



**DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING
FACULTY OF ENGINEERING
DAFFODIL INTERNATIONAL UNIVERSITY**

An Infrared Sensor & LDR Based Automatic Road Light Control System

**A Project submitted in partial fulfillment of the requirements for the Award of
Degree of
Bachelor of Science in Electrical and Electronic Engineering**

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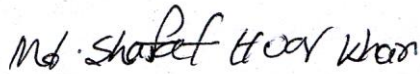
December 2018

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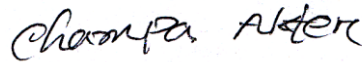
Certification

This is to certify that this project entitled “**An Infrared Sensor & LDR Based Automatic Road Light Control System**” is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

Signature of the candidates

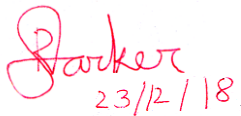


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List of Abbreviations

CD	Chromatic Dispersion
EMI	Immune to Electromagnetic Interference
FBG	Fiber Bragg Gratings
FWHM	Full Width at Half Maximum
GVD	Group Velocity Dispersion
LED	Light Emitting Diodes
MD	Material Dispersion
LDR	Light Depended Resister
PMD	Polarization Mode Dispersion
IR	Infrared Sensor
RMS	Root Mean Square

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ABSTRACT

The purpose of this paper is to focus on a Infrared sensor detector based automatic road light control system which will be very helpful for saving electrical energy . This system is also very easy to use. There are many roads and streets where is no availability of traffics or vehicles and people passes through. But the road light unexpectedly turned on all day long which causes huge consuming of electrical energy. But this control system will work automatically. It not only provides comfort but also reduces energy, efficiency, and time saving. Now a days the maintainance and the initial cost is very high. For all these, we have designed an automatic road light control system which will be very usable for our country according to the high demand of electrical energy. The main objectives of this paper are to control the light automatically and to active with the requirement of darkness. After all this is an effective project for Bangladesh a developing country.

CHAPTER 1

1.1 Introduction

This is a project of an Infrared Sensor & Light Depended Resistance Based Automatic Road Light Control System. The main aim of the project is to save electrical energy from consuming with digitally.

The working function of the project starts with the LDR which will activate the system at night or any darkness & then the IR sensor will detect objects like vehicles and people passing by the road then turns the light on either off.

1.2 History

The utility electricity sector in Bangladesh has one national grid with an installed capacity of 16,048 MW as of July 2018. Bangladesh's energy sector is booming. Recently Bangladesh started construction of the 2.4-gigawatt (GW) Rooppur Nuclear Power Plant expected to go into operation in 2023. According to the Bangladesh Power Development Board in July 2018, 90 percent of the population had access to electricity. However per Capacity Energy Consumption in Bangladesh is considered low.

Electricity is the major source of power for most of the country's economic activities. Bangladesh's total installed electricity generation capacity (including captive power) was 15,351 megawatts (MW) as of January 2017. As of 2015, 92% of the urban population and 67% of the rural population had access to electricity. An average of 77.9% of the population had access to electricity in Bangladesh. Bangladesh will need an estimated 34,000 MW of power by 2030 to sustain its economic growth of over 7 percent.

Problems in Bangladesh's electric power sector include high system losses, delays in completion of new plants, low plant efficiency, erratic power supply, electricity theft, blackouts, and shortages of funds for power plant maintenance. Overall, the country's generation plants have been unable to meet system demand over the past decade.

Considering all this problem our main aim is to save over electricity consuming where no need to turns the road light on for the long time of the low traffic road.

1.3 Project Objectives

To accomplish a project, the objective of the project must be clear and can be understood to achieve.

So, the objectives of this project are:

1. To save the electricity.
2. To monitor the system automatically.
3. Can be activated at any time by the requirement.

1.4 Scope of Project

The main purpose of this project is to activate the system at night or any kinds of darkness. The system including Infrared sensor & the light combined circuit. It's narrowly detect objects like vehicles and people who pass through the road and turn on the light while passing. Then the lights turn off. The main scope of this project is that, we may activate the light automatically only when they need lights.

1.5 Report Outline

Chapter 1 Introduction

Chapter 2 Components of the Project

Chapter 3 Theoretical Model

Chapter 4 Hardware Development

Chapter 5 Results and Discussions

Chapter 6 Conclusions and Recommendations

CHAPTER 2

Components of the Project

2.1 Introduction

To complete this project, many researches and analyze about a LDR based relay & transistor circuit and the outcome with detector sensor based Automatic Road Light Control System had been done. We have used several text books, journals and internet source to complete this project.

2.2 Component List

1. Stepdown Transformer (220/12volt)
2. AC to DC power adapter (12volt)
3. Relay (12volt DC. 12A, 220volt AC)
4. LDR
5. Infrared Sensor Module
6. Transistor BC-458 NPN
7. Capacitor (16volt, 1000uF)
8. Diode
9. Resistor
10. LED
11. Single Wire

2.2.1 Stepdown Transformer (220/12volt)

A stepdown transformer (220/12volt) 50Hz frequency, 1000mA is require to arrange get the power supply from the 240-220volt regular supply to the low voltage circuit with its component from (5-12volt).

