MINI PROJECT REPORT ON

"AUTOMATIC DUSK TO DAWN STREET LIGHTS"

SUBMITTED BY:

G.SARANYA -1NH18EC036

Under the guidance of

Ms DHARMAMBAL .V

ABSTRACT

Automatic streetlight control system , uses a concept, which is very simple but yet so powerful. Here the transistor is used as a switch .manual works are removed by 100% by using this kind of concept. The lights are automatically switched when the sunlight goes below the visible region of our eyes. A sensor called Light Dependent Resistor (LDR) performs this function . An LDR can sense the light exactly like our eyes!. The LDR can automatically switch OFF the lights whenever the sunlight goes below the visible region of our eyes.

Energy consumption can also be reduced using this system,because now-a-days the manual operated streetlights are not switched OFF even when there is enough light present and also switched ON way too before sunset when there is enough light present. In this project, there will be no use and no need of manual operation such as the operation of ON/OFF time settings.

This project will also demonstrate the working of a transistor in saturation and cut-off region. The relay working in this project is also known.

Fig . 01 : Streelight

CHAPTER 1

INTRODUCTION

STREETLIGHT CONTROLLERS are just smarter versions of the usual mechanical or electronic timers which have been previously used for the streetlight ON/OFF operation. There are also other options available 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 very simple but a powerful concept, which uses transistor as a switch to perform operations such as switch ON and OFF the streetlight automatically. By using this system, manual works can be removed for our ease . It automatically switches ON the lights when the sunlight goes below the visible region of our eyes i.e. light decreases. It automatically switches OFF the lights under the illumination of sunlight i.e. ligh increases. This is done by a sensor called Light Dependent Resistor (LDR) which senses the light in the surrounding or falling on it exactly like our eyes.

By using this system, energy consumption can also be greatly reduced because now-a-days the manually operated streetlights are not being operated/ switched ON and OFF properly. In sunny and rainy days, the ON and OFF time can differ significantly, which is also one of the major dis-advantages of using timer circuits or manual operations like the recent technology being used in these days.

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

Modern lamps may also have the light sensitive photo cells to help them turn them on at dusk/night/dark conditions, off at dawn/morning/light conditions or activate automatically in a dark weather and deactivate in dark conditions. In this we use LED as a transmitter for helping us perform the exact operation.

The pictures provided below are some examples of some faulty results/casualities due to manual operation or timer based circuits of streetlights:

Fig. 1.1

Streetlights ON during daytime

(when there is enough light)

Fig 1.2

Street light OFF during night time

(when there is not enough light)

Thus by using this circuit provided in this project we can greatly reduce the manual operation of the streetlights and overcome such faulty measures which are a result of today's technology.

With the use of this idea we can prevent the wastage of energy to a great extent and the further implementation of this circuit in practical purposes and our everyday life i.e., in actual streetlights can be really helpful and useful in conserving energy which can later be used for other purposes .

This idea can be also be implemented in household lamps and lights and also outdoor household lamps too. This idea of a smarter version of streetlights can improve the quality of our human life and that is the implication of this project.

Although this project might require more components than the technology being used today, it will be really efficient and useful to us in the long run. It is also environment friendly.

CHAPTER 2

LITERATURE SURVEY

In varying backgrounds and throughout the past centuries, streetlights always play a crucial role in any place.

MARCH 12, 1949 , the older lamp lighter mostly used in the olden times became a memory and a song , but not an occupation as automatic streetlights start to shine and came more into picture. Digging deeper , we can find on this day, the first operating automatic street light was operated in New Milford , Connecticut. Prior to this development , electric street lamps, not to be mixed up or confused with traffic control lights had to be turned on manually i.e. manual operation on by timer regardless i.e. without any accordance to the lightening conditions.

The first electric streetlights which used arc lamps named as “Yablochkov candle” were first invented and used in 1878 in paris. By the year 1881, atleast 4000 of them were in use by replacing the gas lanterns on the poles.

After the spreading of the arc lamps in the United States, by the year 1890 there were more than 130,000 arc lamps installed as streetlights in there.

Street lighting in the United Stats was first introduced by Benjamin Franklin , who was the postmaster of Philadelphia, Pennsylvania.

Ironically, Bangalore was the first city in India to get electric street light lights introduced and installed in August 1905.

RAVI KISHORE KODALI & SUBBACHARY YERROJU had presented a paper on Energy Efficient Smart Streetlight [1].

Over Singh, IEEE Sr. member also has used an automatic microprocessor with solar cell[2].

BELAM ROY had also proposed a street light optimizer[3].

PRAKASH had developed an intelligent street lightening system for smart city which was based on IoT[4].

DHEERAJ SUNEHRA has presented an wireless sensor networks based on automatic street light control[5].

A.C.KALAIARASAN also studies about solarenergy based streetlight with auto-tracking system.

The sun tracking sensor is also a sensing device, which can sense the position of the sun , from time to time continuously . it gives the output of the sensor to the amplifier based on light density of the sun. Here the sun tracking sensor used is LDR[6] .

CHAPTER 3

PROPOSED METHODOLOGY

PRINCIPLE:

The automatic streetlight control system in this project operates on 12 volt DC supply. The automatic streetlight controller has a photoconductive device ,whose resistance used in the project changes proportionally to the extent of illumination , which can switch on / off the LED with the use of transistor as a switch .

The LDR is a photo conductive device that has been used as a transducer to covert the light energy into electrical energy. The principle of the circuit is that the change in voltage drop of the LDR on illumination of any form of light or darkness switches the transistor between the cutoff region and the saturation region in order to switch off/on the LED i.e. operate the LED without any manual operation .

WORKING:

Automatic streetlight using BC547 transistor is a project done with the help of LDR and transistor. In this project the transistor will act as a switch and the LDR is used to sense the darkness and brightness of the surroundings. The LDR is a light dependent resistor which works according to the principle of variation in the resistivity changes with light intensity. Mostly the resistance and intensity are inversely proportional to each other.

During the day time, the light intensity is high so that the resistance will be low and it will exhibit photo conductivity . The resistance will vary from a few ohms to mega ohms. The LDR is contained of calcium sulphide as a main material. LDR when connected with a potentiometer

parallelly . i.e, acts as a voltage divider circuit. This resistance will act as an input for the transistor BC547.

If the light intensity is low then the LED will automatically glow giving an indication of the automatic turn ON during the light. As the voltage of the transistor is based on the working of the LDR , the transistor will act as a switch accordingly. When the intensity of the light is high, then the base of the transistor is activated and the circuit is closed, and as a result , no input is applied which will give an indication that the streetlight is OFF .

