

# Precision Farming Using Autonomous Vehicle

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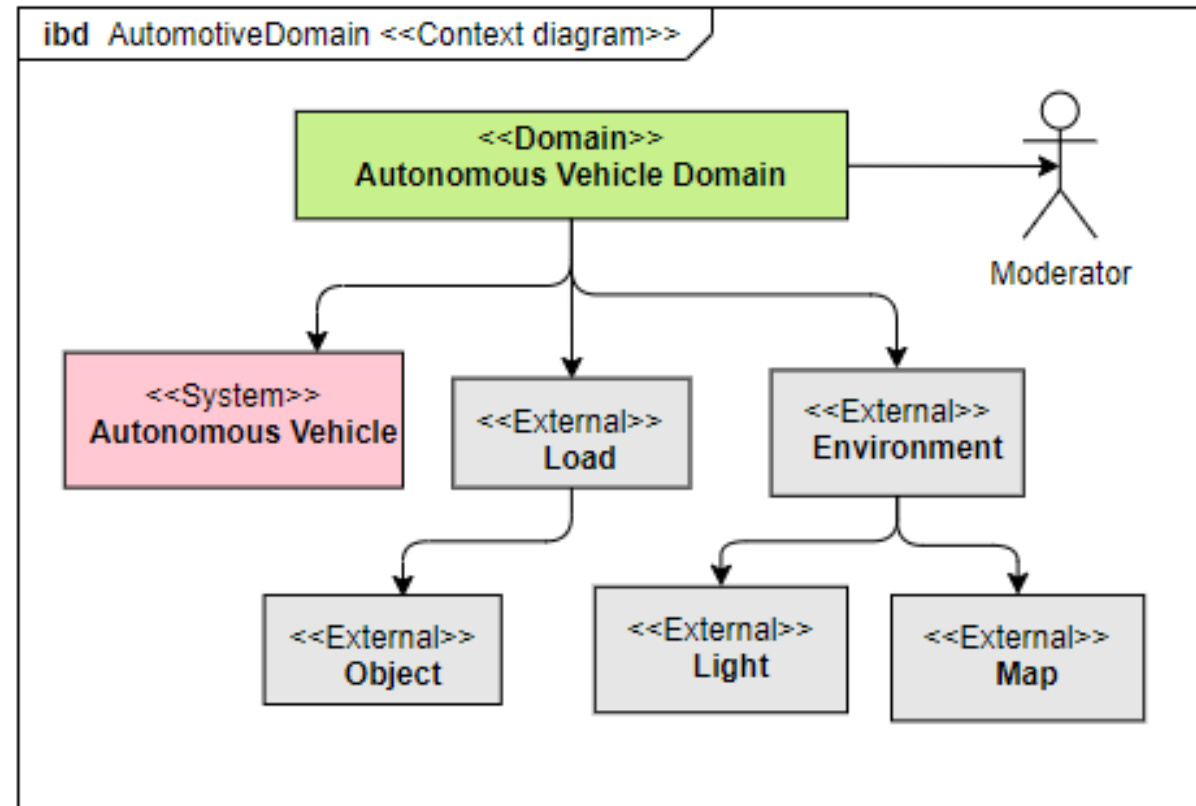


[1]