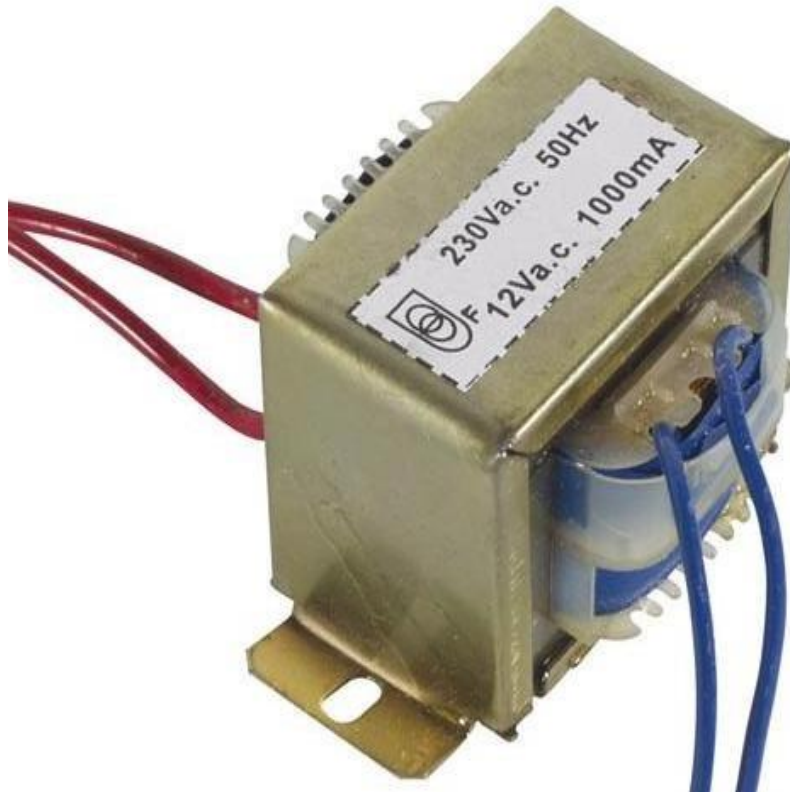


Figure 2.1 Stepdown Transformer

2.2.2 AC to DC power adapter (12volt)

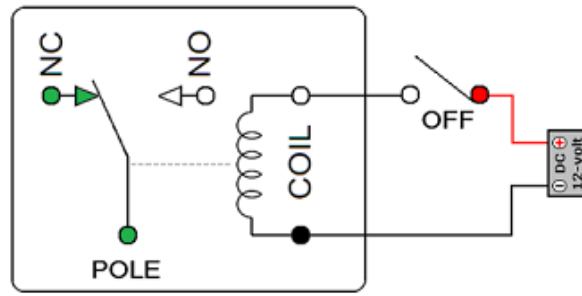
An AC to DC power adapter is a type of external power supply often enclosed in a case similar to an AC plug, used to ensure the stable 12-volt supply to the low-voltage equipment. There are different types- plug pack, plug-in adapter, adapter block, domestic main adapter, line power adapter etc.



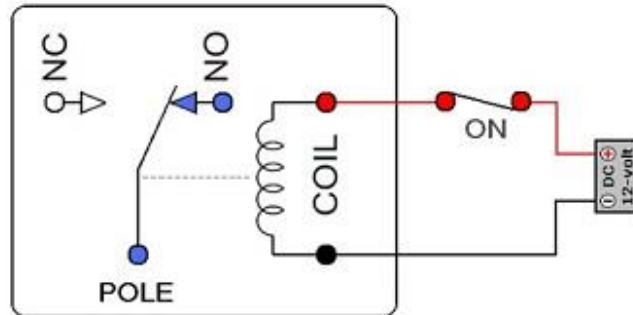
Fig. 2.2 AC to DC power adapter (12volt)

2.2.3 Relay (12V DC, 220V AC)

In this project we are using a normally open relay to meet up the condition. When the output of the LDR is active then the normally open side of the relay becomes closed and either open.



Normally close



Normally open

Relay is one of the most important part of this circuit. There are different types-

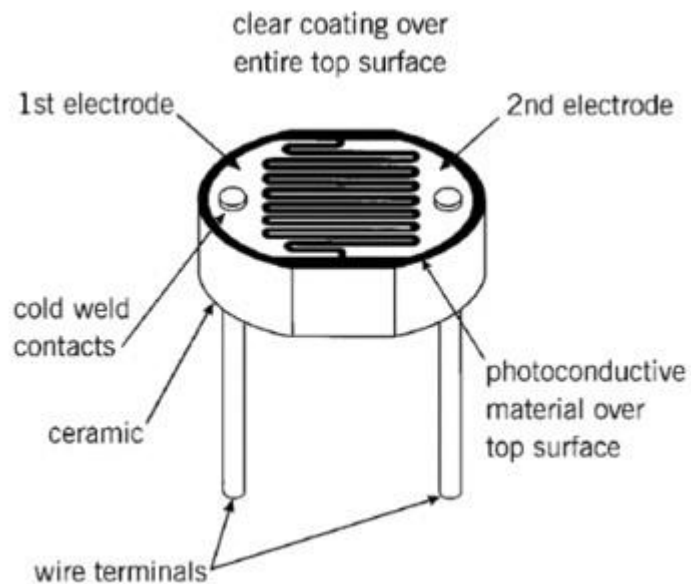
1. Electromagnetic Relay
2. Solid State Relay
3. Hybrid Relay
4. Thermal Relay



Fig 2.3 Relay

2.2.4 LDR

A LDR (Light Dependent Resistor) or photoresistor is used in the project to activate or deactivate the circuit based on the daylight or the darkness.