If the intensity of the light is low, the resistance that is connected to the LDR is high ,and will act as an open switch . The second resistor gets the supply and turns the LED ON , which as a result the streetlight glows.

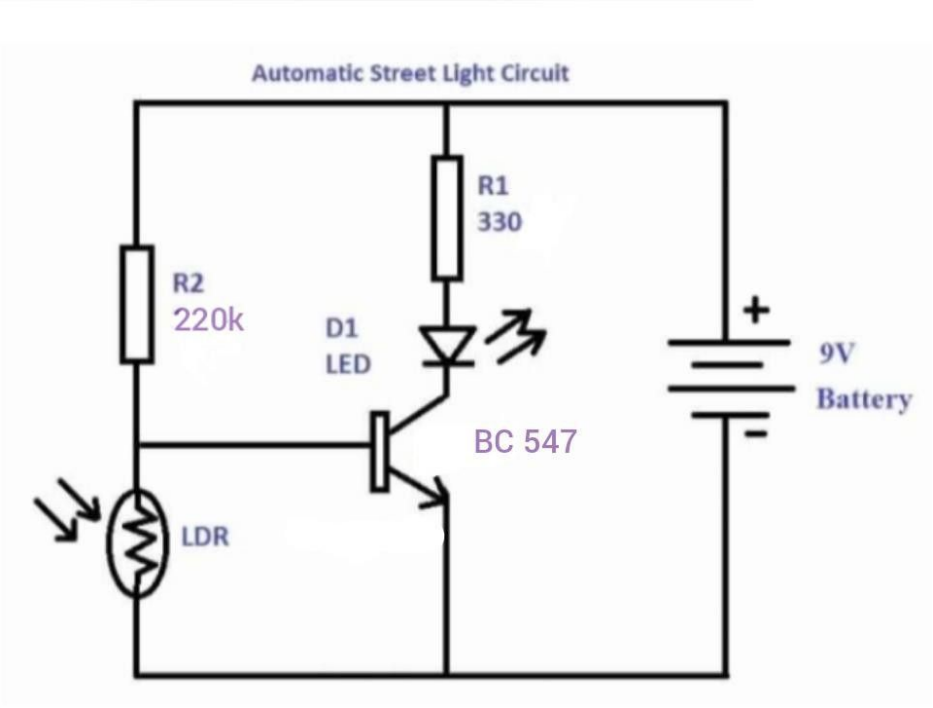


Fig. 3.1

The circuit diagram required for the working model

CHAPTER 4

PROJECT DESCRIPTION

COMPONENTS:

- LDR
- BREADBOARD
- BC-547 TRANSISTOR
- LED
- 220 K Ω RESISTOR
- 330 Ω RESISTOR
- 9 V BATTERY WITH CONNECTOR
- JUMPER WIRES

1. **LDR –**

   An LDR or light dependent resistor which is very useful especially in light or dark sensor circuits. normally , by default the resistance of an LDR is very high , sometimes as high 1,000,000 Ω , but when they are illuminated with light the resistance of the LDR drops dramatically. When the light level is low the resistance of LDR will be high . This prevents the current to flow to the base of the transistor and consequently the LDR does not glow.

LDR's are light dependent resistors whose resistance will be decreased when light falls on it and increases when the LDR is kept in dark. This resistance is known as/ can be named as dark resistance. This value of the dark resistance can be as high as 1,000,000,000,000 ohms and when the device will be allowed to absorb light, the resistance of the device will be decreased

drastically. the current flowing through the device will be increased when there is a constant voltage being applied to it and there is an increasing intensity of light falling on the device .

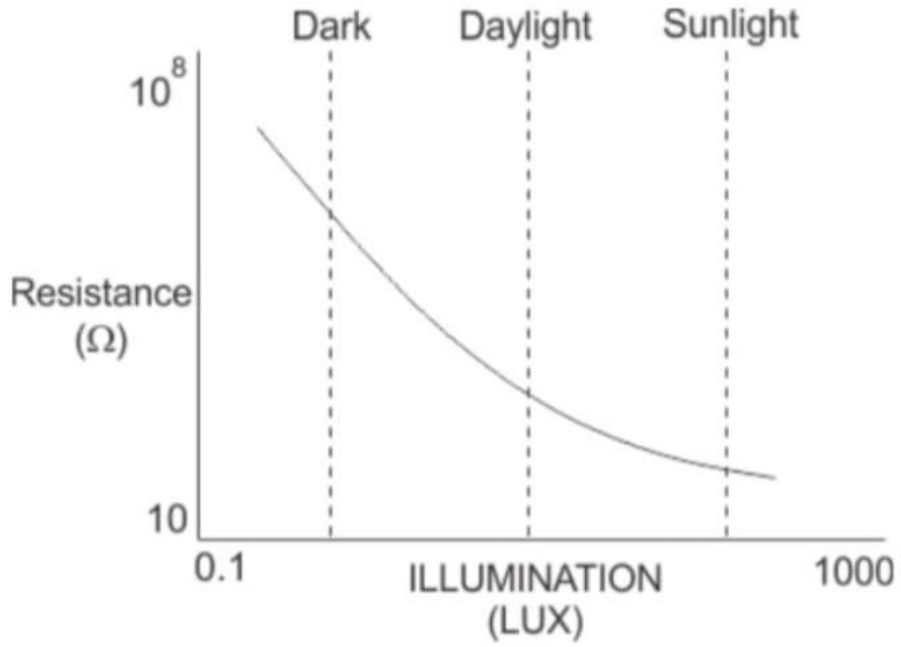


Fig. 4.1 : Resistance Vs Illumination Graph

The above graph represents the curve for the resistance v/s illumination of a particular LDR

In dark conditions the resistance between the terminals of the LDR is high – up to 1 M ohms or so. The resistance will fall with the increase of the light levels to a few hundred ohms at high brightness.

The response time of the LDR is 2- 50 ms , which is much slower than photo-transistors.

LDR's as such are more sensitive to certain kinds of wavelengths (colours). The calcium sulphide types are the most sensitive to green colour.

We notice from the picture provided below that the brown zig-zag stripe being formed on the LDR forms a border crossing between the two terminals and also the number of charge carriers that make it across the border is proportional to the amount of intensity of the light hitting the border zone.

