MINI PROJECT REPORT

TITLE: MOTION DETECTOR USING NE555 TIMER

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CERTIFICATE

Certified that the Mini Project work entitled "MOTION DETECTOR USING NE555 TIMER" carried out by Adithya Hegde - 1NH18EE701, Vishal Suresh – 1NH18EE756, Ananda M A – 1NH18EE702 are Bonafede students of New Horizon College of Engineering submitted the report in completion of department of Electrical and Electronics Engineering, New Horizon College of Engineering during the academic year of 2019-2020. It is certified that all the corrections/suggestions indicated for internal assessment have been approved as it satisfies the academic requirements in respect of Project work prescribed for said degree.

PROJECT GUIDE

NAME OF THE GUIDE

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ABSTRACT OF THE PROJECT

The motion detector works with a LDR (light dependent resistor), the LDR are light sensitive, when there is more amount of light the photo resistor resistance will be less than few kiloohms, but when there is no light the value of the photo resistor will be in few megaohms. The LDR sensor also holds with a stand and it connected with the main driver circuit. The circuit has two parts.

One is filtered the signal of discontinuity light and others is led on circuit. When anybody breaks the path between the light and LDR the main circuit sense the discontinuity by sensor and turn on the led circuit. If once the led circuit is on it will light the led until push the reset button. Any option can be set by switch. The system has built with low cost and high performance.

The power consumption of the system is very low. Introduction The realization of this project will involve the construction of a light sensitive alarm. In this project are to distinguish two parts. The first part of the project explains how the instrument works and the introduction to motion detector and the second part of the project explains the pros and cons with the limitations of motion detector using ne555 timer.

Also, the second part says the importance of motion detector in real world and the future of motion detector in real world applications.

INTRODUCTION TO MOTION DETECTOR

Motion detector is a sensor that detects any moving objects that passes in front of the sensor. The sensor when it detects the motion the sensor automatically alerts the user. The motion detector has many real-world applications such as digital counter, intruder alert system, automatic ticket gates, entry way lighting, security lighting, automated toilet flusher, hand dryers, automatic doors and many other applications.

The motion detector may be classified into different type based on how the motion is detected. There are two types of motion detector they are active detectors and passive detectors.

Active detectors

The types of detector where radio waves are used, the radio waves hit the object and reflect the waves to the detector. When the waves are disturbed it indicates the wave is hit with a moving object. If it detects a Doppler shift, it activates to show it has detected motion.

Passive detectors

Passive detector use infrared(heat) energy levels and they are analyzed. The sensor can detect objects that vary from the ambient temperature of the area being scanned; for example, a person will emit between 9 and 10 μm of infrared energy. When this signal is received, and shown to be moving across the area, motion is detected.

Types of motion detector

-PIR (PASSIVE INFRARED SENSOR)

-MICROWAVE SENSOR

-TOMOGRAPHIC MOTION DETECTOR

-GESTURE DETECTOR

-MOTION DETECTOR USING LDR (LIGHT DEPENDENT RESISTORS)

COMPONENTS USED IN THE PROJECT

		QUANTITY
1.NE 555 TIMER (TIMER IC)	-	1
2.LM 358(OP-AMP)	-	1
3.BC 547(TRANSISTOR NPN)	-	1
4.RESISTOR 220OHMS	-	2
5.RESISTOR 1KOHMS	-	3
6.10K POT	-	1
7.SLIDE SWITCH	-	1
8.LDR (PHOTORESISTOR)	-	1
9.LED (WHITE)	-	2
10.CERAMIC CAPACITOR 100nsF	-	1

Introduction to The Components

1.NE555timer

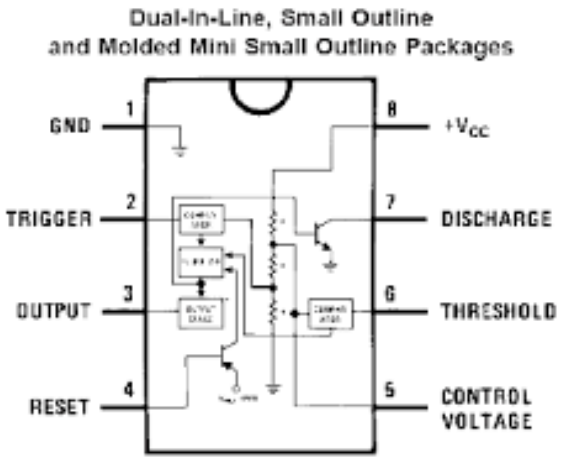

Figure 1.1

The chip was introduced in the year 1972 by the company named Signetics the 555 timer is very popular because of its cheap availability and the low cost. The ne 555 timer is very easy to use and nowadays the timer is made from original bipolar and low power CMOS technology. The ne 555 timer is most popular IC ever created.

