A Practical activity Report submitted

for Engineering Design Project-II (UTA-024)

by

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Submitted to

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TABLE OF CONTENT

Sr. No.	Experiment no.	Objective
1	1 (a)	To draw a schematic diagram of pulse width modulation (PWM) based transmitter for generating specified pulse width waveforms for gantries placed at different locations on the path using CAD tool (Eagle).
2	1 (b)	To design a printed circuit board layout of pulse width modulation (PWM) based transmitter circuit using CAD tool (Eagle).
3	2 (a)	To draw a schematic diagram of receiver to receive specified pulse width IR signals from gantries using CAD tool (Eagle).
4	2(b)	To design a printed circuit board layout of receiver circuit using CAD tool (Eagle).
5	3 (a)	To draw a schematic diagram of IR sensor module circuit (required to move Buggy module on a predefined the path) using CAD tool (Eagle).
6	3 (b)	To design a printed circuit board layout of IR sensor module circuit using CAD tool (Eagle).
7	4	To solder and test a pulse width modulation (PWM) based transmitter circuit (for gantries placed at different locations on the path to be followed by Buggy robot) on a printed circuit board (PCB).
8	5	To solder and test pulse width modulation (PWM) based receiver circuit (to receive IR signals from gantries connected to transmitter circuit) on a printed circuit board (PCB).
9	6	To solder and test an IR sensor module circuit (which helps Buggy robot to move on a predefined path) on a printed circuit board (PCB).

Experiment: 2

Objective:

(a) To draw a schematic diagram of IR sensor module circuit (required to move Buggy module on a predefined the path) usingCAD tool (Eagle).

(b) To design a printed circuit board layout of IR sensor module circuit using CAD tool (Eagle).

Software Used: Eagle Software

Component Used:

Sr. No	Component	Value	Specifications
1.	Resistor	330 ohm, 10k	Carbon resistor with 5% Tolerance
2.	SFH482	-	IR Transmitter LED
3.	BPX65	-	IR Receiver (Photo Diode)
4.	IC-LMV358MM	-	High Gain Operational Amplifier
5.	LED3MM	-	LED lamp
6.	PT-10	10k	Potentiometer
7.	MTA02-100	-	AMP Connector

Theory :

1. **Resistor**: A resistor is an electronic component that resists the flow of electrical current, reducing the amount of current in a circuit. It is typically made of a conductive material, such as carbon or metal, that is coated with an insulating material. The resistance of a resistor is measured in ohms and is used to control the amount of current in a circuit, to provide a voltage drop in a power supply, or to divide voltages in a circuit. Resistors are widely used in electronic circuits to stabilize voltage levels, limit current flow, and adjust signal levels.

2. **SI Unit:** Ohms(Ω)

Fig. 1.1 Various types of resistors **[1]**

3. **<u>SFH482 (IR transmitter LED)</u>:** It emits infrared light in order to send signals to other devices. It is typically a small , clear ,or translucent devices that emit the IR light in a specific frequency range. IR transmitter LEDs are commonly used in remote controls and other IR signaling devices.

Fig. 1.2 SFH482 **[2]**

4. **<u>BPX65 (Photo Diode)</u>**: A photodiode is capable to detect infrared rays. It's operated in Reverse Bias. The photodiode has very High resistance in the absence of infrared rays and becomes low when infrared rays fall on it. Also, It has two terminals, the longer one is Positive and the smaller one is negative.

Fig. 1.3 BPX65 **[3]**

5. **IC-LMV358MM**: LMV358 is a single or dual low-voltage op amp with rail-to-rail output swing. This device is a cost-effective solution for applications where low-voltage operation, space-saving, and low cost are needed. This amplifier is designed specifically for low-voltage (2.7 V to 5 V) operation.
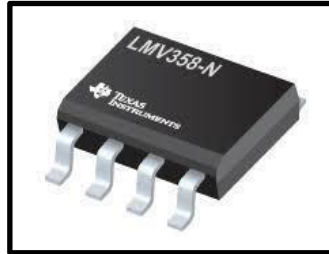
Fig. 1.4 IC-LMV358MM **[4]**