Fig . 4.2 :Picture of an LDR

The LDR is a resistor whose resistance varies inversely proportional to the amount of light/ intensity of the light falling on it. It can be also known/called as photo resistor ,photocell ,photo conductive cell etc. the LDR is available in many dimensions such as-

- 5mm
- 8mm
- 12mm
- 25mm

The LDR is made up of a high resistance semiconductor material and this material is used for photo resistors. The semiconductor material is made up of calcium sulphide, CdS. When the surroundings are dark, the LDR has a high resistance which is also known as dark resistance.

Usually the value of this dark resistance for his device is in the range of few mega ohms . when there is light falling on the LDR the resistance will reduce to a few kilo ohms range.

Here the principle followed is that when there is a light condition i.e., when there are photons falling on the LDR , the valence band electrons get suffienct energy from the light falling on the LDR and get excited.

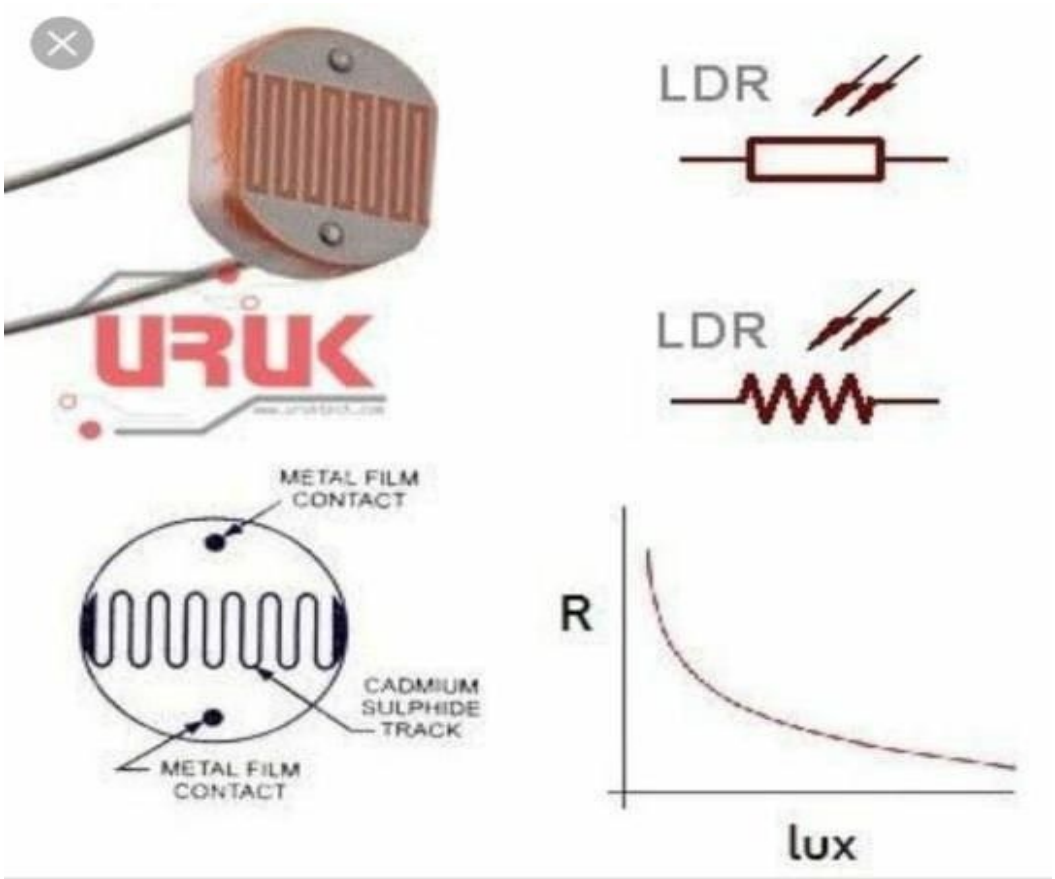


Fig 4.3 : Basic diagram of LDR

Due to this excitation , they are excited to the conduction band and move towards it. The incident photons must have greater energy than the energy of the forbidden energy gap of the semi conductor. When there is enough light falling on the LDR with enough energy, more electrons will be excited to the conduction band. As the number of free electrons in the device increases, there will be more current flowing through the circuit as a result. Hence as a result of this process , as light falls on the LDR , the resistance of the device decreases.

THE GENERAL FEATURES OF AN LDR –

- It has a good characteristic of the spectrum.
- It can give a quick response when compared to certain other devices.
- Its an epoxy or hermetical package.
- It has a reliable performance while compared to other devices.

GENERAL SPECIFICATIONS OF AN LDR-

- Diameter of the LDR : 5mm
- Number of pins : 2
- Maximum operating temperature : + 800C (approximately)
- Dark resistance = 1-20 M ohm

APPLICATIONS :

- It is used in burglar alarms
- It is used in light detectors/light sensors.
- It is used in colour sensors and line sensors.
- It is used in object sensors .

- It is used in photo switches.
- It is used for light intensity meters.
- It is used for lighting controls for street lamps, which is also the main motive of this project.

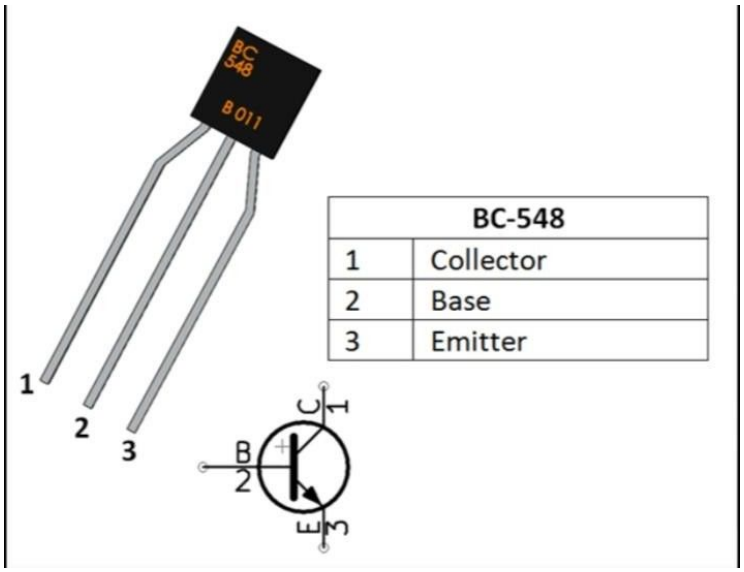
2. TRANSISTOR –

Here ,**BC-547** is an N-P-N bipolar junction transistor. A transistor , stands for the transfer or resistance commonly used to amplify the current . A small current at its base controls a larger current at controller and emitter terminals . BC-547 is actually mainly used for amplification and switching purposes . the transistor has a maximum current gain of 800.