The history of the ne 555

The chip was designed by Hans R. Camenzind under the contract from the company Signetics, which was later acquired by Philips company. He also designed the pulse width modulation amplifier which was not successful in the market because the power amplifier was missing in the amplifier however this was used for audio applications. Hans gave the proposal for the universal circuit based on the oscillator and he developed it alone. The first design for the timer was reviewed on Q2 of 1971. It worked without any errors but Hans got the idea of using three five kiloohm resistor which worked and later on the resistors were added and the 9^{th} pin was removed which was used as the variable power supply to circuit. Then 12 companies started producing these integrated circuits and the integrated circuit became one of the bestselling components.

The working of ne 555

The above figure shows the data sheet of the ne555 timer. pin 1 and 8 are connected in series with three 5kohm resistor, which gives ne555 timer its name, and it gives a great voltage divider since pin 8 is connected to the supply voltage and pin one to ground. Pin 2 is the trigger pin and

it is connected to the negative terminal of a comparator the positive input of the comparator connects the voltage divider which has the potential of one third of the supply voltage. The output of the comparator is connected to the set pin of the integrated flip flop. Pin 3 is the output which is connected to the output driver which itself is connected to the output of the integrated flipflop. Pin 4 is the reset pin which is directly connected to the reset pin of the integrated flip flop. When pin 4 is connected to the ground the pin instantly resets the whole IC, that's is why they are usually connected to the supply voltage.Pin5 is control voltage which is connected to the negative part of the second comparator and also to the voltage divider but has a potential of two third of the supply voltage. To stabilize the current, we can simply add a 10 nano-farad capacitor to stabilize it. Pin 6 is threshold pin which is connected to the positive pin of the second comparator, and the output of the second comparator is connected to the reset pin of the flip flop. Pin 7 is the discharge pin which is directly connected to the collector of the bipolar junction transistor and the emitter is connected to the ground and the base is connected to the output driver.

2. LM 358

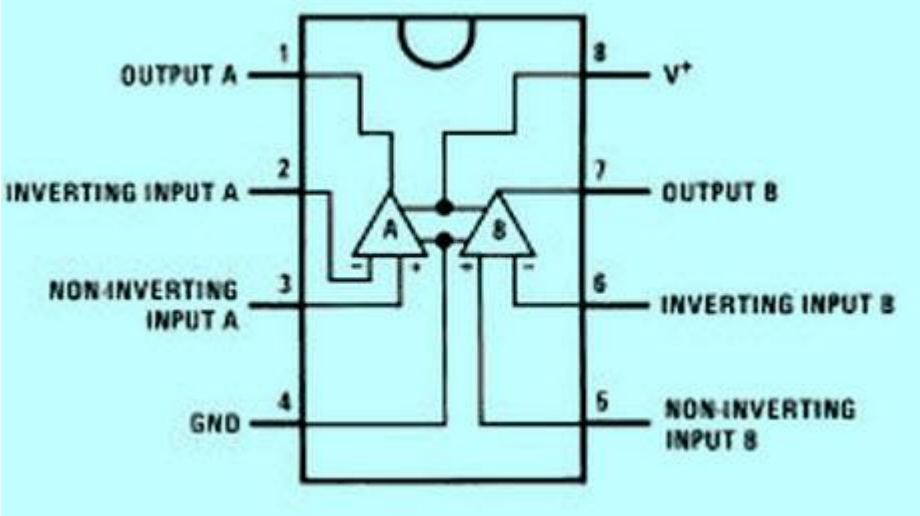

Fig.1.2

The above figure shows the datasheet of the operational amplifier that is Lm358. As we can see the figure the pin 1 and 8 are the outputs of the comparator and also the pin 8 is the power supply voltage for the whole LM358. The pin 2 and the pin 6 are the inverting inputs of the op amp whereas the pin 3 and pin 5 are the non-inverting input pins of the op amp. The pin 4 is the common ground pin for the whole op amp.