This photo resistor is made of a high resistance semiconductor in the dark, a photo resistor can have a resistance as high as several mega ohms ($M\Omega$), while in the light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photo resistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photo resistor can substantially differ among dissimilar devices. Moreover, unique photo resistors may react substantially differently to photons within certain wavelength bands.

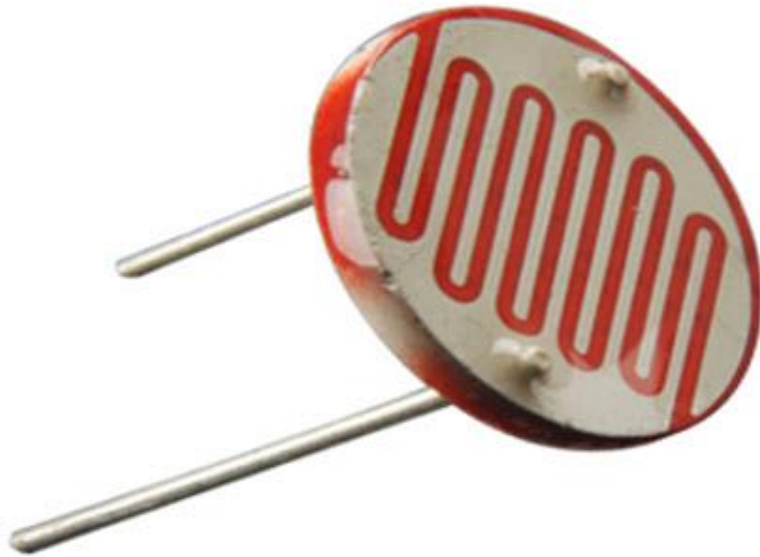
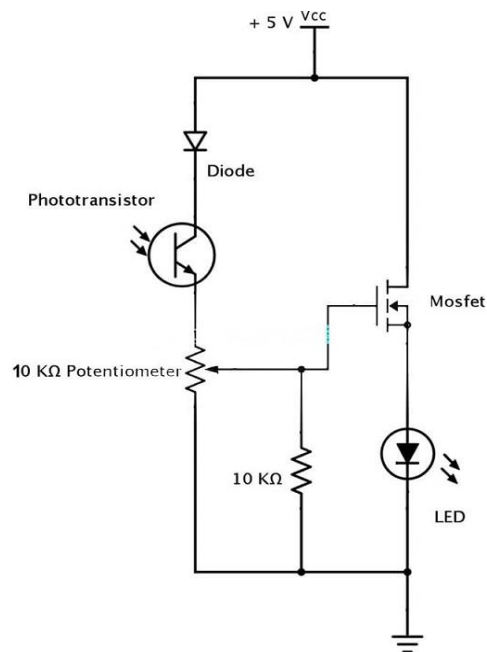


Figure: 2.4 Rechargeable Battery

2.2.5 Infrared Sensor Module

An infrared sensor is used to detect objects. This device consisting of an infrared transmitter and a receiver.



More in detail an IR transmitter, also known as IR LED, sends an infrared signal with a certain frequency compatible with an IR receiver which has the task to detect it. There are different kind of IR sensors for different type of application. IR technology is used, for

example, in proximity sensors to detect a near object, in contrast sensors to find a path or in counting sensors to count objects.

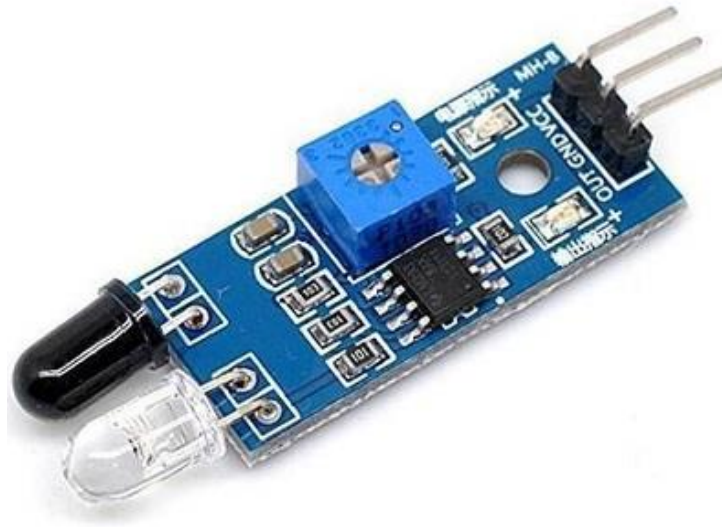


Figure: 2.5 Infrared Sensor Module

2.2.6 Transistor BC-458 NPN

We have used a BC-458 NPN transistor. It's a general purpose NPN bipolar junction transistor. This transistor is a part of epitaxial silicon transistor that organized the metal-cased BC-108 of transistor family. Datasheets for the BC548 give specifications that are identical to, or exceed, those of the BC108, BC148 and BC238 predecessors. Thus the BC548 (or BC546 to 550) is a valid substitute in any circuit designed for the older BC108 (or BC148), which includes many Mullard and Philips published designs.

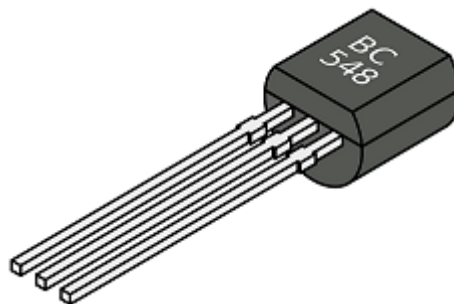


Figure: 2.6 transistor BC-458

2.2.7 Capacitor (16volt, 1000uF)

Here we have used a 1000 microfarad (μF), 16volt capacitor with the diode to make the fullwave bridge rectifier circuit.