6. **LED3MM**: A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

Fig. 1.5 LED 3MM **[5]**

7. **PT-10 (Potentiometer)**: It is a resistor which doesn't have a fixed value.it is used so because we didn't know the height of the IR sensor from the board.
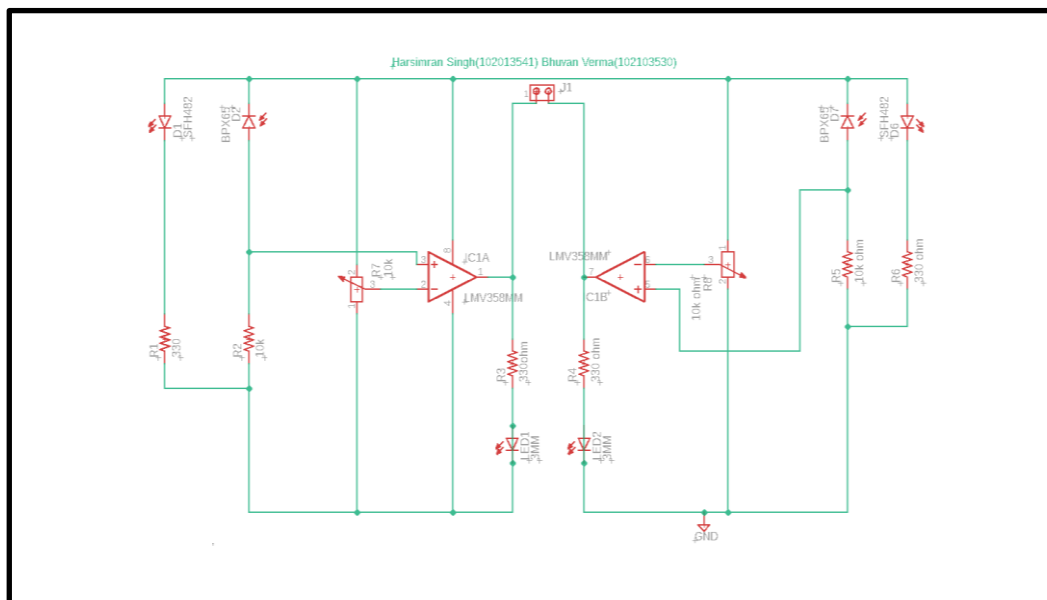
Fig. 1.6 PT-10(Potentiometer)**[6]**

8. **MTA02-100**: MTA02-100 is a connector that is used to connect wires from the PCB to the Arduino In MTA02-100, 02 signifies 2 pins. It gives the output of the Infrared circuit to the buggy which helps the buggy to know that the obstacle is there or not.
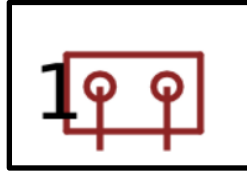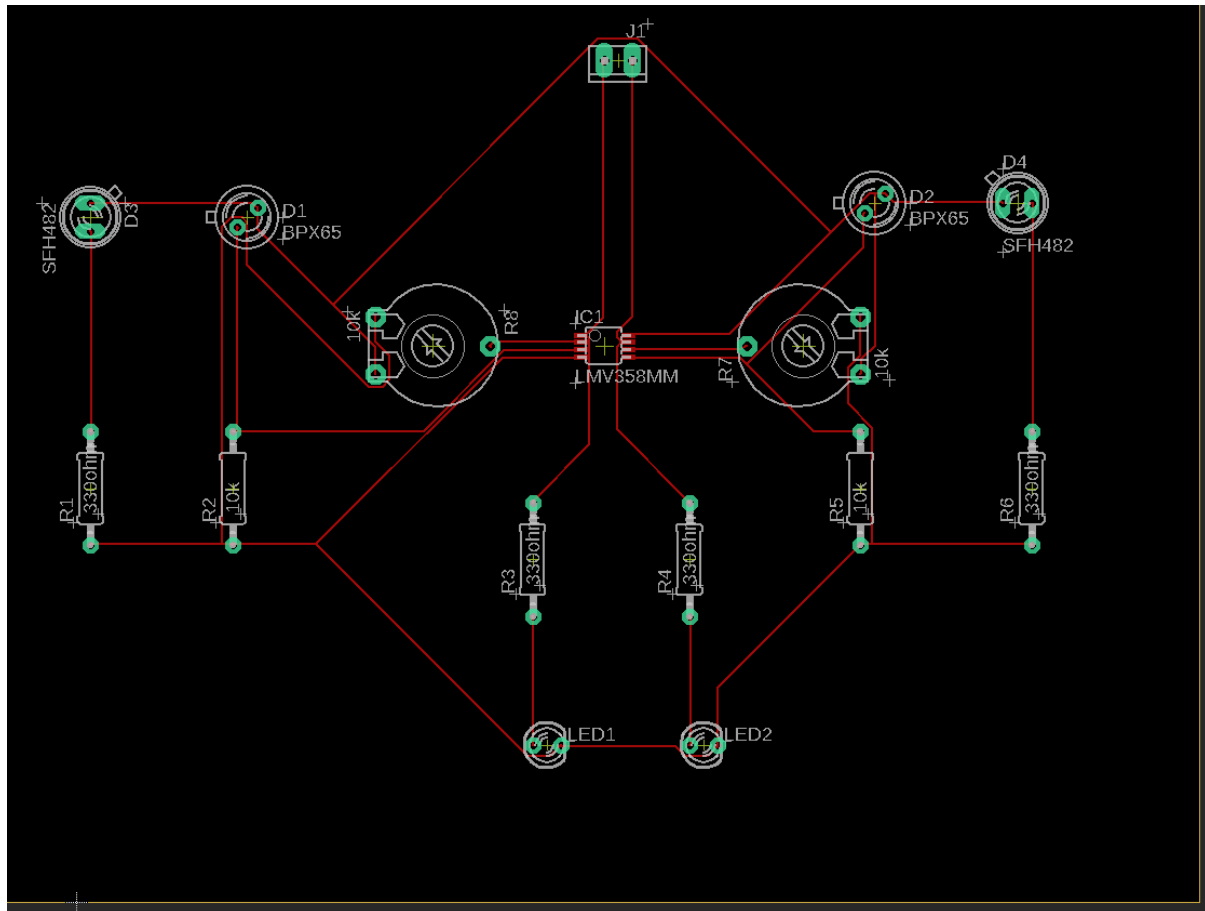