The pin 2 is connected to the negative terminal of the first comparator whereas the pin 3 is connected to the positive terminal of the first comparator. The pin 6 is connected to the negative terminal od the second comparator and pin 5 to the positive terminal of the second terminal and pin 1 and pin 7 are the outputs.

FEATURES OF LM 358

1. As we can see the pin diagram of the there are 2 op amps and the frequency is compensated for unity gain.

2. The bandwidth of the op amp is 1MegaHertz.

3. It can be connected to single or dual power supplies.

4. The range for the single power supply is from 3 volts to 32 volts.

5. For the dual power supply range is from + or – 1.5 volts to + or -16 volts.

6. The current drain for the op amp is very low that is 500microamperes.

7. The op amp has very low input offset voltage that is 2 millivolts.

8. Common mode input voltage range comprise of ground.

9. The power supply voltage of the op amp and the differential input voltages are almost similar.

10. The output voltage swing for the op amp is very large.

ADVANTAGES OF LM358

1. The two operational amplifiers are compensated internally.

2. Removes the necessity for need for dual supplies.

3. The op amp permits direct sensing close to Ground and $V_{OUT.}$

4. Its also well suited for all kinds of logic.

5. The power drains appropriate for the operations of the battery.

3.BC547 transistor

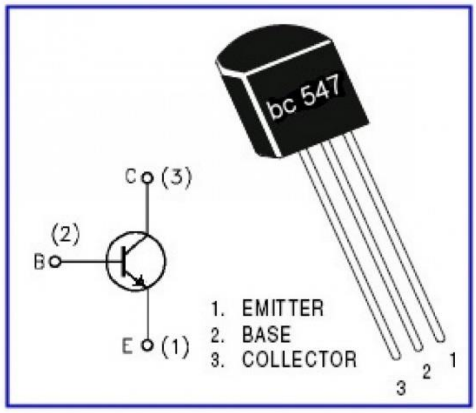

Fig 1.3

BC547 is an NPN bipolar junction transistor, it can be used as an amplifier also. The large current at the collector and the emitter can also be controlled by giving a small amount of current at the base.as mentioned earlier the BC547 can also be used as an amplifier and also switches. Just like any other transistor even the BC547 has three terminals they are base, emitter and collector.in the figure we can see the representation of the transistor. The working principle of the NPN BC547 is when an input voltage is applied at the terminals there is some amount of current that starts to flow from the base of the transistor to the emitter and controls the current at the collector of the transistor. The voltage between the base and the emitter (Vbe), is said to be negative and the base terminal is said to be positive because of its NPN construction.

The current ratings and the voltage ratings of the BC547 NPN transistor are

Values and units

1.collector emitter voltage (V_{CEO}) ---------- 65V

2.collector base voltage (V_{CBO}) ---------- 80V

3.emitter base voltage (V_{EBO})---------- 6V

4.power dissipation at the collector (P_d)---------- 500mW

5.collector current (I_c)---------- 100mA

6.storage temperature (T_{stg})---------- 65 to 150 ^oC

7.operating temperature (T_o)---------- 150^oC

4.LDR (LIGHT DEPENDENT RESISTORS)

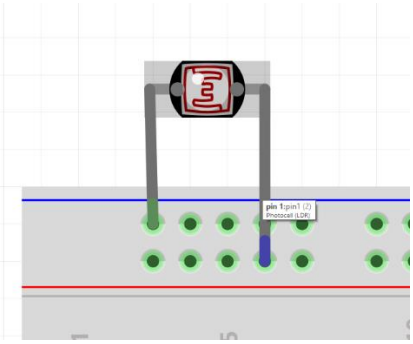

Fig**1.4**

LDR is also called as photo conductive cell, LDR is a light controlled resistor. The resistance of this photo resistor decreases with more amount of light and when there is no light incident on the photo resistor the value of resistance increases up to a megaohms. The photo resistor can be applied in a light sensitive detecting circuit (such as this project) or it can be used in the light activating or dark activating switching circuit.

The working of the photo resistor is when a beam of light is incident on the photo resistor the resistor exceeds a certain frequency, the photons absorbed by the semiconductor give rise to electrons which excites them to the conduction band. This results to free electrons and hole pairs and eventually they conduct electricity, thereby lowering the resistance. The range of the conduction band differ from one manufacture to other manufactures. And some unique photoresistor can react differently to photons with variable wavelengths.

