SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Programming, Apps & Robotics

Year 3-4

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TunnelCore
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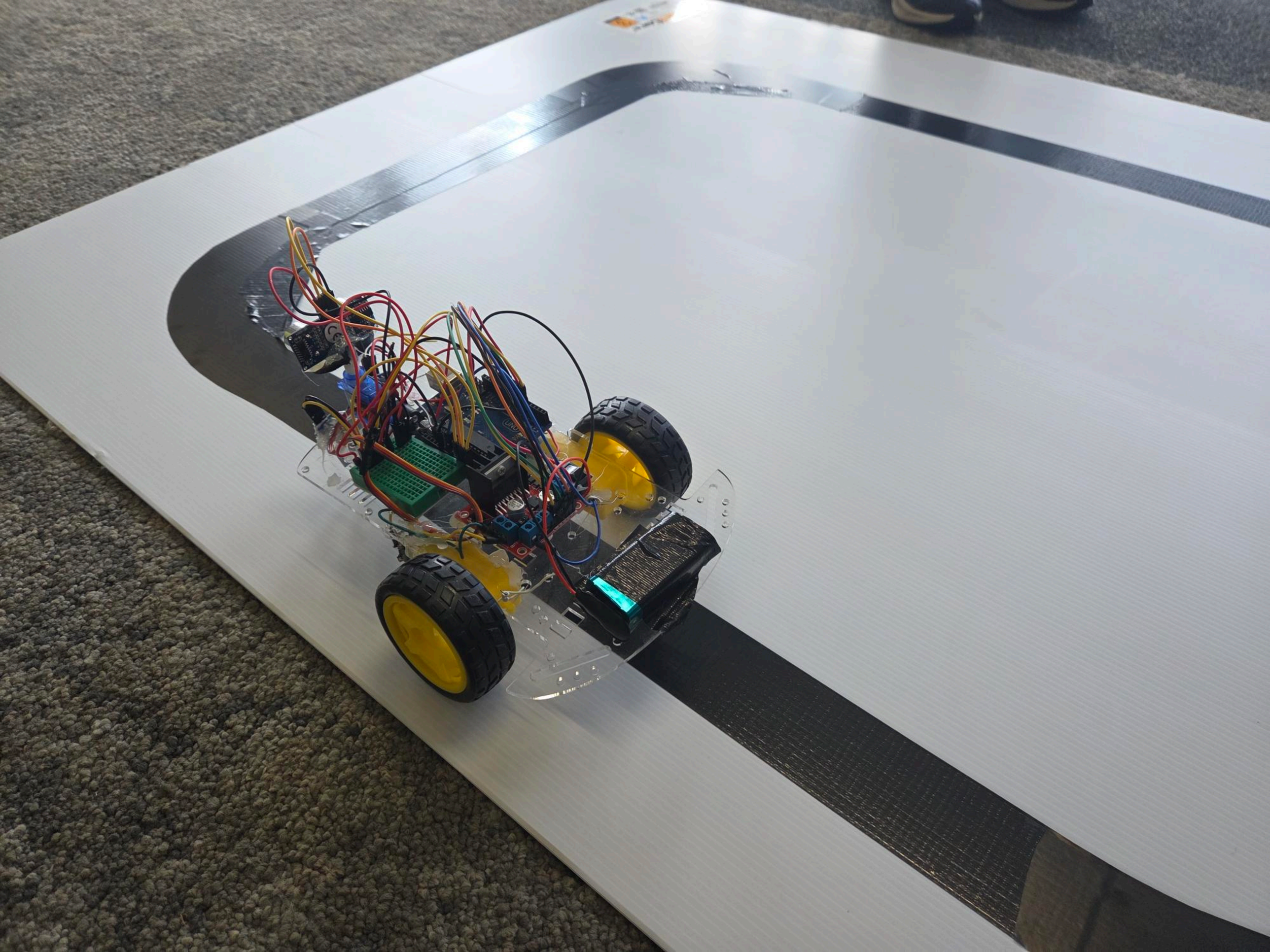


Line Following Robot

Aim of Project

The aim of this project is to create a robot that follows a line. It could be used to:

- transport items from the back of the warehouse to the front of the warehouse.
- transport from the kitchen to the table in a restaurant.
- transport and give the luggage from the bagging area in the airport and give it to the owner.
- you can give an order to the robot at the library, and it will give the book to you.

Type of computer / device required to run the program

The code was created using C++ and the program is designed to run with Arduino boards and attachments.

