NSS COLLEGE OF ENGINEERING, PALAKKAD
(Affiliated to APJ Abdul Kalam Technological University)

LINEAR INTEGRATED CIRCUITS (ECT 301)

PROJECT REPORT

On

LIGHT FOLLOWER ROBOT

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ABSTRACT

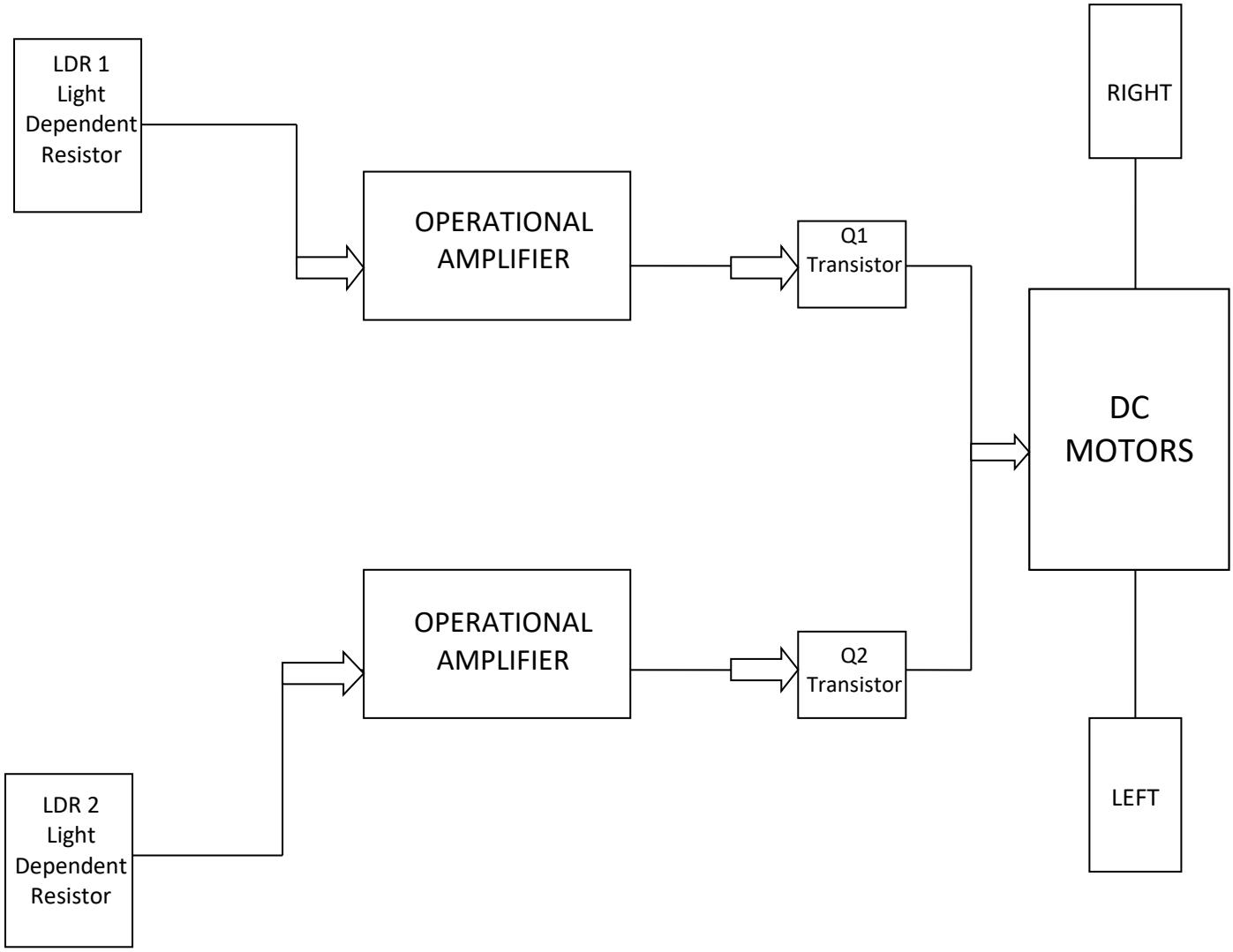
Since the beginning of the developments of modern-day robots, people are very much fascinated by them. There is innumerable number of robots in almost all the sectors in the present-day. A lot of new techniques on robotics are developed since its inception. In this project, we've build a robot that can automatically drive toward a bright light source. The robot uses a simple electronic circuit mainly consisting of operational amplifiers to track light. It has various applications such as in Street Lights, Burglar Alarms, Cameras etc..