The photo resistor can neither be an intrinsic semiconductor nor an extrinsic semiconductor due to its unique composition. These usually can’t be used in higher temperature fields due to its sensitivity and they have a latency between exposure to light and the subsequent decrease in resistance, which is around 10 milli seconds. When its darker the lag time is greater, hence making them unsuitable for flashing lights. But they are used in smoothing the response of audio signal compression.

Working of Motion Detector

First, the Op – Amp circuit acts as a comparator i.e. it compares the voltages at the inverting and non – inverting terminals and produces an output accordingly. The LDR – 10 KΩ resistor Voltage divider is connected to the non – inverting terminal of Op –Amp and a POT is connected to the inverting terminal. Assume, the LED light is placed directly in line of sight to the LDR and the light from the LED is continuously being incident on LDR.

In this situation, the resistance of LDR falls too few Ohms (or tens of Ohms) and thus, the voltage at the non – inverting terminal will be less than that at the inverting voltage. The output of the Op –Amp is low and the transistor is OFF.

If the laser light is blocked by an object from falling on the LDR (even for a small duration), the resistance of the LDR goes to few hundreds of megaohms and thus, the output of the Op –Amp will be HIGH. This will turn on the Transistor.

As the output of the transistor (that is collector) is connected to the Trigger Pin (Pin 2) of the 555 Timer IC, if the transistor is ON, the trigger pin gets a short low pulse and thus, the 0utput of the 555 becomes HIGH. This will activate the alarm by turning ON the other.

Since, the 555 Timer IC is configured as a Bi – Stable Multi vibrator, a small active low trigger pulse at the trigger pin will set its 0utput to HIGH and to reset it we need to push the reset button.

Until the reset push button is pushed, the LED will stay on hence, we can place the reset button at a secret location so that 0nly the 0wner can disable it.

Block Diagram

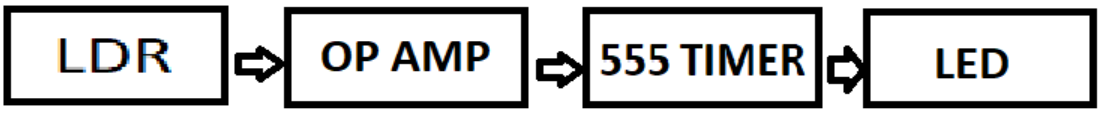

Fig 1.5

The block diagram just shows the basic working structure of the project. Here the when the LDR senses any fluctuation in the constant light source the LDR gets triggered (resistance increases) due to which the op amp sends inverted signals to the timer. In between the timer, there is a transistor which acts like a switch. Then the pin connected to the pin of the timer gets triggered hence powering on the LED.