A capacitor is a passive two terminal component device that stores electrical energy in an electric field. The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit.

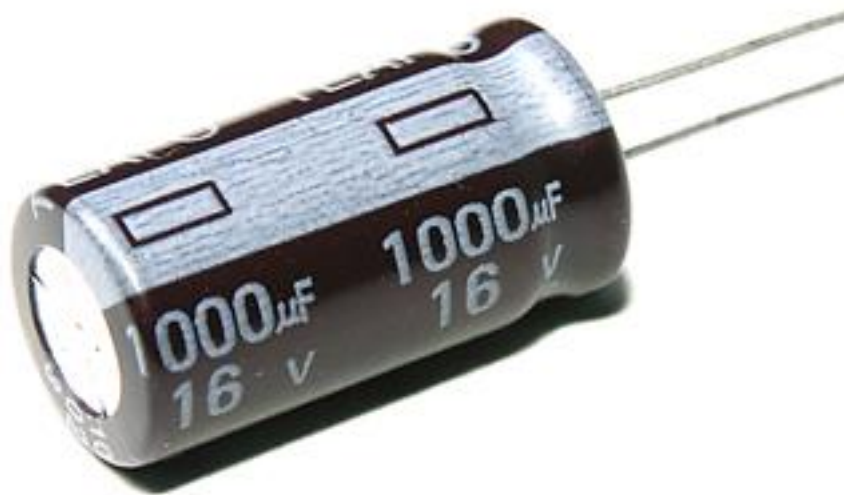


Figure: 2.7 Capacitor

2.2.8 Diode

Here we used diode to make full wave bridge rectifier circuit so that we can receive 12volt DC from the transformer output of 12volt AC.

A diode is a two-terminal electronic component that conducts current primarily in one direction it has low almost zero resistance in one direction, and high ideally infinite resistance in the other. A diode vacuum tube or thermionic diode is a vacuum tube with two electrodes, a heated cathode and a plate, in which electrons can flow in only one direction, from cathode to plate.



Figure: 2.8 Diode

2.2.9 Resistor

In the circuit we have different types of resistor to limit the voltage as requires to the load by dropping the voltage. The resistance value depends up to its color code.

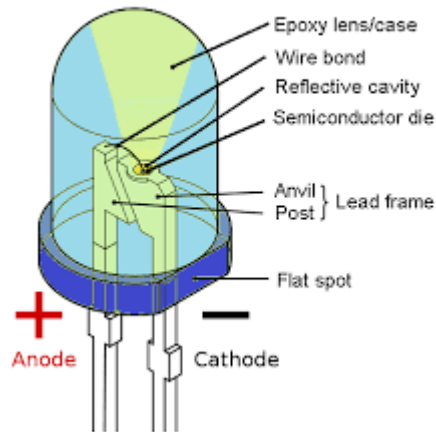
A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses



Figure: 2.9 Soil Moisture Sensor

2.2.10 LED

In this automatic road light control system, we used LED (Light Emitting diode) as the road lamp. This light requires very low voltage. So we used different value's resistance to the supply of the light.



A LED lamp or LED light bulb is an electric light for use in light fixtures that produces light using light-emitting diode (LED). LED lamps have a lifespan many times longer than equivalent incandescent lamps, and are significantly more efficient than most fluorescent lamps.



Figure: 2.10 LED

2.3 Summary

The chapter describes about some important equipment that relates to the project. Describes all equipment like Infrared sensor, Light Depended Resistor, Relay, transistor, transformer etc. that work properly to complete the project.

CHAPTER 3

THEORETICAL MODEL

3.1 Basic Block Diagram

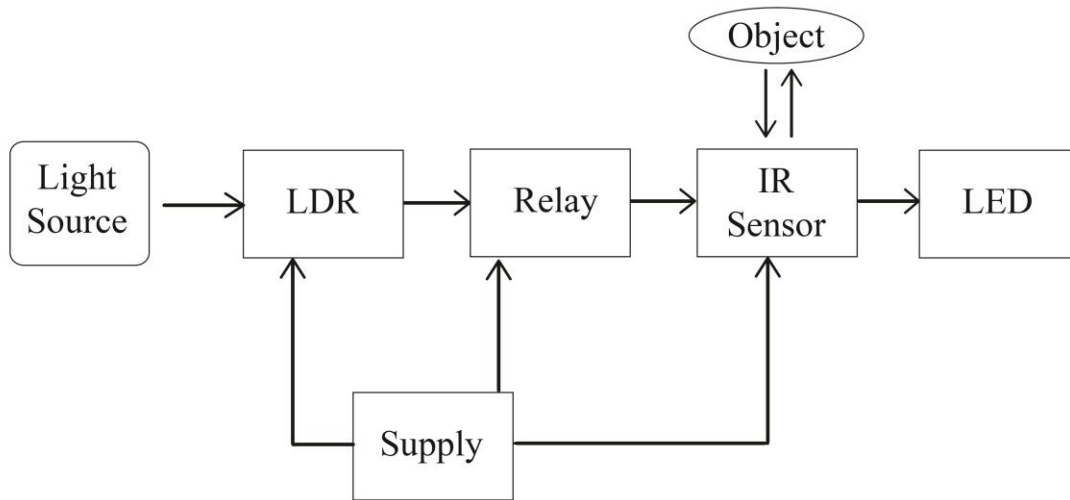


Figure: 3.1 Basic Block Diagram

An LDR is connected with the relay. At day time the Light Dependent Resistance device send normally close signal to the relay. Then at night when it's dark the Light Depended give positive signal to the relay and the relay active the circuit. Then IR sensor start detecting for any object. When any object found of passes through, then it sends a positive signal to the light load. And turn the lights on. When the sensor understand that no objects is passing or feedback signal in coming back, it turns the light of.