INTRODUCTION

Light follower robot is a mobile robot which detects the light (such as the light of a flashlight) and follows it through a travelling path. The robot has two light detection sensors which are prepared with LDRs (light dependent resistors). The sensitivity of the sensors can be set by using the trim pots on each sensor circuit.

Light follower robot is activated with light. The robot moves as long as it detects the light.

BLOCK DIAGRAM



Explanation of each block

Light Dependent Resistors

A light dependent resistor, also called LDR, changes its resistive value depending on the incident light intensity. The resistance will decrease with increasing intensity and increases with decreasing intensity of incident light.

Operational Amplifiers

The op amps compare the input signal from the detectors with two extreme voltage references which constitute their thresholds. As long as the input signal level is within these reference thresholds, the output of both the op amps maintains high logic across their outputs. However, in an event the input signal tends to cross the reference thresholds, the relevant op amp output turns low, resulting in opposing outputs from the op amps.

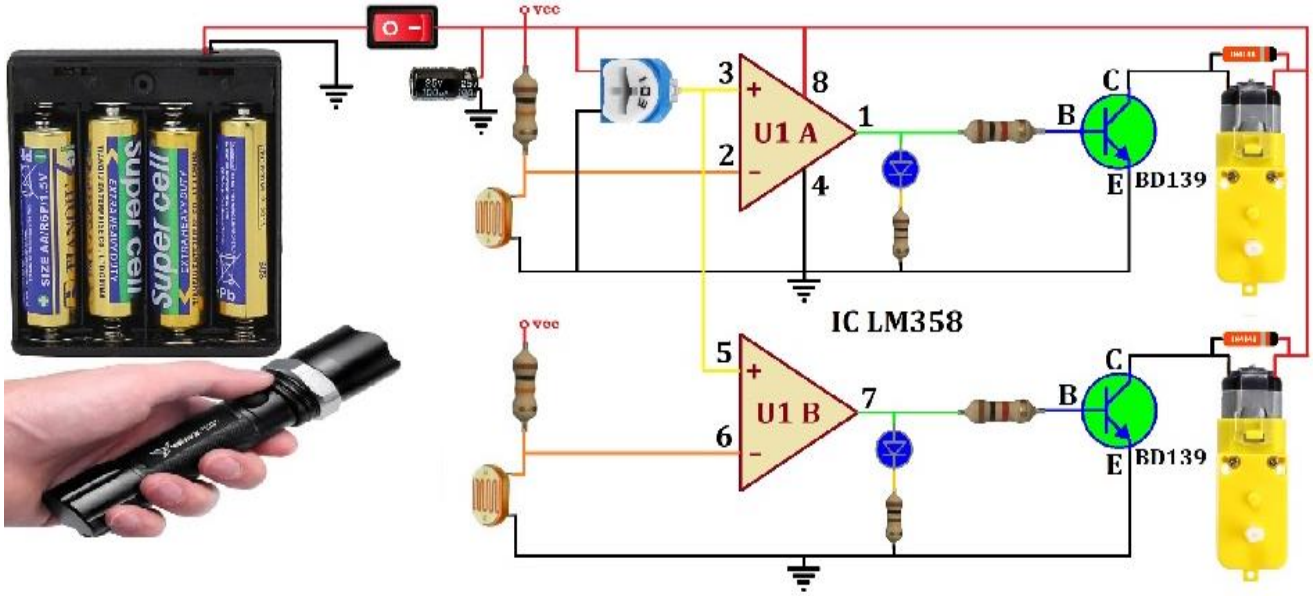
NPN Transistors

Here, we've used two BD139 transistors, which are NPN Bipolar Junction Transistors (BJTs). They are used for low power amplification and switching purposes. Here we are using this as a switch.