CIRCUIT DIAGRAM

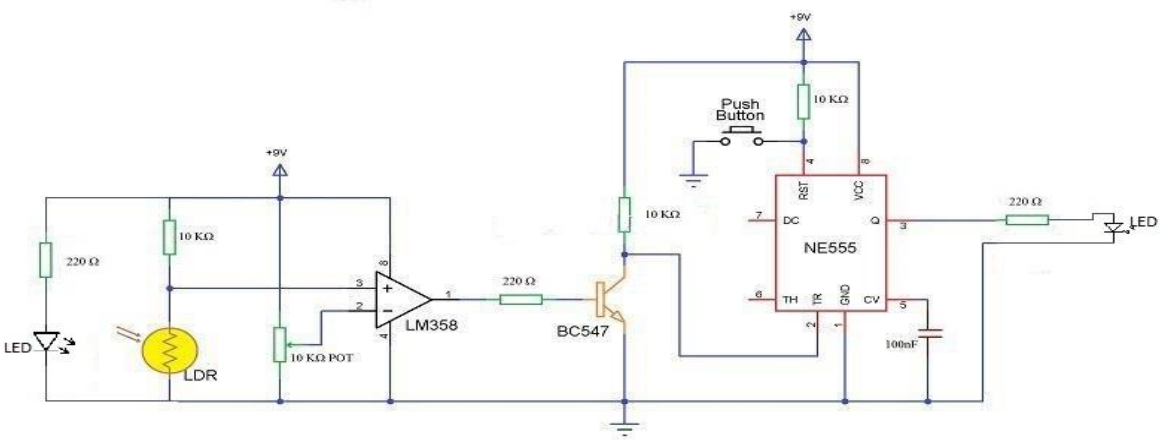

Fig 1.6

The LDR one pin is connected to the ground where as the second pin is connected to 10kilo ohms resistor and then the resistor is connected to the positive terminal of the voltage power supply. The potentio meter variable part is connected to the second pin of the OPAMP and the fixed part is connected to voltage power supply and the other is connected to the ground terminal of the power supply. The 8th pin of the OPAMP is connected to the positive 9v of the power supply and the 4th pin is connected to the ground of the power supply. The 3rd pin of the op amp is connected in parallel to the 10 kilo ohms' resistors. The 1st pin is connected to a 220 ohms' resistor in series.

The 220 ohms' resistor is then connected to the base of the BC547 transistor whereas the emitter part is connected to the ground of the power supply. The collector of the transistor is connected to the 2nd pin of the 555 timer which is the trigger pin of the timer. Also, the collector is connected to the 10 kilo ohms' resistors and then connected 9v positive terminal of the power supply.

Coming to the 555 timers 1st pin is ground pin hence it is connected to the ground terminal of the power supply and the 8th pin of the timer is connected to the positive terminal of the 9v power supply. The 4 pin is reset pin hence it connected to a switch for resetting the whole timer and then connected to 10k ohms resistor and the other pin of the resistor is connected to the positive terminal of the 9v power supply. The 7th and 6th are not connected to any source. The 5th pin of the timer is control voltage it is used to give stable power supply to the timer hence a 100nF capacitor is connected in series with the pin. The other pin of the capacitor is connected to ground terminal of the 9v power supply. The output for the timer is given at 3rd pin hence the LED is connected in series with the pin to show the output of the whole circuit.

Methodology

The main part of this light activated alarm circuit is LDR and transistor. Transistor is mainly used in switching applications. It produces the output required.

This can be operated in two modes. These two modes are off mode, on mode. In this circuit, it is operated in both modes. In this mode, no external triggering is required. One terminal which is emitter connected to the +ve terminal of battery through the led and beeper combination.

When light is strike at the LDR the transistor is remain in off mode and circuit complete through 1K resistance and LDR. When the light of laser getting break the transistor comes in on mode than led will grow and beeper rings. This is all about the laser security system.

The circuit mainly depends on the light dependent resistor for varying the sound in the circuit. These are also called photo resistors. Generally, light dependent resistors will have high resistance in darkness and it is decreased when they are illuminated with the light. The photo resistors used here are two mega ohm resistors i.e. they have resistance in the range of mega ohms in darkness.

We have one another circuit in our project it may be known is simple counter this circuit have a timer IC 555 and a counter IC and seven segment display and resistances and capacitors to make the operation of counting easy and safely. it also has a laser light which produce the beam and strike at the laser receiver and when it is interrupted by any object the display shows the no. of brake of beam so we can see that how time laser beam is broken by any object.

IC 555 and counter IC and seven segments have interface in between 40 This is all about the whole system which is capable the count the entry of threats to a secured area. The final product will be the model of "security alarm".

ADVANTAGES AND DISADVANTAGES OF MOTION DETECTOR

ADVANTAGES

1.The advantages of having a motion detector is that it can be used as a security system for home and industrial purpose

2. the motion detector can also be used as a counter, the is directly connected to the 4026-integrated circuit and every object that passes by the sensor will be counted and then after certain value the whole counting system will reset and begin from the starting.

3. It can also be used as automatic door open system with a help of infrared light, we can just alter the circuit which has 2 separate working parts one is the receiver and the other is the antenna. When someone crosses the infrared signal, or disturbs the signal the door automatically open and when the user is moved away the sensor resets and sets when it detects motion again.

4. It can also be used as automated ticket giver, when a passerby moves through the detector the ticket printing machine gets triggered and gives the passerby the ticket. This also uses the same concept as the infrared waves.

5.Not only is very easy to produce and the availability of the components is also relatively very cheap and accessible.

6. Better technologies like infrared waves can be used for much more further distances.

7. Using better components like Arduino can help all the software language to be transferred across all the devices. So, more compatibility is given to these devices.

8. The maintenance for these devices is very easy and cheap and does not require any skills to maintain.

9. The replacement parts for the device is also very cheap and cost effective and anyone can buy.

DISADVANTAGES

1.The disadvantages of the motion detector is mainly the LDR, since the LDR id very light sensitive any source of light falling on the LDR makes the whole circuit not work.