The transistor terminals here require affixed DC voltage to operate in the desired region of its characteristic curves . This is known as biasing of the circuit .For the amplification applications ,the transistor is biased such that it is partly on for all input conditions .

The input signal at base of the transistor is amplified and taken at the emitter. The transistor BC-547 is used in common emitter configuration for amplifiers .The voltage divider biasing circuit is the commonly used biasing mode .For switching applications ,the 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 turned OFF.

The basic purpose of using the transistor is to transfer the resistance .It is basically used for the amplification of current . The larger current at the emitter and collector of the transistor is controlled by a mere amount of the base current of the transistor . The maximum current gain of this transistor is around 800 .Fixed DC voltage is required inorder to operate in the desired region .



BC-548	
1	Collector
2	Base
3	Emitter

Fig . 4.4 : picture of a transistor

VOLTAGE POLARITY OF BC-547 :

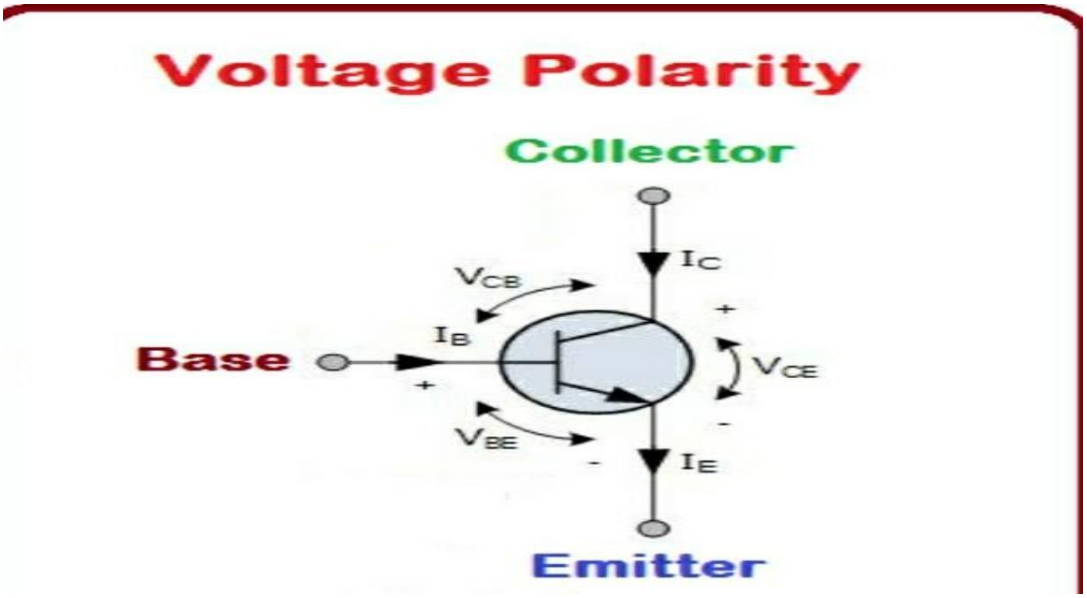


Fig 4.5 polarity of a transistor

APPLICATIONS :

- It is used for switching purposes .
- Also used in amplification purposes .

THERMAL CHARACTERISTICS :

The thermal characteristics of the transistor are shown in the below table

BC547 Thermal Characteristics			
Sr. No	**Characteristics**	**Value**	**Units**
1	Junction to case thermal resistance	83	°C/W
2	Junction to ambient thermal resistance	B	°C/W

RATINGS OF BC-547 :

BC547 Ratings		
Parameters	**Values**	**Units**
Collector emitter voltage (V_{CEO})	65	V
Collector base voltage (V_{CBO})	80	V
Emitter base voltage (V_{EBO})	6	V
Power dissipation at collector (P_D)	500	mW
Collector current (I_C)	100	mA
Storage temperature (T_{STG})	65 to 150	°C
Operating temperature (T_O)	150	°C

Fig 4.7 : Ratings of BC-547

3.RESISTOR-

A Resistor is an electrical component that reduces the electric current flowing through a circuit line . The resistor's ability to reduce the current is known as resistance and is measured in the units of ohms .

USE OF RESISTORS :-

- To reduce the current flow
- To adjust the signal levels
- To divide voltages
- Bias active elements
- To terminate the transmission lines
- Also used in motor controls to distribute power

Resistors are used for adjusting circuit elements to sense heat, light, humidity, force or chemical activity.

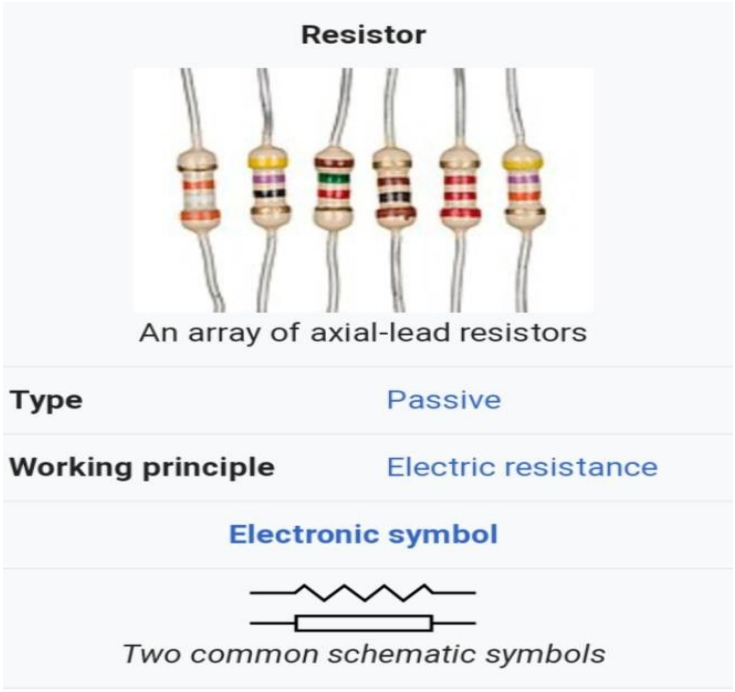


Fig. 4.8 : information of resistors

COMPOSITION OF A RESISTORS:-

The resistor element is made by finely powdered carbon with an insulating material , mostly ceramic . resin is used to hold the mixture together . resistance is determined by the ratio of ceramic to carbon . a resistance is said to be a good conductor basing on the composition of carbon . now-a-days carbon composition is not mostly used.