3.2 Circuit Diagram

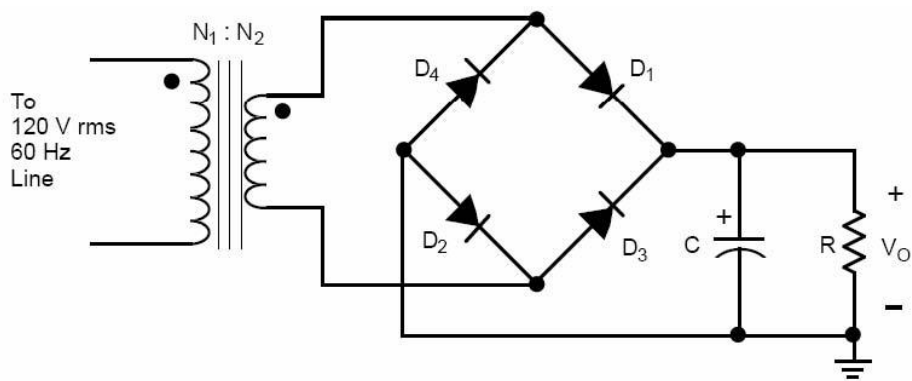
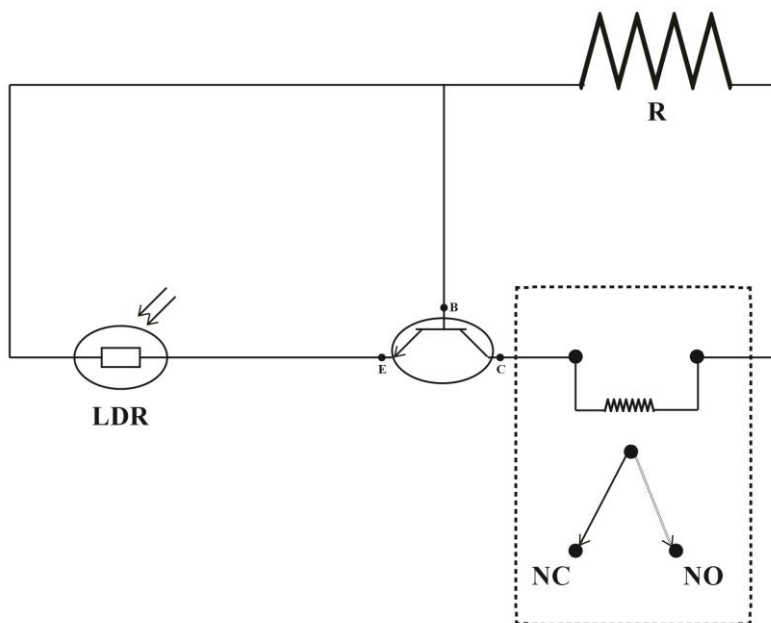
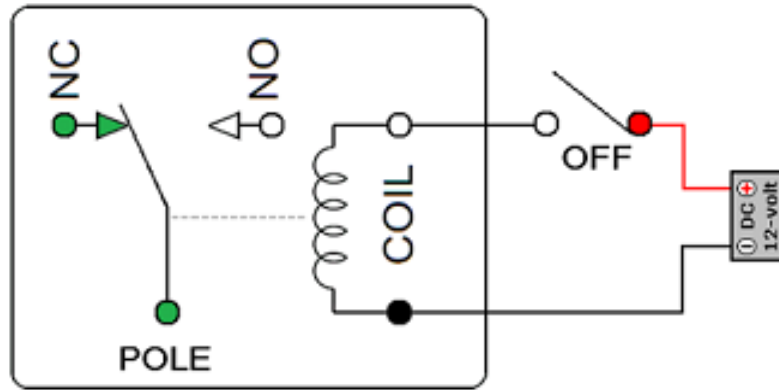


Figure: 3.2 Circuit Diagram

On the above figure we can see the circuit diagram. In the circuit diagram initially a full wave bridge rectifier (containing a 16V, 1000uF capacitor) is connected to the output side of the of the stepdown transformer. The bridge rectifier circuit convert AC signal into a DC signal. Which required by the DC circuit.