DC Motors

DC motors are machines that convert electrical energy to mechanical energy. The electrical energy is in the form of direct current. DC motors produce either linear force or torque in fans, conveyor belts, or any other external mechanism. The DC motor is generally designed for continuous rotation or for linear movement over a significant distance compared to its size.

Circuit Diagram



Working

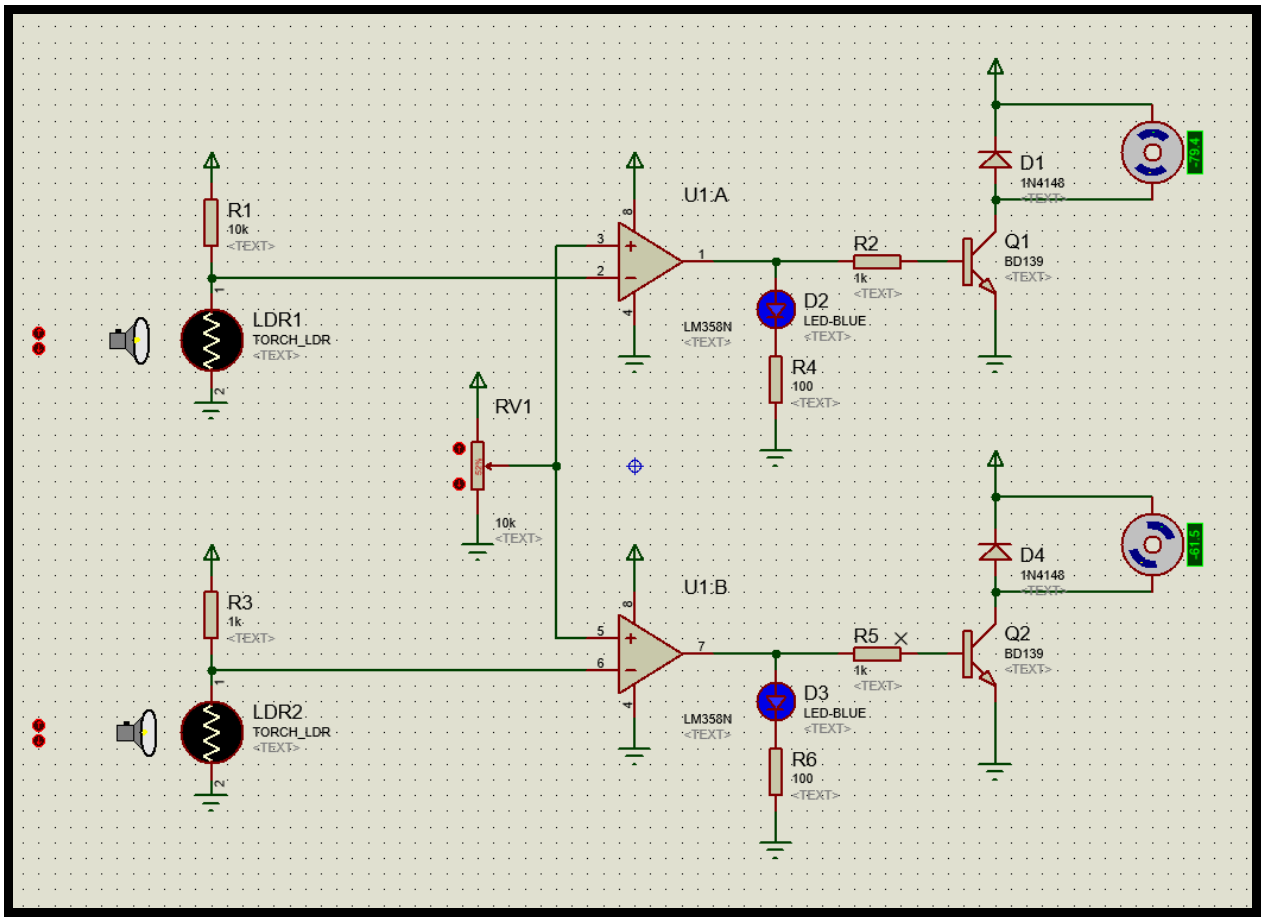
The LDRs (Light Dependent Resistor) sense the intensity of light and converts it into an analog output. This analog output is then fed to a comparator configured by the use of operational amplifiers. The comparator is used to digitize the output of the LDR.