The thermal noise of a practical resistor might be larger than the theoretical, as a result, that in turn increases the frequency dependant. Excess noise is heard from a practical resistor only when the current flows through it. Mostly thick fill and carbon composition resistor generate high noise.

Resistors are usually rated basing on the maximum power released. Resistors are typically rated as 1/10 , 1/8, ¼ watt , which is usually less than the watt of electrical power.

Fig. 4.9: 220 k ohm resistor

Fig. 4.10 ; 330 ohm resistor

4.LED—

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 the 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 is determined by the energy band gap of the semiconductor .

Fig. 4.11: **picture of LED**

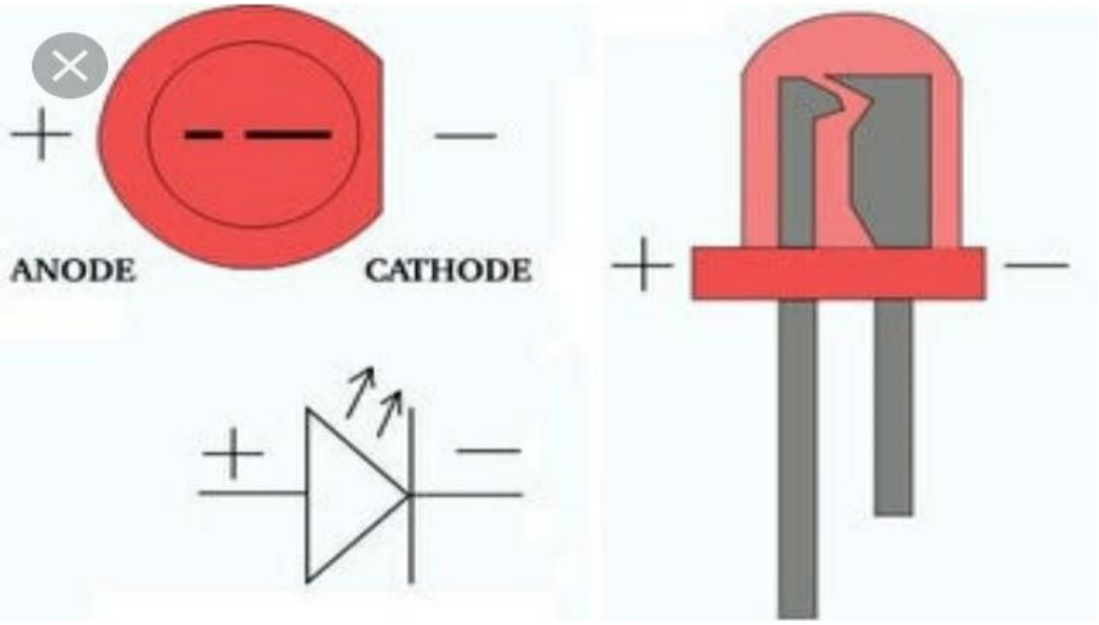


Fig 4.12 : polarity of an LED

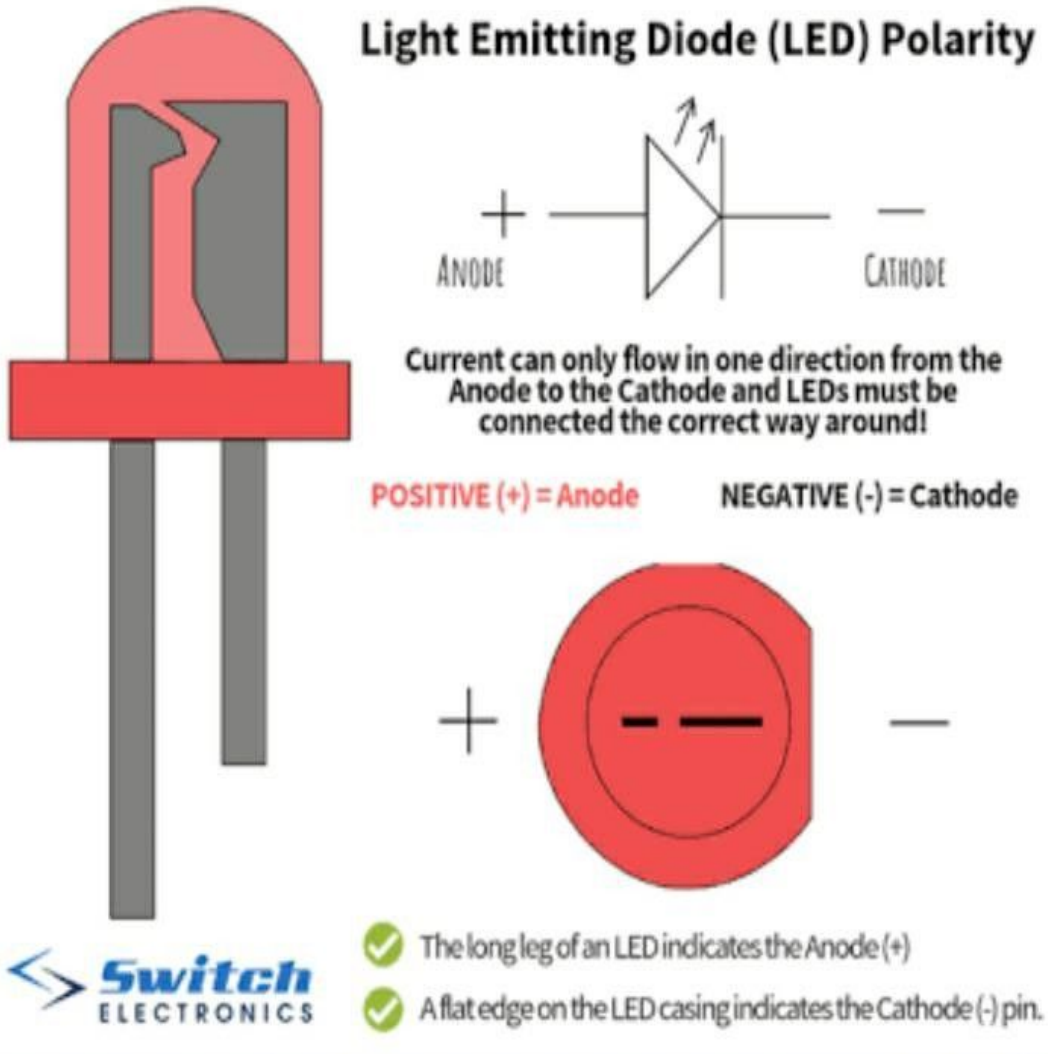
LED lamps are usually made of surface mount LED modules (SMD modules) which are used to replace the incandescent or fluorescent lamps having rated from 5 - 200 watts . the difference from other light sources is the fact that light is more directional which can also be known as emitting in a narrow beam.