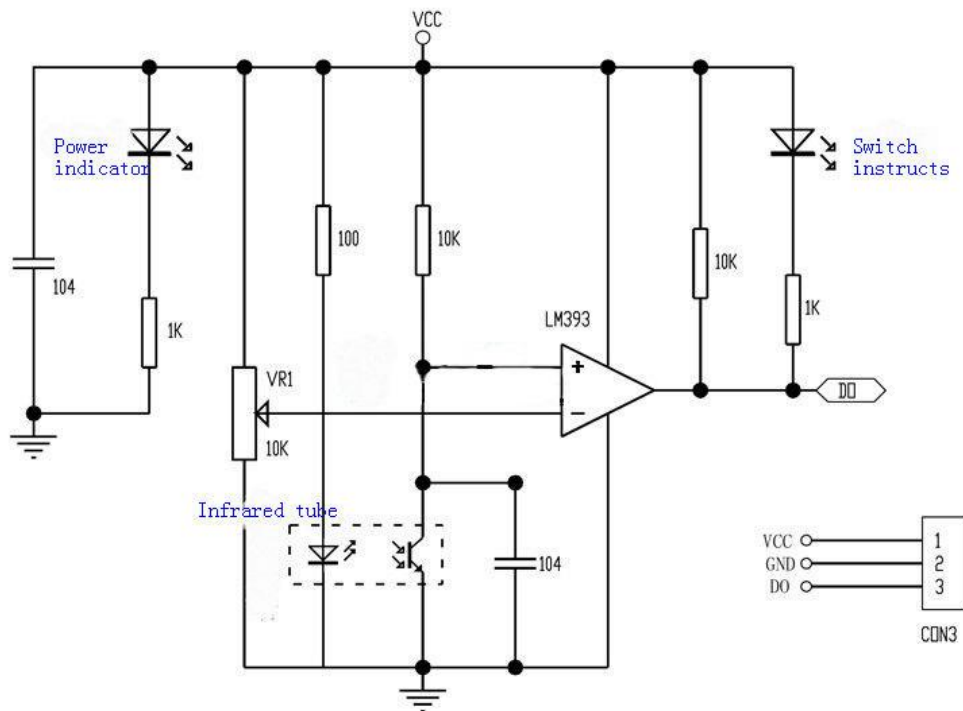
A relay is connected as a bridge through the supply line. A Light dependent resistor is connected with the Emitter side of the NPN transistor. And the another side of the Light depended resistor is connected to the base of the transistor. The common side of the transistor is connected to the base and the Light depended resistor short point.



At normal condition the relay contact point connected to the normally closed path. When its dark, the Light depended resistor send a positive signal to the relay circuit and the contact connected to the normally close path. The output of the relay turn the circuit active.

The IR sensor which is the bridge between the supply and the load. IR sensor is operated by a constant supply of DC 5volt. And output side of the IR sensor is connected to the light.

Initially the IR sensor send a signal to detect any object which passing through it. If there found no device the signal is fail to return to the receiving end of the sensor. Yet the device turned off.



When any objects pass through the road, then the signal which send by the IR sensor become reflected by the object. The reflected signal arrived as the feedback signal to the receiver and the positive output of the signal of the IR sensor turned on the light while the object remaining of passes through.

Then when it goes away, the sensor is failed to receive the feedback reflected signal. And turned the lighting load circuit off.

Thus the daylight comes to the Light dependent resistor. The sensor sends turn off signal to the relay. The contact path releases the normally close open path of the relay. And they become inactive at this time.

3.3 Summary

In this chapter has discussed about block diagram, circuit diagram of this project. It has also explained operating system of the project.

CHAPTER 4

HARDWARE DEVELOPMENT

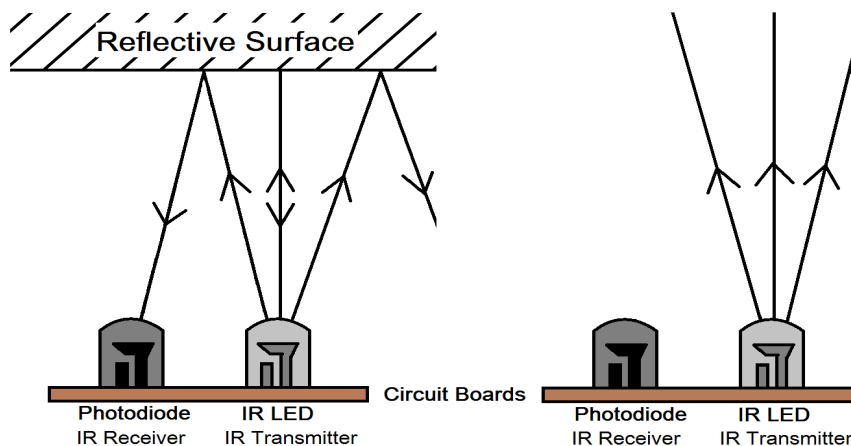
4.1 Principle of Operation

The IR transmitter sends an infrared signal that, in case of a reflecting surface (e.g. white color), bounces off in some directions including that of the IR receiver that captures the signal detecting the object.

When the surface is absorbent (e.g. black color) the IR signal isn't reflected and the object cannot be detected by the sensor. This result would occur even if the object is absent.