When the output voltage of the LDR exceeds or becomes less than the small reference voltage given to the comparator, the output of the comparator switches between Vcc and ground that has been provided for the IC. In this case, it is 5V. So, in this way, we get a digital signal of 5V and 0V. The output of the module is connected to the base of the transistor and the motor is connected to the collector of the transistor so that it controls and drives the DC motor.

When the intensity of incident light increases, the output of the LDR module becomes high. Hence, the input voltage at the base of the transistor becomes high and turns the DC motor ON. Similarly, when the intensity of incident light decreases, the output of the LDR module goes low, the input voltage at the base of the transistor becomes low and turns the DC motor OFF.

When there is a turn in the path, say for example the path turns left, the left LDR module detects light, the corresponding transistor acts as short circuit and the robot turns in that direction. Similarly, when there is a right turn in the path, the exact same thing happens with the right LDR sensor module. In order to stop the vehicle, we must remove the light source.

SIMULATION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LED-BLUE
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1N4148
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Q2
BD139
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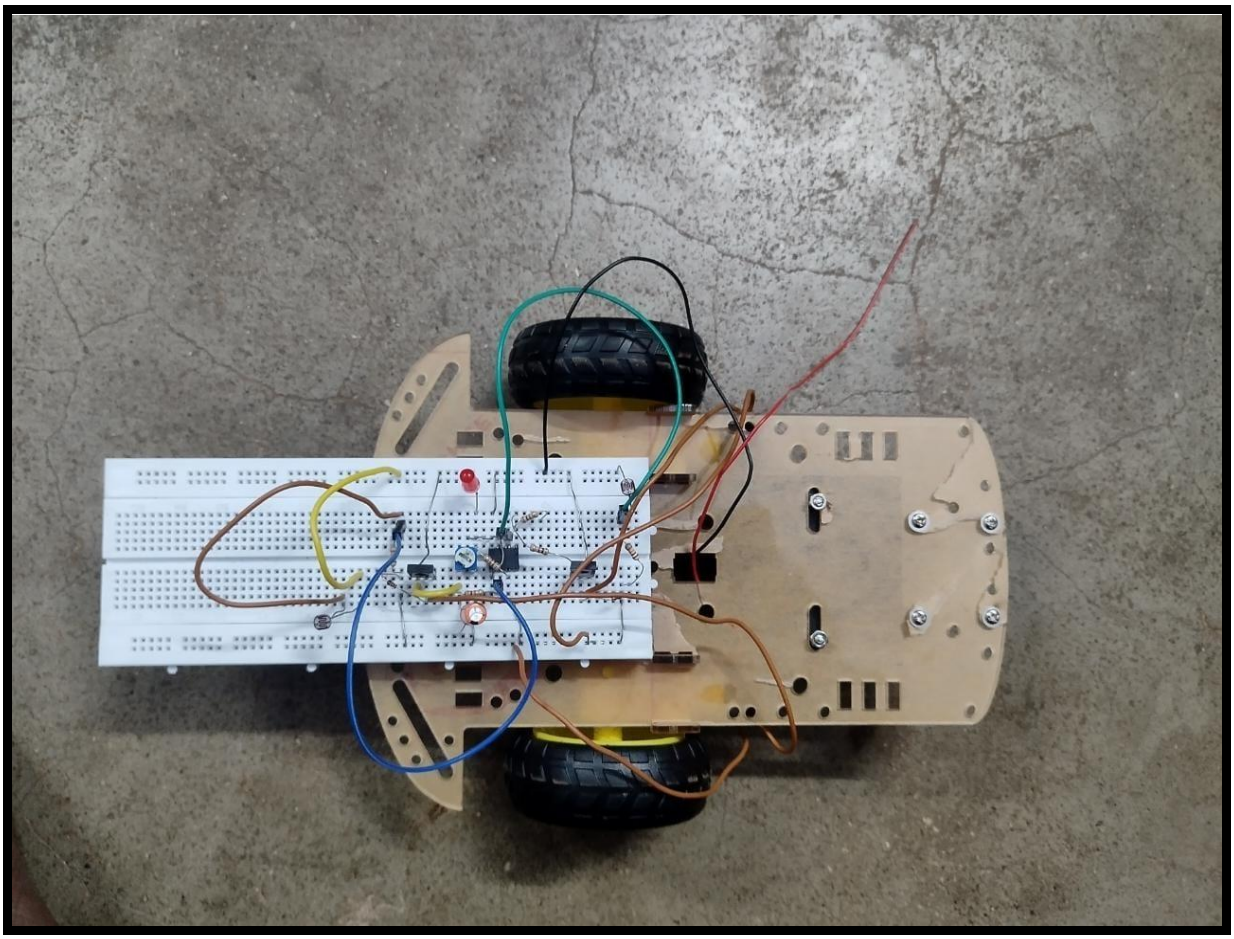
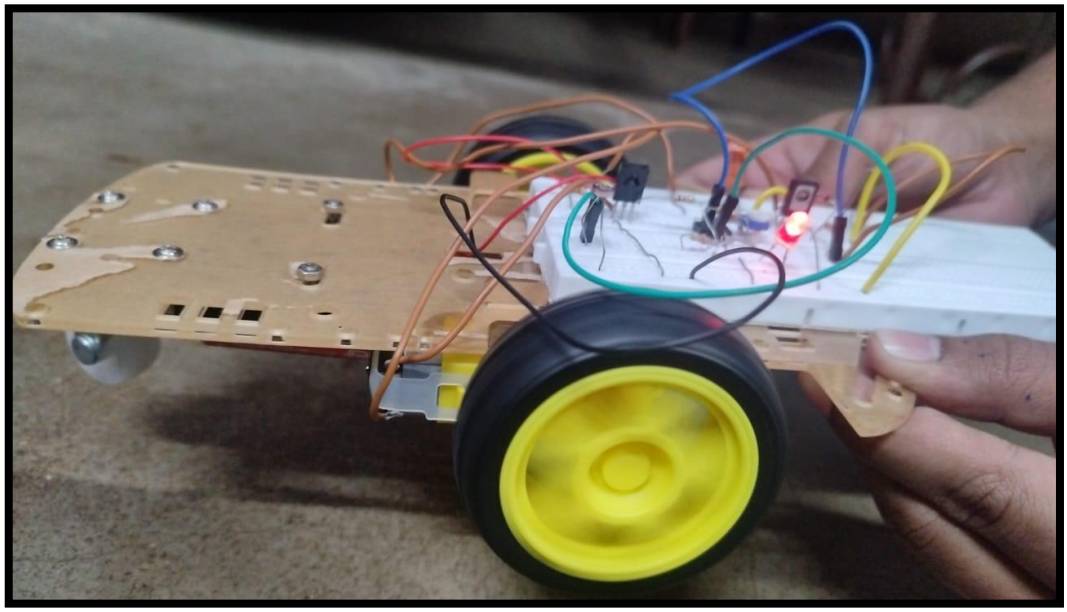
HARDWARE COMPONENTS USED

