- Easy to be manufactured.

8.2 Disadvantages:-

In sunny and rainy days, on and off time differ notice which is one of the major disadvantages of using timer circuit or manual operation for switching the street light system.

- For efficient working of circuit, the LDR used should be sensitive.
- LEDs should be connected in forward bias for circuit to work. So we have to take care of polarity while connection.
- LDR should be so adjusted that it should not get light from streetlight.

CHAPTER-9

APPLICATIONS

CHAPTER-9

9. APPLICATIONS:-

- Street lights can be used for increasing public safety in areas that people use, such as doorways and bus stops in the night times.
- It can be used in areas where manual switching is difficult such as hilly areas and dense paths.
- It is used as energy efficient lighting technique for the streets.
- With some modifications it can also be used at home for rooftop lighting.
- It can be used on roads which reduces the accidents

CHAPTER-10

RESULT

CHAPTER-10

RESULT

The result of the project is observed from switching of LED into on and off conditions. Because of LDR, which has 1 MΩ resistance when it is lighting around the circuit. At this condition the LED doesn't glow due to high resistance in LDR. When the surroundings are dark the LDR attains low resistance like 100 ohms. At this condition the LED glows due to low resistance in LDR.

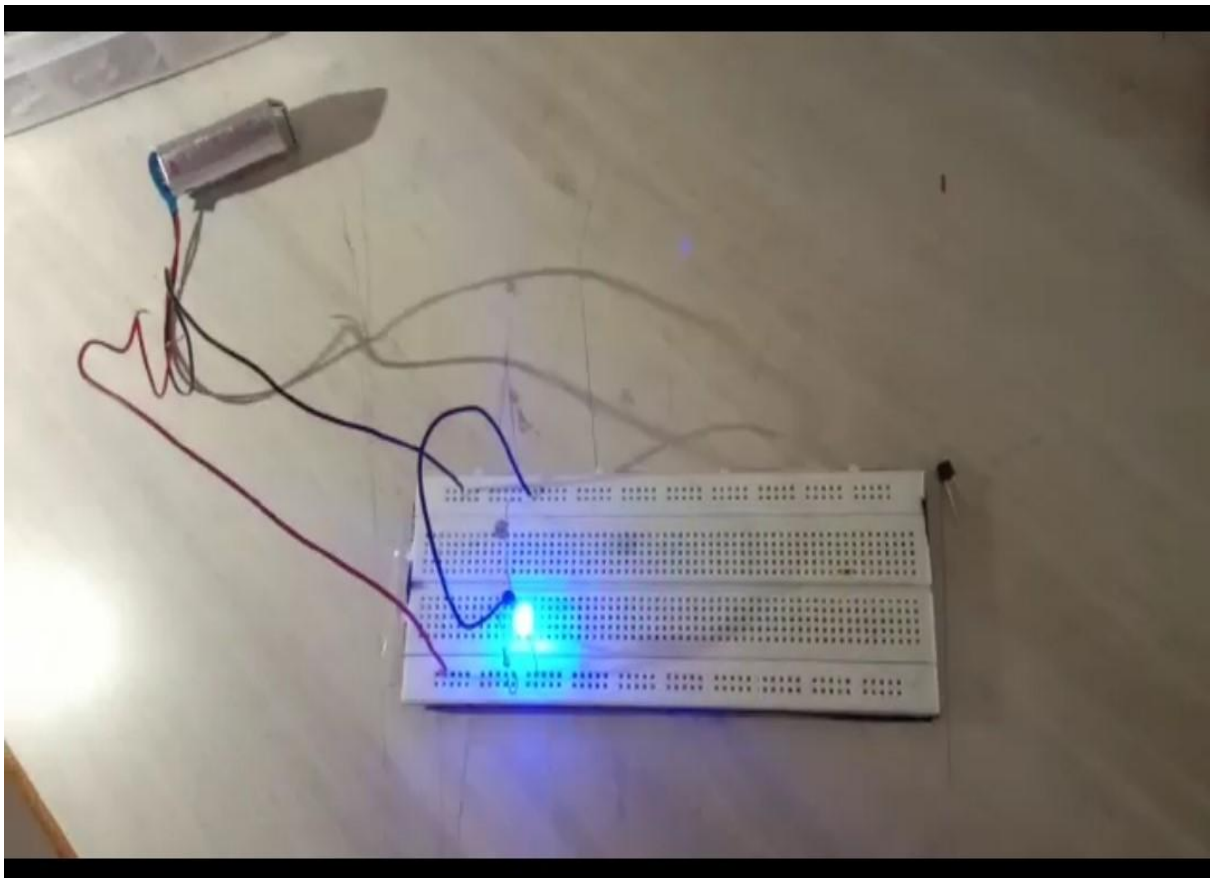


Fig: 10. Output of the Circuit

CHAPTER-11

FUTURE SCOPE

CHAPTER-11

FUTURE SCOPE

We can save the energy for the future use and we can control the losses of the power. We can implement this project for the home lamp or night lamp of the room. This is also used for the signals. We need to save or conserve energy because most of the energy sources we depend on, like coal and natural gas can't be replaced. Once we use them up, they're gone forever. Saving power is very important, instead of using the power in unnecessary times it should be switched off. In any city “STREET LIGHT” is one of the major power consuming factors. Most of the time we see street lights are ON even after sunrise thus wasting lot of energy.

CHAPTER-12

CONCLUSION

CHAPTER-12

CONCLUSION

This project elaborates the design and construction of automatic light control system circuit. The circuit works properly to turn lamp ON/OFF. LDR sensor is the main conditions in working the circuit. If the 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 lights have been successfully controlled by LDR and transistor. With the LDR presence or absence the lights will be ON in the places of the movement when it's dark. Finally, control circuit can be used in various purposes.

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 . The Streetlight controller using LDR based Light intensity & traffic density, in the days up growing countries will be 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 control 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

CHAPTER-13

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CHAPTER-13

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THANK YOU