LED has an efficiency drop referring to the decrease in the luminous efficacy of LED when the electric current increases above 10 m amps .

LIMITATIONS:-

- LED lamps flicker sometimes , it is seen on a slow motion video of such a lamp. The extent of flickering is absed on the quality of the DC power supply built into lamp structure , which is lamp base.
- The life span of an LED drops at high temperature ,by limitimg the power that is used .
- LED lamps are sensitive to excess heat .

Fig : polarity of an LED



5.BREADBOARD—

A breadboard is a construction base for prototyping of electrons. Breadboard has many tiny sockets arranged on a 0.1 grid . Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires with respect to circuit .

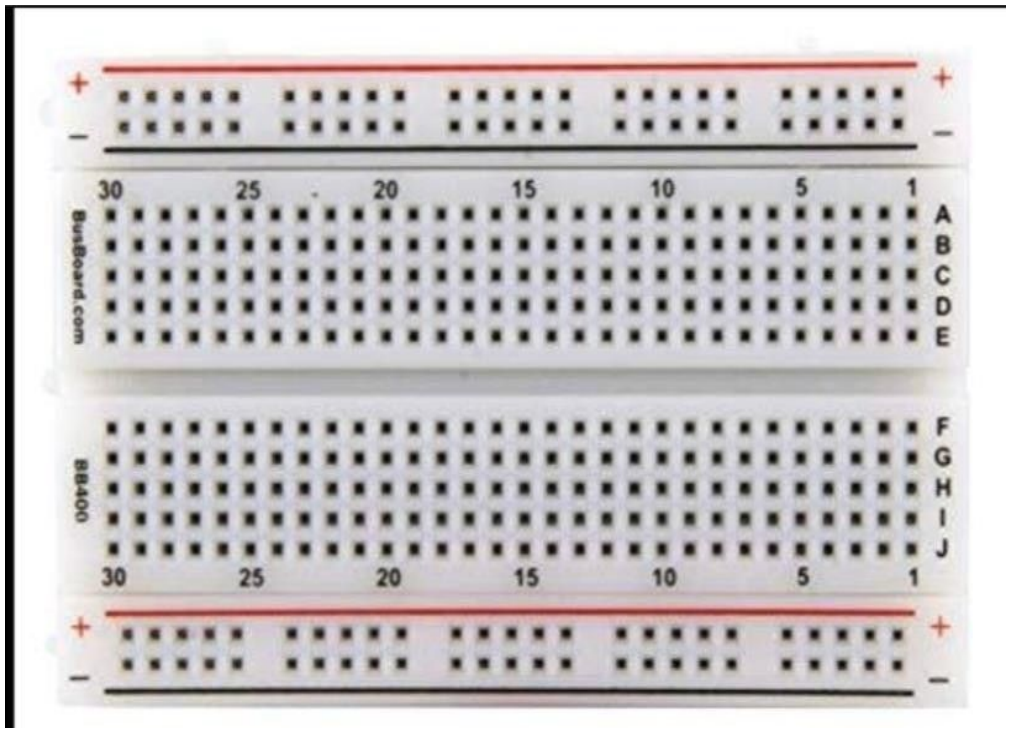


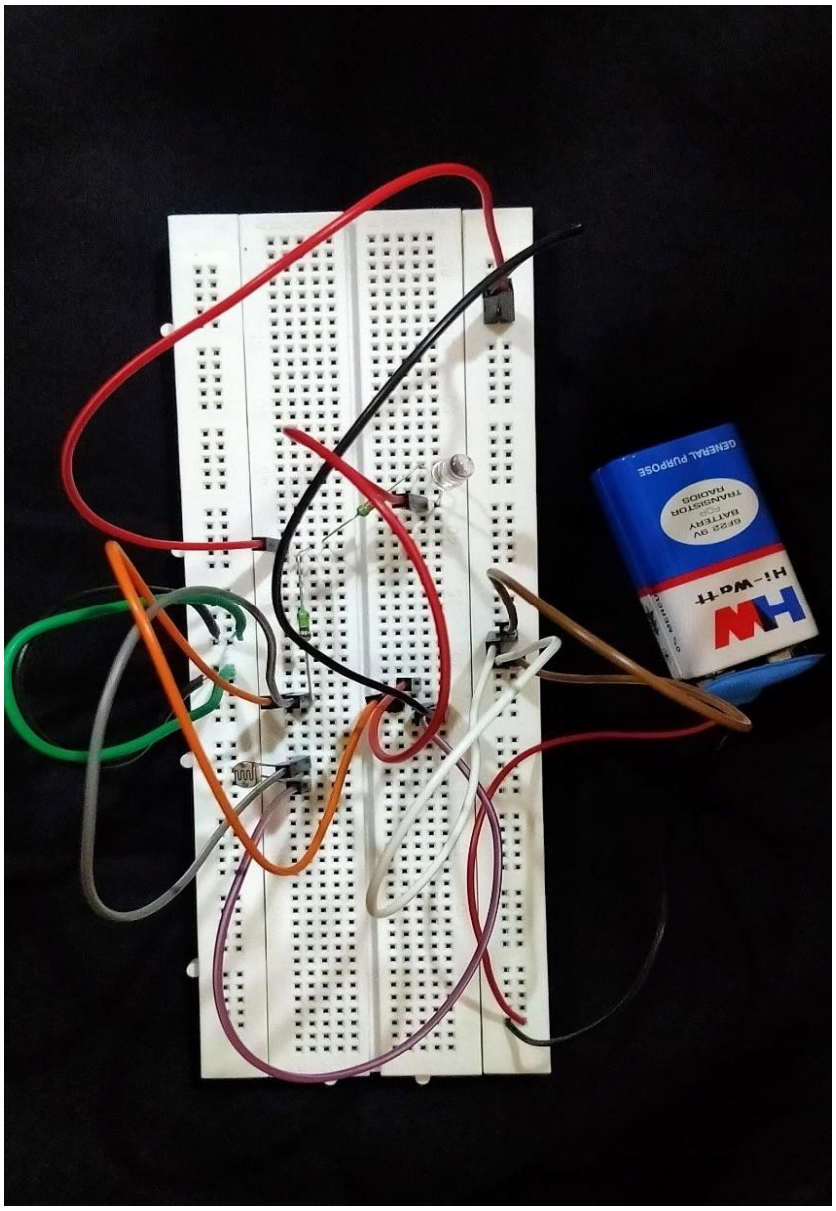
Fig:4.13 :picture of an Breadboard

6. POWERSUPPLY –

A power supply is a device that supplies electric power to a electric load .The term is most commonly referred to electric power converts that converts one form of electrical energy to another ,though it may also refer to that convert another form of energy (mechanical chemical, solar) to electrical energy . The regulated power supply is that controls the output voltage or current to a specific value ;the controlled value is held nearly .