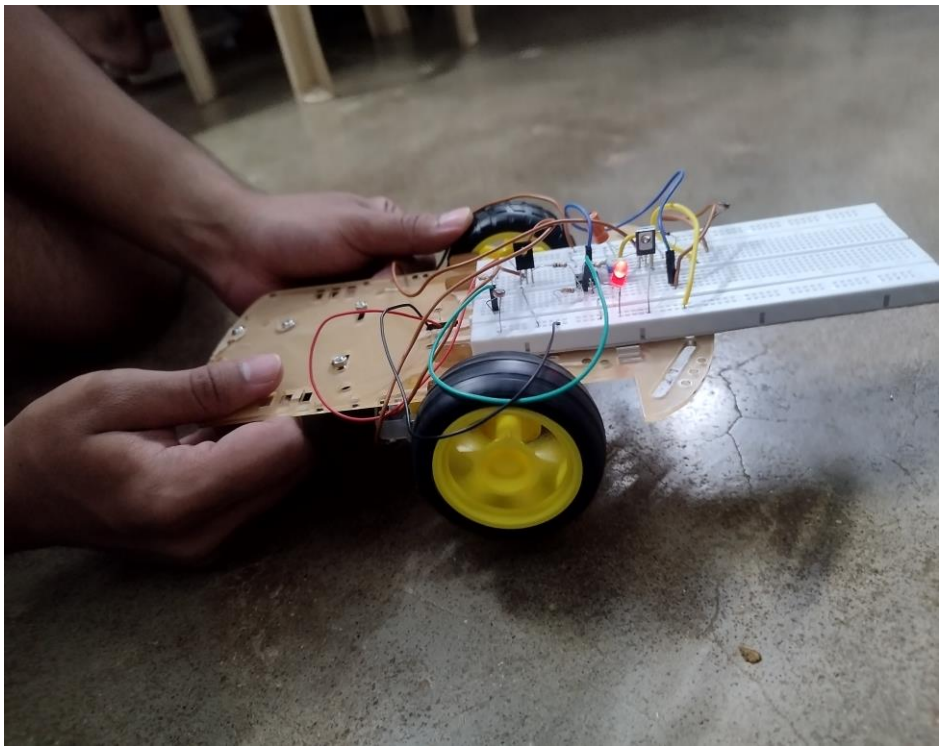
- ROBOT 3 WHEELS VEHICLE CHASSIS
- Breadboard
- LM358 Dual Operational Amplifier
- 10k Variable Resistor
- BD139 NPN Transistor x 2
- 4148 Diode x 2, LDR Sensor x 2
- 100R Resistor x 2, 10k Resistor x 2
- 1k Resistor x 2
- LED x 2
- 100uf Capacitor
- AA Battery cell x 4
- Connecting Wires

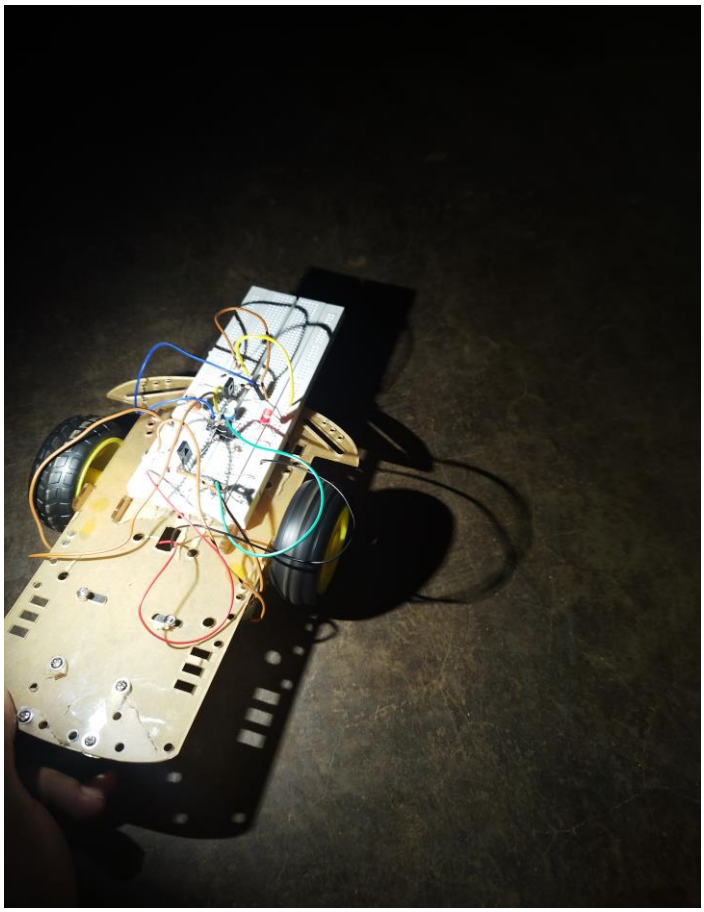
ASSEMBLY



WORKING MODEL







CONCLUSION

The circuit was designed and implemented in a successful manner. The robot could detect light and move accordingly. This project could be upgraded by adding solar panels or any other devices that capture light.