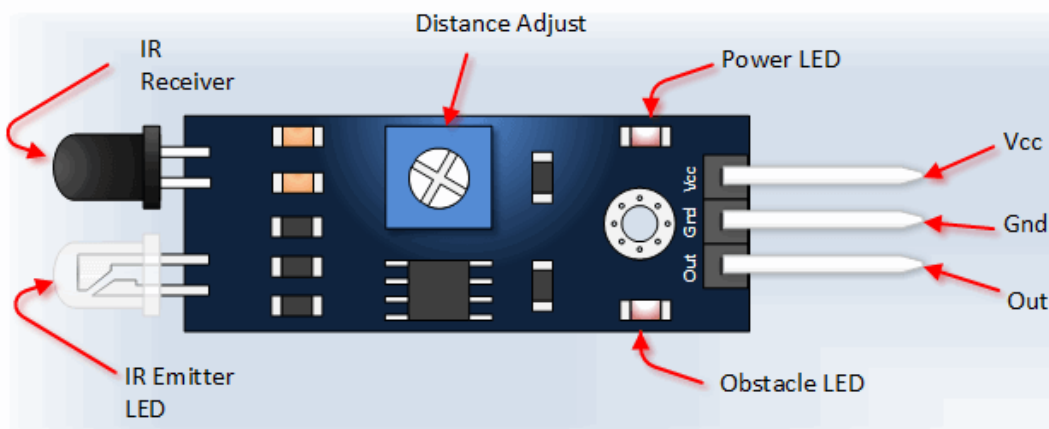
4.2 IR Transmitter and IR Receiver

The IR transmitter is a particular LED that emits radiation in the frequency range of infrared, invisible to the naked eye. An infrared LED just works as a simple LED with a voltage of 3V DC and a current consumption of about 20mA. The IR receiver, such as a photodiode or a phototransistor, is capable of detect infrared radiation emitted from the IR transmitter. Aesthetically it is similar to a LED but the external capsule can be wrapped by a dark color film.



4.3 IR Sensor FC-51

The sensor used in our demo is model **FC-51**. It is a cheap sensor easily available on the internet for less than 2\$ but unfortunately we didn't find the datasheet. In any case we will explain the operation of the related electronic circuit and subsequently implement some demo to test its functioning.



4.4 Pinout and Schematic

The package has three connection pins:

1. Vcc to the power supply 3-5V DC
2. Gnd to the ground reference
3. Out for the digital output signal of the sensor

This sensor detects objects at a distance in range between 2~30cm. With the potentiometer you can calibrate the sensitivity according to the application and environmental conditions (e.g. brightness). The IC LM393 is an open-collector voltage comparator which provides an output if there is a pull-up R between the output of the IC (DO) and the power supply Vcc ($R=10K\Omega$). The output DO is:

low if the object is detected.

Chapter 5

RESULTS AND DISCUSSIONS

5.1 Introduction

In this chapter we shall discuss about the result and discussion. I think this project will be very helpful for the farmers of our country. There is also so much scope to develop this system.

5.2 Our Project

After connecting with all equipment of our project, the system will start properly. We have used a program to run the system. Our project picture is given below:

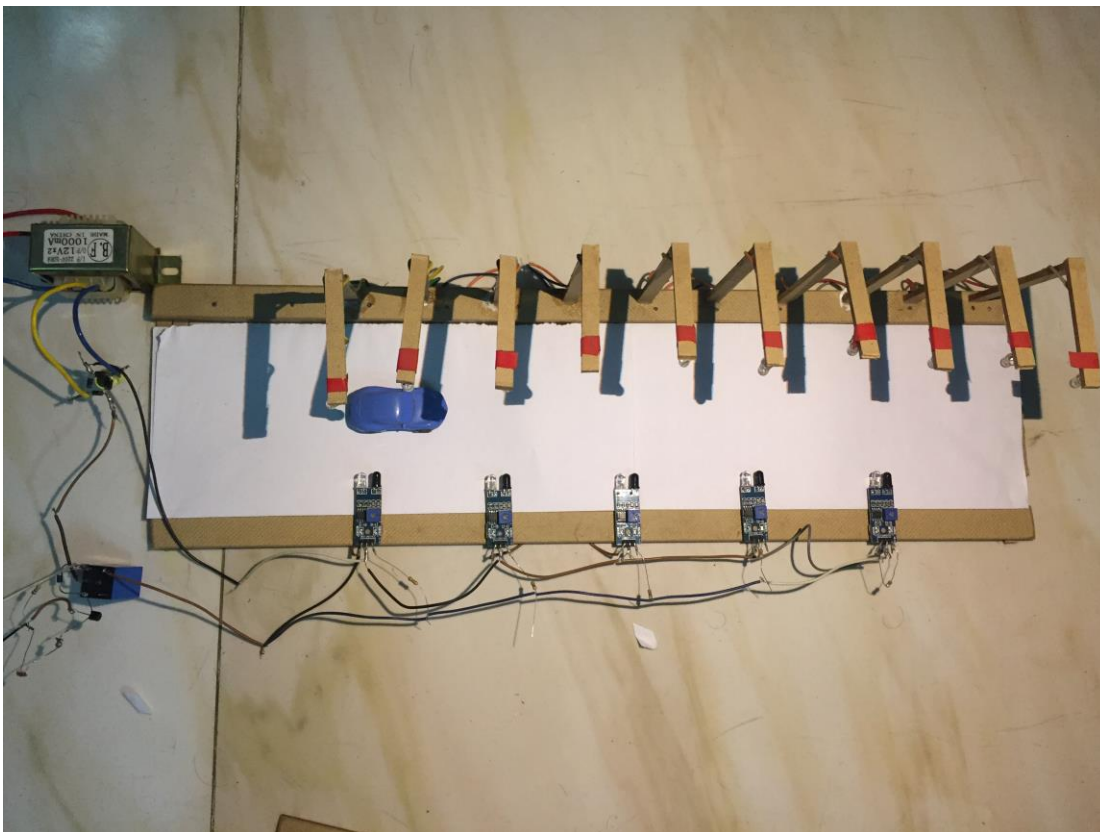
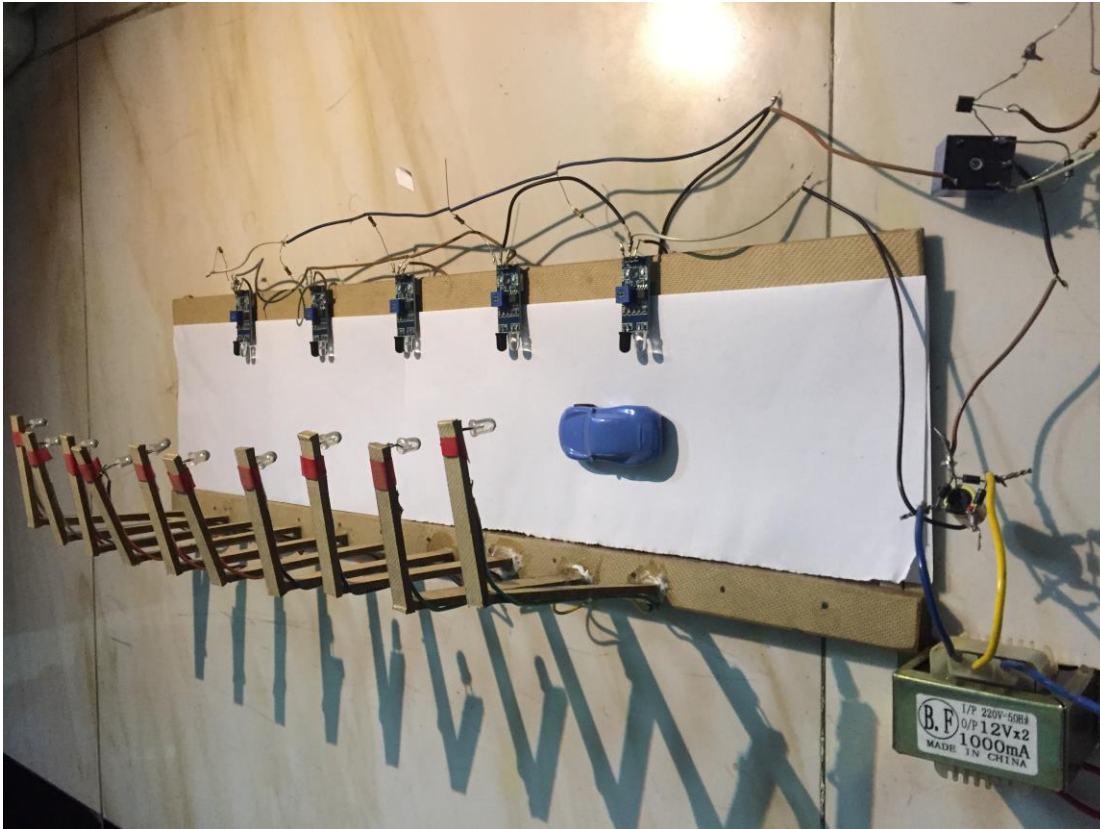


