**ARDUINO LAB**

**MANUAL**

**LAB 7: AUTOMATIC ROBOT**

# Introduction

In this exercise, the robot is programmed to follows black line automatically. In the previous exercise, the values in white and black zone are measured. In this exercise, a compared value is predefined as follows: when the sensor value is higher than this value, the robot is in the white zone, in a contrast, when the sensor value is lower than this value, the robot is in the black zone.

In my measurements, the values are very different. In black zone the sensor value is less than 5 while in the white zone, this value is 1000. Therefore, a predefined value is set to 500 to distinguish between black and white.

Firstly, some constants are defined at the top of the program. Then, an **if else** statement is used to compare the sensor value to the predefined value to decide the sensor is in black or white zone. The program is proposed as follows:

#define WHITE\_ZONE 0

#define BLACK\_ZONE 1

#**define** COMPARED\_LEFT 500

**int** left\_sensor\_value;

**int** left\_sensor\_zone;

void **setup**() {

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

**Serial**.**begin**(9600);

}

void **loop**() {

// put your main code here, to run repeatedly:

left\_sensor\_value = analogRead(A5);

if(left\_sensor\_value < COMPARED\_LEFT)

left\_sensor\_zone = BLACK\_ZONE;

else

left\_sensor\_zone = WHITE\_ZONE;

Serial.println(left\_sensor\_zone);

delay(1000);

}

In the program, the value left\_sensor\_zone are sent to the serial monitor to check the detection process is correct or not.

# Exercise

1. Implement the same program to detect the white and black zone for right sensor.

**#define WHITE\_ZONE 0**

**#define BLACK\_ZONE 1**

**#define COMPARED\_RIGHT 500**

**int right\_sensor\_value;**

**int right\_sensor\_zone;**

**void setup()**

**{**

**pinMode(A0,INPUT);**

**Serial.begin(9600);**

**}**

**void loop()**

**{**

**right\_sensor\_value = analogRead(A0);**

**if(right\_sensor\_value < COMPARED\_RIGHT)**

**right\_sensor\_zone = BLACK\_ZONE;**

**else**

**right\_sensor\_zone = WHITE\_ZONE;**

**Serial.println(right\_sensor\_zone);**

**delay(1000);**

**}**

1. Checking two values left\_sensor\_zone and right\_sensor\_zone to make the robot as follows: if the left sensor is in the black zone, turn the robot slightly to the left. Meanwhile, if the right sensor is in the black zone, turn the robot slightly to the right. You can re-use the speed() function in Lab 2 for this lab. Please check the mechanics of the robot, and make sure that in the best condition, both sensors are in white zone. A suggested program is presented following:

if(left\_sensor\_zone == BLACK\_ZONE){

speed(60, 80);

}

else if (right\_sensor\_zone == BLACK\_ZONE){

speed(80,60);

}

else{

speed(50, 50)

}

**Solution:**

**void setup()**

**{**

**pinMode(8,OUTPUT);**

**pinMode(11,OUTPUT);**

**pinMode(9,OUTPUT);**

**pinMode(12,OUTPUT);**

**pinMode(13,OUTPUT);**

**pinMode(10,OUTPUT);**

**pinMode(A5,INPUT);**

**pinMode(A0,INPUT);**

**}**

**void speed(int speed\_left,int speed\_right)**

**{**

**if (speed\_left < 0)**

**{**

**digitalWrite(11,LOW);**

**digitalWrite(8,HIGH);**

**analogWrite(9,abs(speed\_left));**

**}**

**else**

**{**

**if(speed\_left==0)**

**{**

**digitalWrite(11,LOW);**

**digitalWrite(8,LOW);**

**}**

**else**

**{**

**digitalWrite(11,HIGH);**

**digitalWrite(8,LOW);**

**analogWrite(9,abs(speed\_left));**

**}**

**}**

**if (speed\_right < 0)**

**{**

**digitalWrite(13,LOW);**

**digitalWrite(12,HIGH);**

**analogWrite(10,abs(speed\_right));**

**}**

**else**

**{**

**if(speed\_right==0)**

**{**

**digitalWrite(13,LOW);**

**digitalWrite(12,LOW);**

**}**

**else**

**{**

**digitalWrite(13,HIGH);**

**digitalWrite(12,LOW);**

**analogWrite(10,abs(speed\_right));**

**}**

**}**

**}**

**void turn\_left()**

**{**

**speed(40,80);**

**}**

**void turn\_right()**

**{**

**speed(80,40);**

**}**

**void go\_ahead()**

**{**

**speed(80,80);**

**}**

**void loop()**

**{**

**int sensor\_left = analogRead(A5);**

**int sensor\_right = analogRead(A0);**

**if (sensor\_left > 500 && sensor\_right > 500) go\_ahead();**

**else if (sensor\_left <= 500 && sensor\_right > 500) turn\_right();**

**else if (sensor\_right <= 500 && sensor\_left > 500) turn\_left();**

**else if (sensor\_right <= 500 && sensor\_left <= 500) speed(-80,-80);**

**delay(5);**

**}**