Fig 4.14 : power supply

Fig.4.15: The final circuit connections



CHAPTER 5

RESULTS AND DISCUSSION

The working model of the automatic streetlight project was effectively planned and executed. The prepared model was tested under different light intensity conditions such as light condition and dark condition.

The model could turn off the light under light condition or when the intensity of the light in the surrounding atmosphere is high and turn on its light when the intensity of the light in the surrounding atmosphere is low or when it is dark.

The model working basing on the condition of light .which can also be defined as the LED stops glowing when there is light around and it starts glowing once the dark intensity of LDR is met .As a result it helps to operate the street lights automatically without the manual operation .

When the LDR is not covered/light intensity is high

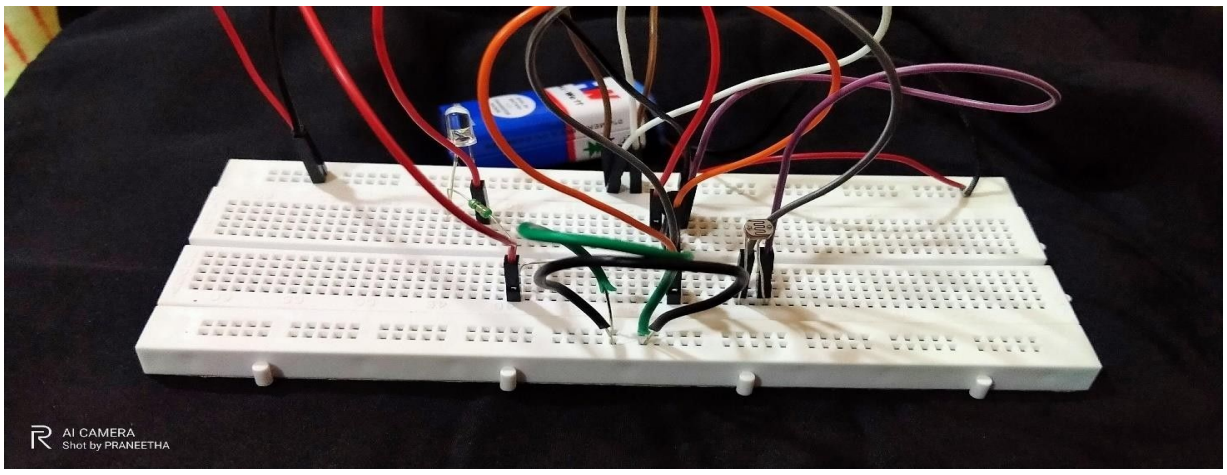


Fig.5.1: LIGHT CONDITION

When the LDR is covered / light intensity is low

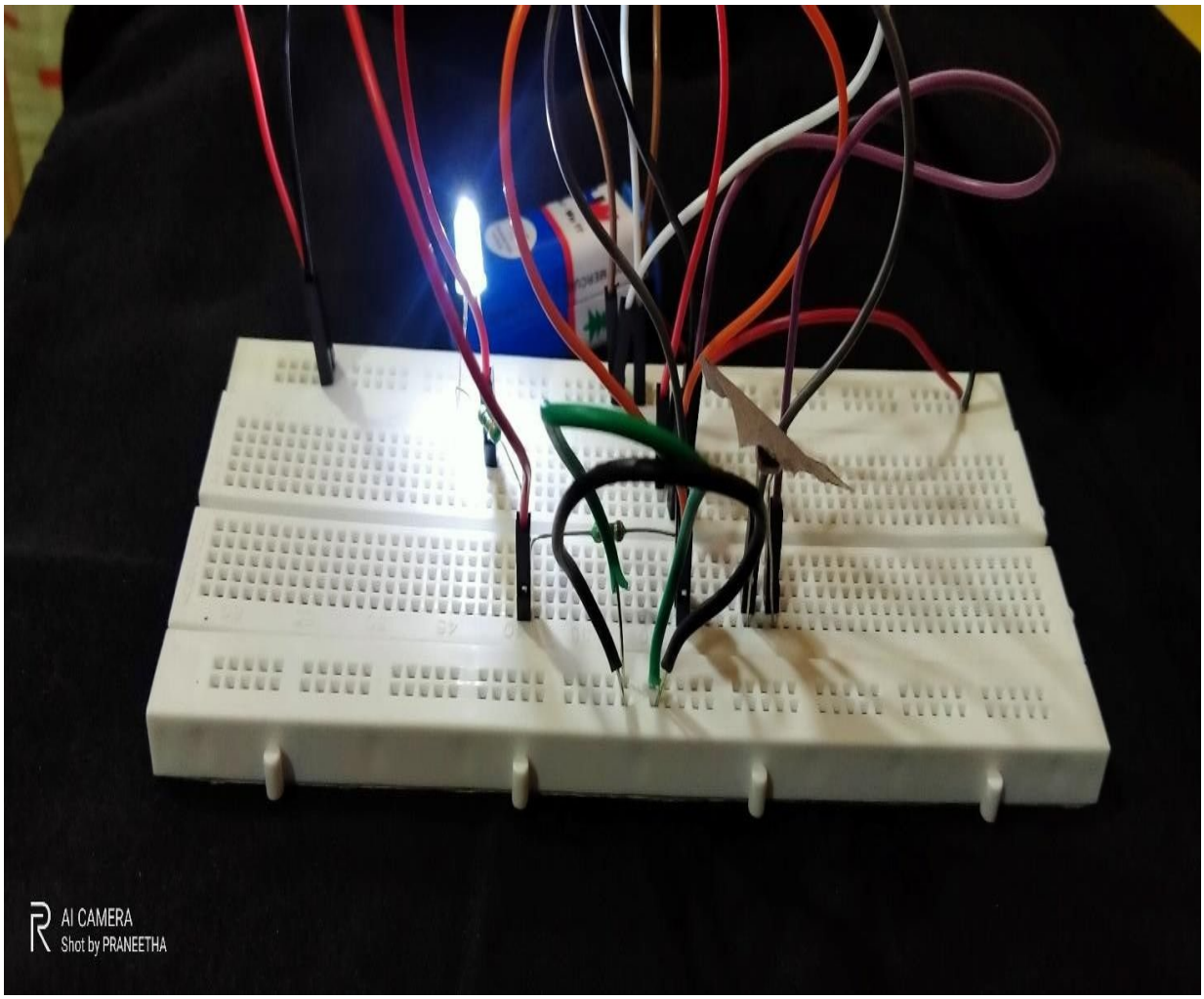


Fig.5.2: DARK CONDITION

Thus the project works accordingly to the conditions mentioned above.

As you can see in the images provided , when the light falling on LDR is high , LED switches off .

When the light falling on the LDR is low , LED switches on.

As a result it helps to operate it without manually which reflects on the power saving and life saving .If the streetlights are glown in the exact time all the accidents happening due to lack of light are reduced to a great extent .

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

ADVANTAGES:

- Photo resistors can change light into electricity and are not dependent on any other force, LDR's are delicate, inexpensive and readily obtainable devices.
- They are small enough suitable into virtually any electronic device and are used all around the world .
- As a basic component in many electrical systems and photoresistors made from materials that are easily obtainable, permitting hundreds of thousands of units to be produces each year.
- Road accidents happening due to lack are reduced to a larger extent .

Fig 6.1: image of a vehicle during night time without light

DISADVANTAGES:

- Can be more intricate to align detector pairs.
- Is sensitive to ambient light and require careful shielding.
- Photo resistors are only sensitive to light and no other force can power it without risking damage. Also they are unable to detect low light levels and may take a few seconds to deliver a charge while their electrons build up the momentum.
- For working the circuit effectively ,the LDR has to be sensitive.
- The position of LDR has to be placed properly that it could receive the light
- LED has to be connected in forward bias,for the circuit to work accordingly .Polarity has to be carefully maintained .

APPLICATIONS:

- Photo resistors are applied, most of them which involve recognizing the presence of light.
- Photo resistors are also used in digital cameras to perceive how much light camera sees and adjust the picture quality accordingly.
- Smoke detection, alarm clocks, automatic lighting control, burglar alarm systems, camera(electronic shutter), strobe(color temperature reading).

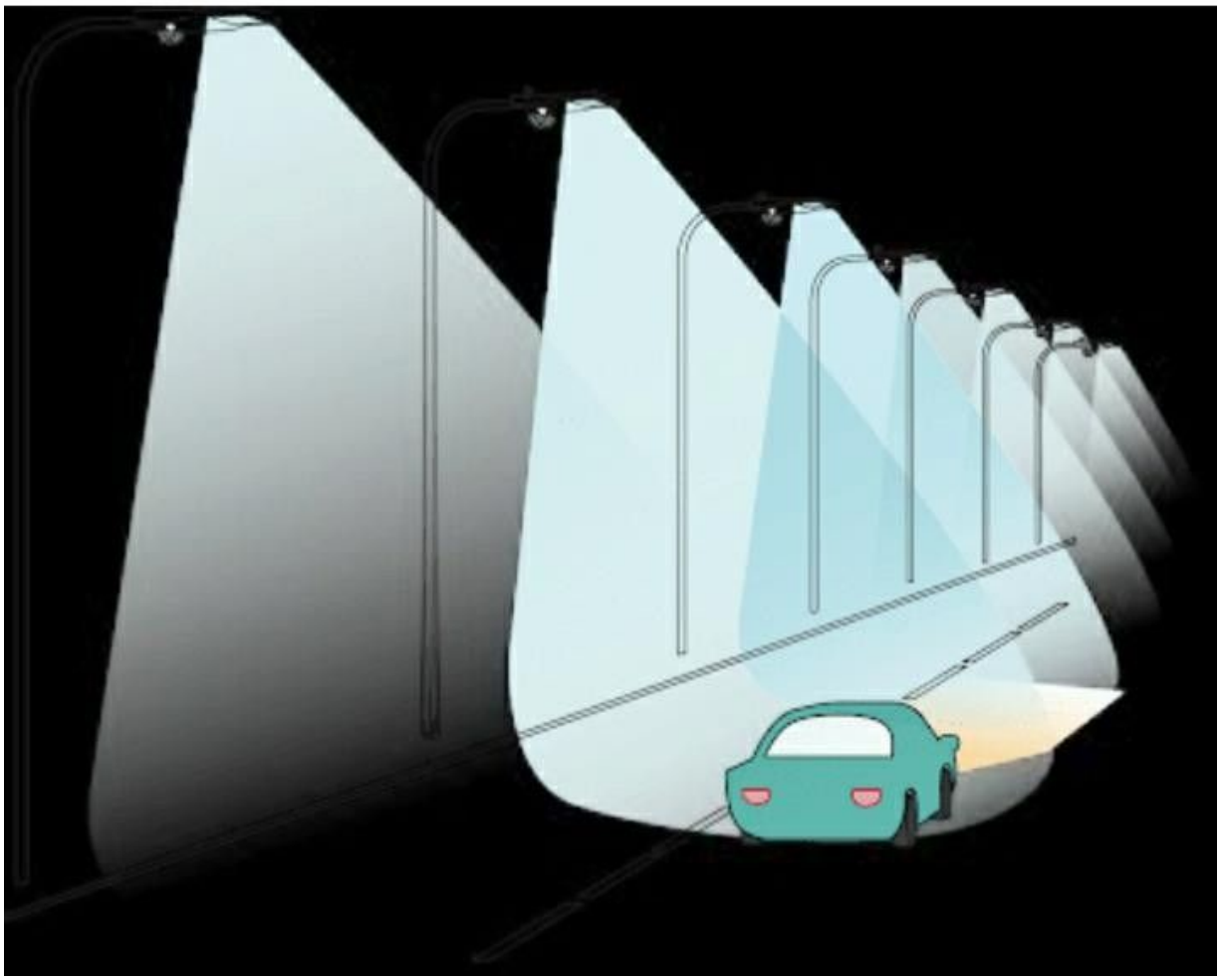


Fig 6.2 : Automatic streetlight