Fig. 5.1 Our Project Picture



When any vehicles cross the road at day time than the supply turned off by the LDR using relay. When it's dark at night the sensor automatically turned on the circuit and become ready to detect vehicles or any other objects. When any of the object passes through the road the sensing element detect the vehicles by the receiving output. Then the lights turned on while the object passes through the system. Thus when the objects completely overcome the circuit, the receiver will fail to receive the signal that send from the sending end of the sensor. At this condition the light will turn off .

5.4 System Cost

Serial	Components	Price in (BDT)
01	IR Sensor Module 5pcs	750
02	Transformer	200
03	Relay 3pcs	150
04	LDR 5pcs	75
05	Capacitors	30
06	Some Resistor	40
07	Diode	50
08	Transistor NPN & PNP	50
09	Connector	20
10	AC to DC Power Supply	300
11	Some Wires	80
12	LED	50
13	Model Bord, Structure And ETC	300
Total Cost		= 2095 Tk.

Table 5.1: Cost Analysis

5.5 Discussion

The project has been tested and it has worked properly. I think this technology can easily be used to save excessive consuming of electricity. This system will be low cost for the than its feedback. By using this system where found the irregular moving of vehicles and people this will be very efficient system, there.

5.6 Advantage and Disadvantage

Advantage:

1. It will be able to save electrical energy.
2. The proposed system is cost efficient.
3. Huge amount of electrical consuming probability will be save.
4. No need to human operating, it will automatically be done.
5. The power supply system is also very easy.

Disadvantage:

1. This will be very unexpected when any system fault occurred.
2. It's primary cost is very high.

5.7 Summary

In this chapter has discussed about result and discussion. With our project we became successful to demonstrate with regarding the objectives of the project. At last completing this chapter the project is ready to use.

CHAPTER 6

CONCLUSIONS

6.1 Conclusion

In this project we have tried to do special to save excessive consuming of electricity. And tried to make ensure of using this saved energy to another demand. This is a modern project and this will be so much cost efficient for the local users. In this project we have used an object detector sensor. Here we have used a conditional circuit to run the system. The Light Dependent Resistor sensor has been connected with the conditional relay which output connected to the Infrared sensor and it will send an on or off signal to the load. The lighting system will work automatically by sensing the object cross through the road. I think it is a standard model of automatic light control system.

6.2 Limitations of the Work

Mention few limitations or challenges faced in my work. In this project, we have faced few problems as like as:

1. Reverse feedback of the sensor.
2. Total detection objects distance area limitation.
3. Sensors accuracy of sensing signal.
4. Mismatch of the objects total crossing area.

References

- [1] <https://blog.aeris.com>
- [2] en.banglapedia.org
- [3] <https://nrcca.cals.cornell.edu>
- [4] <https://learn.sparkfun.com>
- [5] <https://whatis.techtarget.com>
- [6] <https://www.digitaltrends.com>
- [7] <https://www.gmb.jp>
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