2.Due to this disadvantage people misuse this and put others into series of unfortunate events.

3. Any loose connections in the devices can lead to not working of the device.

4. Any one loose connection or improper connections can lead to shorting of the components. Especially the ne 555 is very sensitive and can easily be shorted if it is given to a higher voltage, that is more than 12v.

5. Cannot be kept in a well-lit area.

6. Due to the lag in the LDR that is milliseconds of lag will lead to slower trigger of the timer and the op amp.

CONCLUSION

The connections shown were made on the bread board and the working of the motion detector was successful.

The motion detector is one of the most unique and versatile piece of equipment as it has merits in various fields. It is used widely as it a sure proof method of detecting movement or motion of a person or thing in a specific region. Its error rate or chances of being inaccurate is also very low as it functions electronically.

The main aspect where this detector thrives is in the security field. It can provide a secure region or space for whatever our need may be. It alerts the respective people as soon as this region is breached. The analog counter will even give the count of the number of times the area was invaded. Thus, motion detectors are used in intruder alarms, automatic doors, security lighting and even in hand dryers in restrooms etc.

Therefore, in conclusion we can say that the motion detector is truly an extremely efficient mode of safety as it can provide a very secure environment and even alert those in charge if there is any trespassing or movement in that secure space.

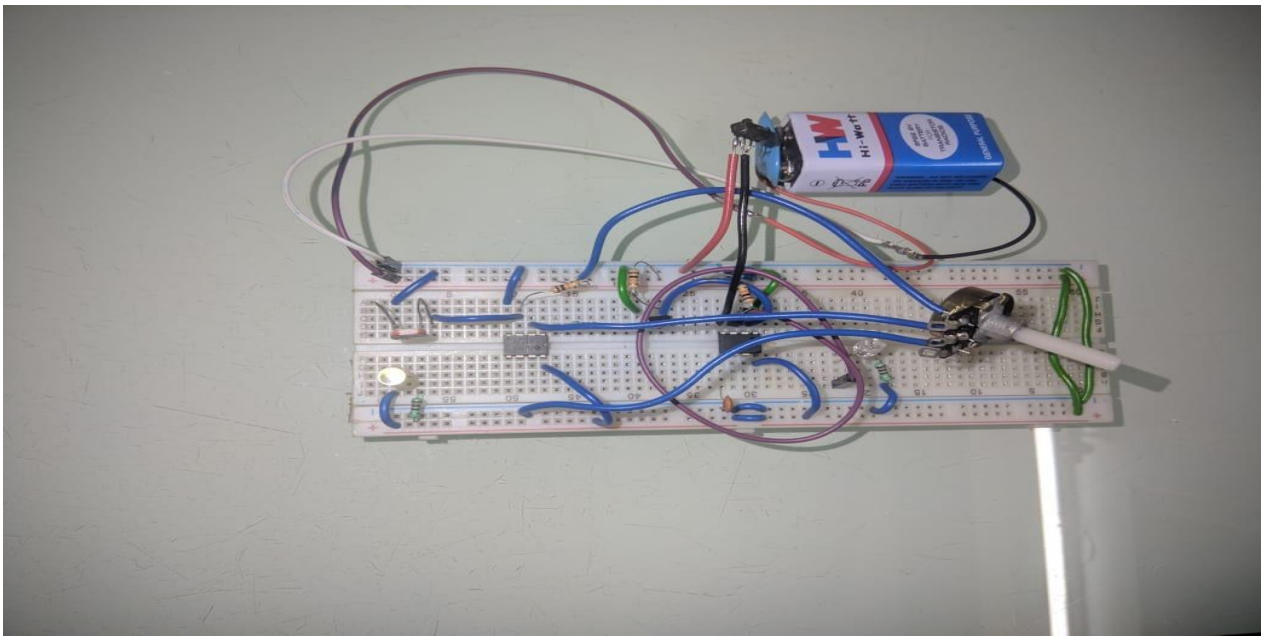

Fig 1.7

REFERENCES

For the project to be complete and successful we have taken resources from other places and they have been mentioned below.

1.www.Electronicshub.com

2. Youtube/Greatscott!!.com

3.en.wikipedia.org/wiki/555_timer_IC

4.elprocus.com/lm358-ic-pin-configuration-and-applications

5. www.theengineeringprojects.com