Here is a link to Youtube explaining how the project works and how it's done.

https://www.youtube.com/watch?v=tvuwN6E5vtk

Program code

```
#define enA 5//Enable1 L298 Pin enA

#define in1 7 //Motor1  L298 Pin in1

#define in2 8 //Motor1  L298 Pin in1

#define in3 9 //Motor2  L298 Pin in1

#define in4 10 //Motor2  L298 Pin in1

#define enB 6 //Enable2 L298 Pin enB


#define L_S A3 //ir sensor Left
```

```
#define R_S A4 //ir sensor Right

#define echo A2    //Echo pin
#define trigger A1 //Trigger pin

#define servo 13

int Set=10; //minimum obtace distance
int distance_L, distance_F, distance_R;

void setup(){ // put your setup code here, to run once

Serial.begin(9600); // start serial communication at 9600bps

pinMode(R_S, INPUT); // declare if sensor as input
pinMode(L_S, INPUT); // declare ir sensor as input

pinMode(echo, INPUT );// declare ultrasonic sensor Echo pin as input
pinMode(trigger, OUTPUT); // declare ultrasonic sensor Trigger pin as Output

pinMode(enA, OUTPUT); // declare as output for L298 Pin enA
pinMode(in1, OUTPUT); // declare as output for L298 Pin in1
pinMode(in2, OUTPUT); // declare as output for L298 Pin in2
pinMode(in3, OUTPUT); // declare as output for L298 Pin in3
pinMode(in4, OUTPUT); // declare as output for L298 Pin in4
pinMode(enB, OUTPUT); // declare as output for L298 Pin enB

analogWrite(enA, 100); // Write The Duty Cycle 0 to 255 Enable Pin A for Motor1 Speed
analogWrite(enB, 100); // Write The Duty Cycle 0 to 255 Enable Pin B for Motor2 Speed
```

```
pinMode(servo, OUTPUT);
//Trurning Right
 for (int angle = 70; angle <= 140; angle += 5)  {
   servoPulse(servo, angle);  }
   //Trurning all the way left from right
 for (int angle = 140; angle >= 0; angle -= 5)  {
   servoPulse(servo, angle);  }
//Coming Back to Center(70 degrees)
 for (int angle = 0; angle <= 70; angle += 5)  {
   servoPulse(servo, angle);  }

distance_F = Ultrasonic_read();

delay(500);
}



void loop(){
//=============================================
//    Line Follower and Obstacle Avoiding
//=============================================

distance_F = Ultrasonic_read();
Serial.print("D F=");Serial.println(distance_F);



//if Right Sensor and Left Sensor are at White color then it will call forword function
 if((digitalRead(R_S) == 1)&&(digitalRead(L_S) == 1)){
```

```
 if(distance_F > Set){forword();}
            else{Check_side();}
}

//if Right Sensor is Black and Left Sensor is White then it will call turn Right function
else if((digitalRead(R_S) == 1)&&(digitalRead(L_S) == 0)){turnRight();}

//if Right Sensor is White and Left Sensor is Black then it will call turn Left function
else if((digitalRead(R_S) == 0)&&(digitalRead(L_S) == 1)){turnLeft();}

//if Right Sensor is Black and Left Sensor is Black then it will call turn Stop function
else if((digitalRead(R_S) == 1)&&(digitalRead(L_S) == 1)){forword();}

delay(10);
}

void servoPulse (int pin, int angle){
int pwm = (angle*11) + 500;     // Convert angle to microseconds
 digitalWrite(pin, HIGH);
 delayMicroseconds(pwm);
 digitalWrite(pin, LOW);
 delay(50); // Refresh cycle of servo
}


//**********************Ultrasonic_read*****************************
long Ultrasonic_read(){
  digitalWrite(trigger, LOW);
  delayMicroseconds(2);
```

```
 digitalWrite(trigger, HIGH);
 delayMicroseconds(10);
 long time = pulseIn (echo, HIGH);
 //Based on the speed of sound in Air per centemeter calculating distance to the obstacle total time to hit the object and come back / 2
 return time / 29 / 2;
}

void compareDistance(){
 if(distance_R > distance_L ){
  Serial.print("D R In TurningR=");Serial.println(distance_R);
  Serial.print("D L In TurningR=");Serial.println(distance_L);
  delay(100);
 //turnRight();
 turnLeft();
 delay(300);
 forword();
 forword();
 delay(700);
 turnLeft();
 //turnRight();
 delay(500);
 forword();
 forword();
 }
 else  if(distance_R < distance_L ){
 Serial.print("D L In TurningL=");Serial.println(distance_L);
 Serial.print("D R In TurningL=");Serial.println(distance_R);
  //turnLeft();
  turnRight();
```

```
 delay(200);
 forword();
 forword();
 //turnRight();
 turnLeft();
 delay(500);
 forword();
 forword();


 }
}

void Check_side(){
   Stop();
   delay(100);
 for (int angle = 70; angle <= 140; angle += 5)  { //turn left
  servoPulse(servo, angle);  }
   delay(300);
  // if(angle >100) {
   distance_L = Ultrasonic_read();

   Serial.print("D L=");
   Serial.println(distance_L);
   delay(100);
  // }
  for (int angle = 140; angle >= 0; angle -= 5)  { //turn right
  servoPulse(servo, angle);  }
   delay(500);
```

```
   //if(angle < 100)  {
   distance_R = Ultrasonic_read();
   Serial.print("D R=");Serial.println(distance_R);
   delay(100);
  // }
 for (int angle = 0; angle <= 70; angle += 5)  {
  servoPulse(servo, angle);  }
   delay(300);
   compareDistance();
}

void forword(){  //forword
digitalWrite(in1, LOW); //Left Motor backword Pin
digitalWrite(in2, HIGH); //Left Motor forword Pin
digitalWrite(in3, HIGH); //Right Motor forword Pin
digitalWrite(in4, LOW); //Right Motor backword Pin
}

void turnRight(){ //turnRight
digitalWrite(in1, LOW); //Left Motor backword Pin
digitalWrite(in2, HIGH); //Left Motor forword Pin
digitalWrite(in3, LOW); //Right Motor forword Pin
digitalWrite(in4, HIGH); //Right Motor backword Pin
}

void turnLeft(){ //turnLeft
digitalWrite(in1, HIGH); //Left Motor backword Pin
digitalWrite(in2, LOW); //Left Motor forword Pin
digitalWrite(in3, HIGH); //Right Motor forword Pin
```

