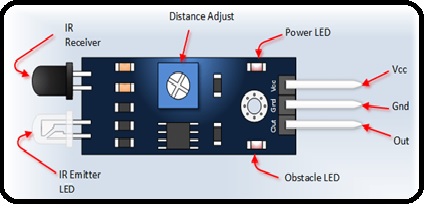
**Line following robot car**

**Introduction**

The purpose of this project is to build a Line Follower Robot with PID control. We will also use an Android device to easily setup the main control parameters for better and fast tuning.



**Components**

* Arduino nano R3
* TCRT5000 4CH Infrared sensor module
* HC-06 Bluetooth module
* LED
* 1 button
* Battery (5V each set) 2
* BreadBoard and wiring
* Wood squares and Wood wheels
* SM-S4303R Continuous Rotation 360 Degree Plastic Servo 2

**Application**

* TCRT5000 IR sensor is used in IR sensor modules
* It is used in the applications of proximity detection
* Used in maze solver robots/ [Line follower](https://www.elprocus.com/line-follower-robot-basics-controlling/)
* Used in [Obstacle avoidance](https://www.elprocus.com/obstacle-avoidance-robotic-vehicle/)/detection
* This TCRT5000 IR sensor is used to verify the existence of a physical object like noticing a coil within a coin sorting machine.
* Used to detect the color on a white or black scale and this principle is used in line following robot project. The dissimilar shades will modify the reflected IR light level.
* The TCRT5000 IR sensor is normally used to calculate the distance of the object or target.

**Objective**

During this activity ,you will help students to achieve following objectives

1. Understanding the principle and operation of TCRT5000 IR sensor
2. Design algorithm and flowchart to detect line &follow path
3. Programming TCRT5000 IR sensor module using Arduino nano
4. Interfacing TCRT5000 IR sensor module with Arduino nano

**Program**

**// Black Line Follower**

**int IR1=8; //Right sensor**

**int IR2=9; //left Sensor**

**// motor one**

**int enA = 5; //Right motor**

**int MotorAip1=2;**

**int MotorAip2=3;**

**// motor two**

**int enB = 6; //Left motor**

**int MotorBip1=4;**

**int MotorBip2=7;**

**void setup()**

**{**

**// put your setup code here, to run once:**

**pinMode(enA, OUTPUT);**

**pinMode(enB, OUTPUT);**

**pinMode(IR1,INPUT);**

**pinMode(IR2,INPUT);**

**pinMode(MotorAip1,OUTPUT);**

**pinMode(MotorAip2,OUTPUT);**

**pinMode(MotorBip1,OUTPUT);**

**pinMode(MotorBip2,OUTPUT);**

**}**

**void loop()**

**{**

**if(digitalRead(IR1)==HIGH && digitalRead(IR2)==HIGH) //IR will not glow on black line**

**{**

**//Stop both Motors**

**digitalWrite(MotorAip1,LOW);**

**digitalWrite(MotorAip2,LOW);**

**digitalWrite(MotorBip1,LOW);**

**digitalWrite(MotorBip2,LOW);**

**analogWrite (enA, 0);**

**analogWrite (enB, 0);**

**}**

**else if(digitalRead(IR1)==LOW && digitalRead(IR2)==LOW) //IR not on black line**

**{**

**//Move both the Motors**

**digitalWrite(MotorAip1,HIGH);**

**digitalWrite(MotorAip2,LOW);**

**digitalWrite(MotorBip1,HIGH);**

**digitalWrite(MotorBip2,LOW);**

**analogWrite (enA, 200);**

**analogWrite (enB, 200);**

**}**

**else if(digitalRead(IR1)==LOW && digitalRead(IR2)==HIGH)**

**{**

**//Tilt robot towards left by stopping the left wheel and moving the right one**

**digitalWrite(MotorAip1,HIGH);**

**digitalWrite(MotorAip2,LOW);**

**digitalWrite(MotorBip1,LOW);**

**digitalWrite(MotorBip2,HIGH);**

**analogWrite (enA, 200);**

**analogWrite (enB, 150);**

**delay(100);**

**}**

**else if(digitalRead(IR1)==HIGH && digitalRead(IR2)==LOW)**

**{**

**//Tilt robot towards right by stopping the right wheel and moving the left one**

**digitalWrite(MotorAip1,LOW); // If I want to turn right then the speed of the right wheel should be less than that of the left wheel, here, let a be the right wheel**

**digitalWrite(MotorAip2,HIGH);**

**digitalWrite(MotorBip1,HIGH);**

**digitalWrite(MotorBip2,LOW);**

**analogWrite (enA, 150);**

**analogWrite (enB, 200);**

**delay(100);**

**}**

**else**

**{**

**//Stop both the motors**

**digitalWrite(MotorAip1,LOW);**

**digitalWrite(MotorAip2,LOW);**

**digitalWrite(MotorBip1,LOW);**

**digitalWrite(MotorBip2,LOW);**

**analogWrite (enA, 0);**

**analogWrite (enB, 0);**

**}**

**}**

**Hardware**

1. Connect the Battery to be used with servos: Left one of lateral power grid exclusively for servos source
2. Connect the Arduino Nano to the breadboard
3. Connect the GND of Power Grid to Arduino GND.
4. Connect the Servos to Arduino: LEFT ==> Pin 5; RIGHT ==> Pin 3
5. Connect the LED to Arduino Pin 13
6. Connect the button to Arduino Pin 9
7. An external LED is add to pin13, for signalization and test purposes
8. Also a button is connected to pin 9. This button is very useful for test purposes and for robot's start.
9. The Bluetooth module HC-06 should be installed at breadboard as

Tx Pin to Arduino pin 10 (Rx)

RX Pin to Arduino pin 11 (Tx)

VCC/GND to Arduino 5V/GND