Fig. 1.7 MTA-02 100 **[7]**

Schematic diagram:

Fig. 1.8 Schematic diagram of IR Sensor Module[8]

Printed Circuit Board layout:

Fig. 1.9 PCB layout of IR Sensor Module[9]

Discussion and Working:

In this experiment, we implemented the IR sensor module on EAGLE software and learnt the working of the IR sensor module. When the IR receiver does not receive signal the potential at the inverting input goes higher than that that at non-inverting input of the comparator .Thus the output of the comparator goes low and the LED does not glow .When the IR receiver receives signal the potential at the inverting input goes low. Thus the output of the comparator goes high and the LED starts glowing.

The potentiometer in the circuit is used as a variable resistor, the value can be changed depending upon the output we need but it is preset at 10k.

Reference:

[1] https://eepower.com/resistor-guide/resistor-fundamentals/what-is-a-resistor/ -**Resistor Information**

[2] https://images.easytechjunkie.com/resistors.jpg - **Image of various resistors**

[3] Osram-Opto-SFH-482.jpg (90×90) (octopart.com)– **Image of SFH482**

[4] https://www.etechnophiles.com/wp-content/uploads/2022/08/types-of-capacitors-new-1024x623.png?ezimgfmt=ng:webp/ngcb40 - **SFH482 Information**

[5] Osram BPX65 Silicon Pin Photodiode | Rapid Online– **Image of BPX65**

[6] BPX 65 OSRAM Opto (ams OSRAM) | Sensors, Transducers | DigiKey **Information of BPX65**

[7] LMV358MM Datasheet(PDF) - National Semiconductor (TI) (alldatasheet.com)– **Informatio of IC-LMV358MM**

[8] https://www.google.com/url?sa=i&url=https%3A%2F%2Foctopart.com%2Flmv358mm-texas%2Binstruments24850534&psig=AOvVaw0QN_xhlSn2uFZgyuFJnQAq&ust=1675279032305000&source=images&cd=vfe&ved=0CA0QjRxqFwoTCPC2xYPD8vwCFQAAAAAdAAAAABAD – **Image of IC-LMV358MM**

[9] https://cdn.shopify.com/s/files/1/1490/5112/products/02760026_00_83941ed6-3ed7-4c46-aba5-9c6ca8b529bb_grande.jpg?v=1478047329 – **Image of LED3MM**

[10] LED3MM Datasheet, PDF - Alldatasheet- **Information of LED3MM**

[11] PT-10 Potentiometer - Amphenol Piher | DigiKey- **Information of PT-10 Potentiometer**

[12] https://luckyretail.com/Uploadfile/201901306/132570/132570-5.JPG - **Image of PT-10 Potentiometer**

[13] MTA-100 Series Pin (Male) 2 Position Headers & Wire Housings – Mouser - **Information of MTA02-100**

[14] https://easyeda.com/component/user/MTA02_100_10X02MTA-Zd1Aa8IGg.png - **Image of MTA02-100**

Signature of Faculty member