digitalWrite(in4, LOW); //Right Motor backword Pin

}

void Stop(){ //stop

digitalWrite(in1, LOW); //Left Motor backword Pin

digitalWrite(in2, LOW); //Left Motor forword Pin

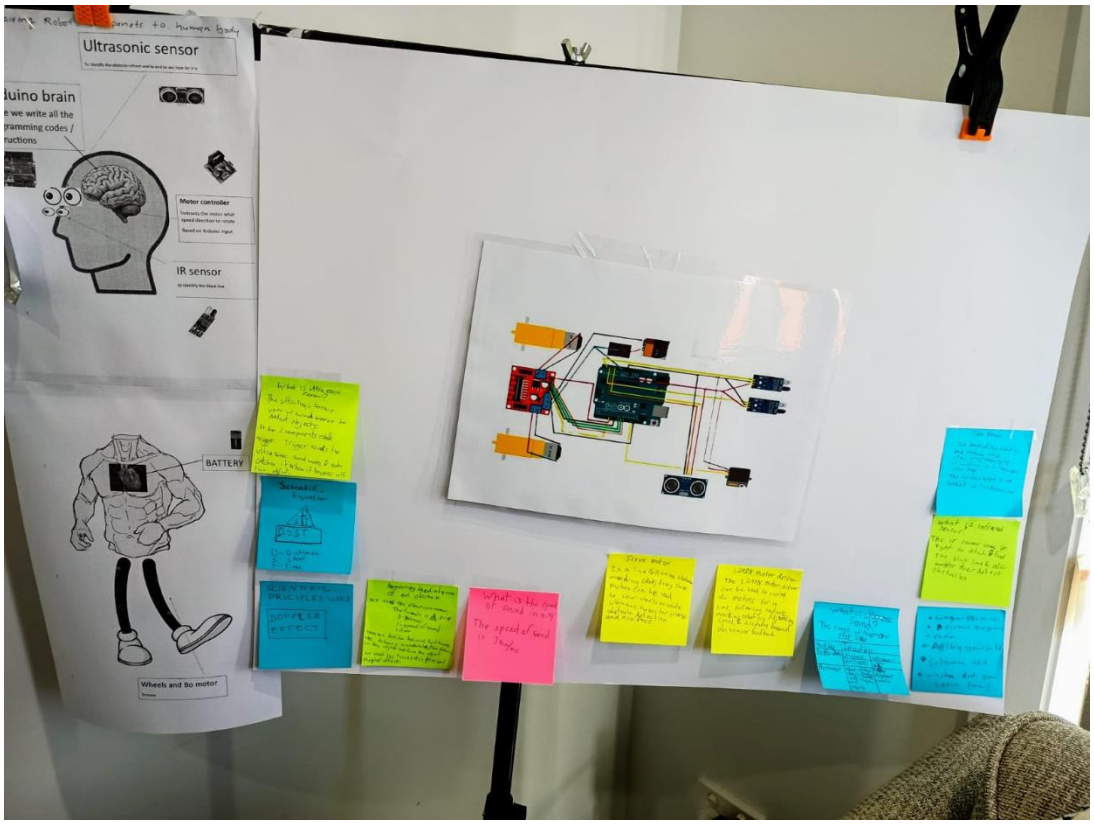
digitalWrite(in3, LOW); //Right Motor forword Pin

digitalWrite(in4, LOW); //Right Motor backword Pin

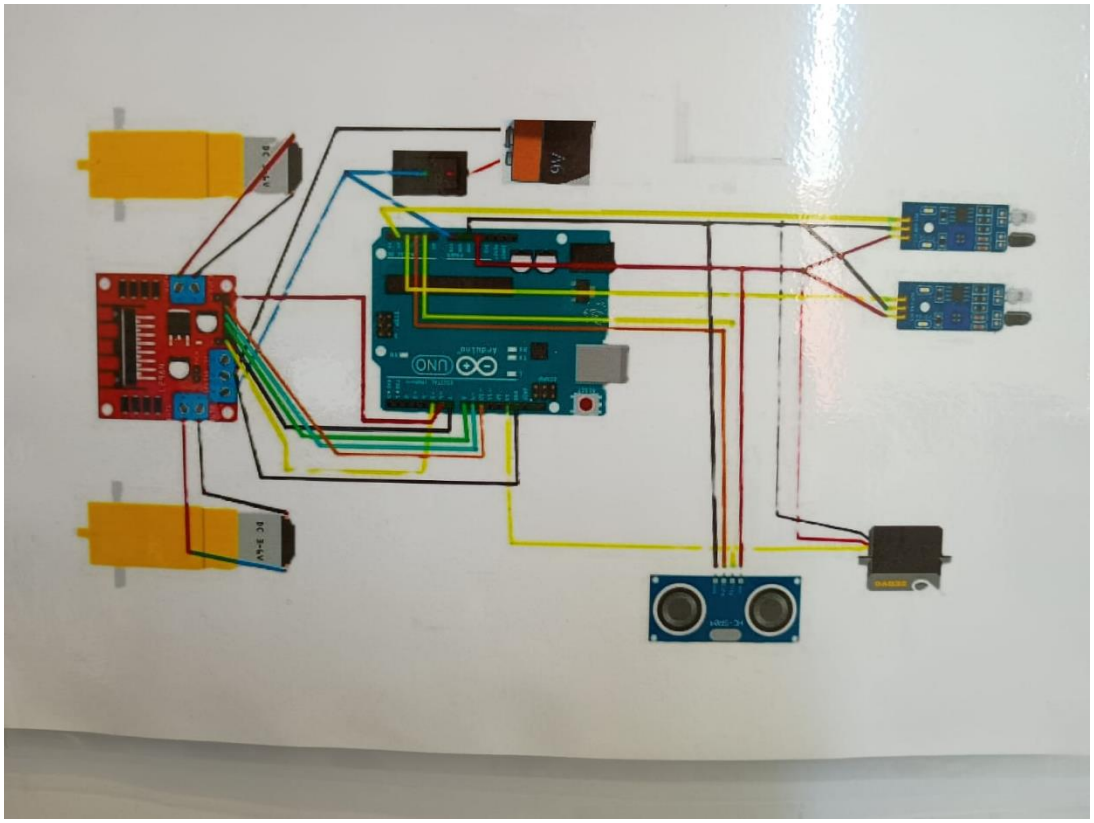
<u>Acknowledgements</u>

My Dad help with the code and debugging, the rest of his work was done by watching Youtube and other related articles.

* Photo of the project summary board



* Circuit Diagram



Bibliography:

I used coding for kids 2023 SRILANKAN ENGINEERING IN SOUTH AUSTRALIA booklet

YouTube link:

FY25Q2 Acrobat au en ROITheJourney MetaYT 1920x1080

D=ST:Bing Videos

Tutorials | Arduino Documentation

How Do Infrared Sensors Work? #electronics #iot #engineering

How to use the L298N Motor Driver with Arduino - Quick Tutorial - YouTube

L298n Dual H-Bridge Motor Driver : DC Motors : PWM : Stepper Motors : Eye-On-Stuff

HC-SR04 Ultrasonic Distance Sensor and Arduino (Lesson #9)

2023 Arduino Tutorial for Beginners 01 - Introduction