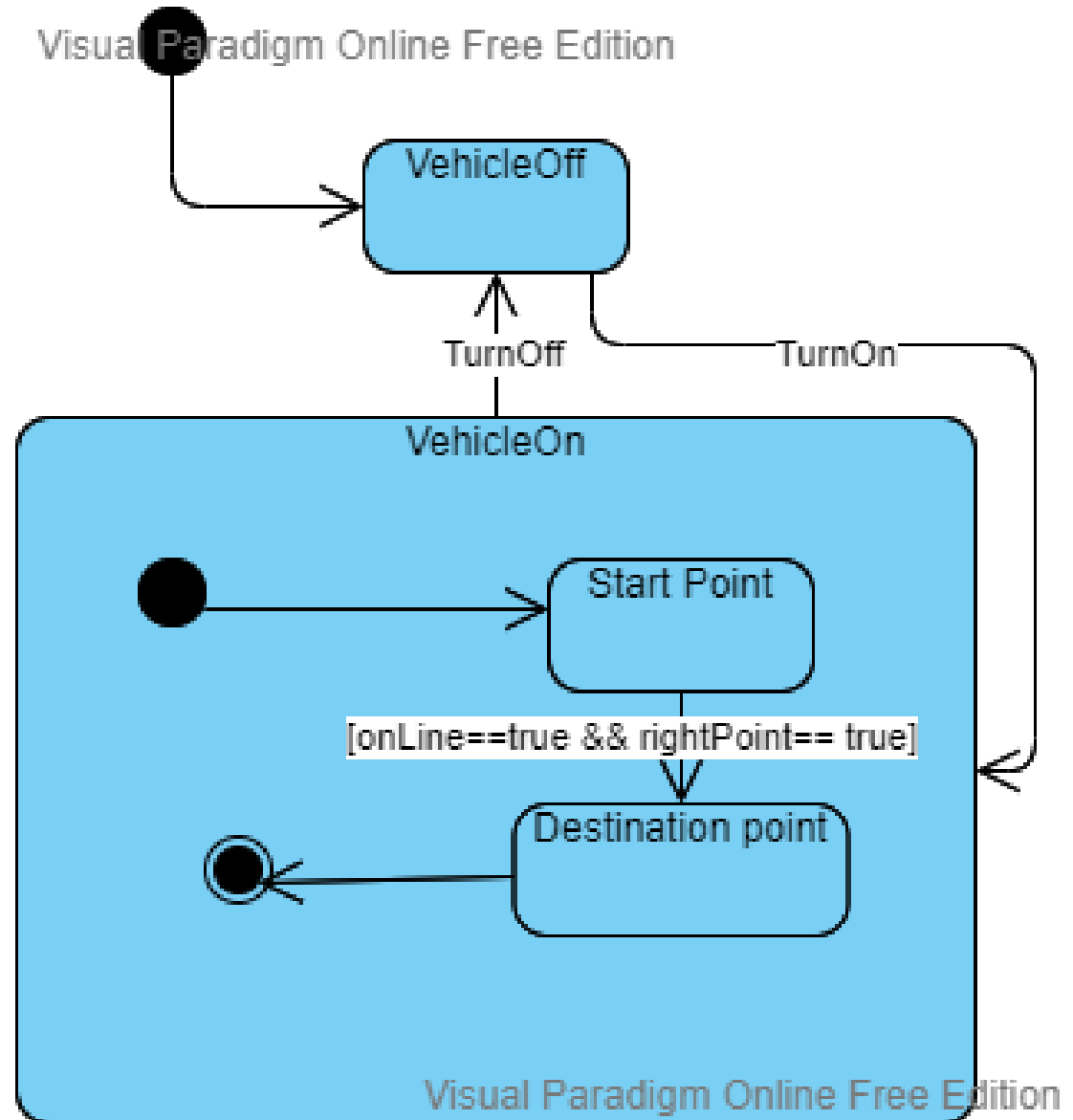
# The Software Modelling

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# Context Diagram

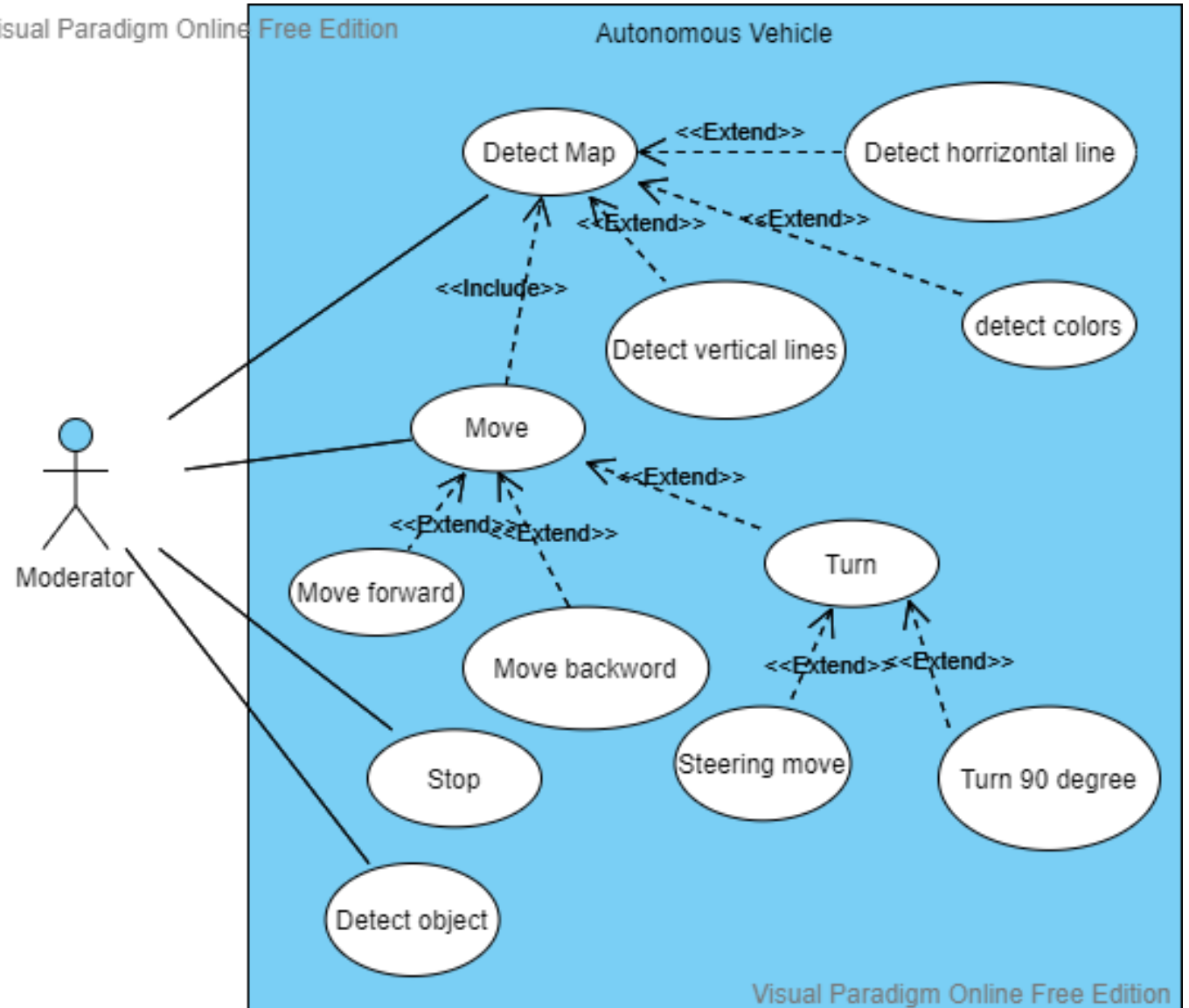


# State Machine Diagram



# Use Case Diagram

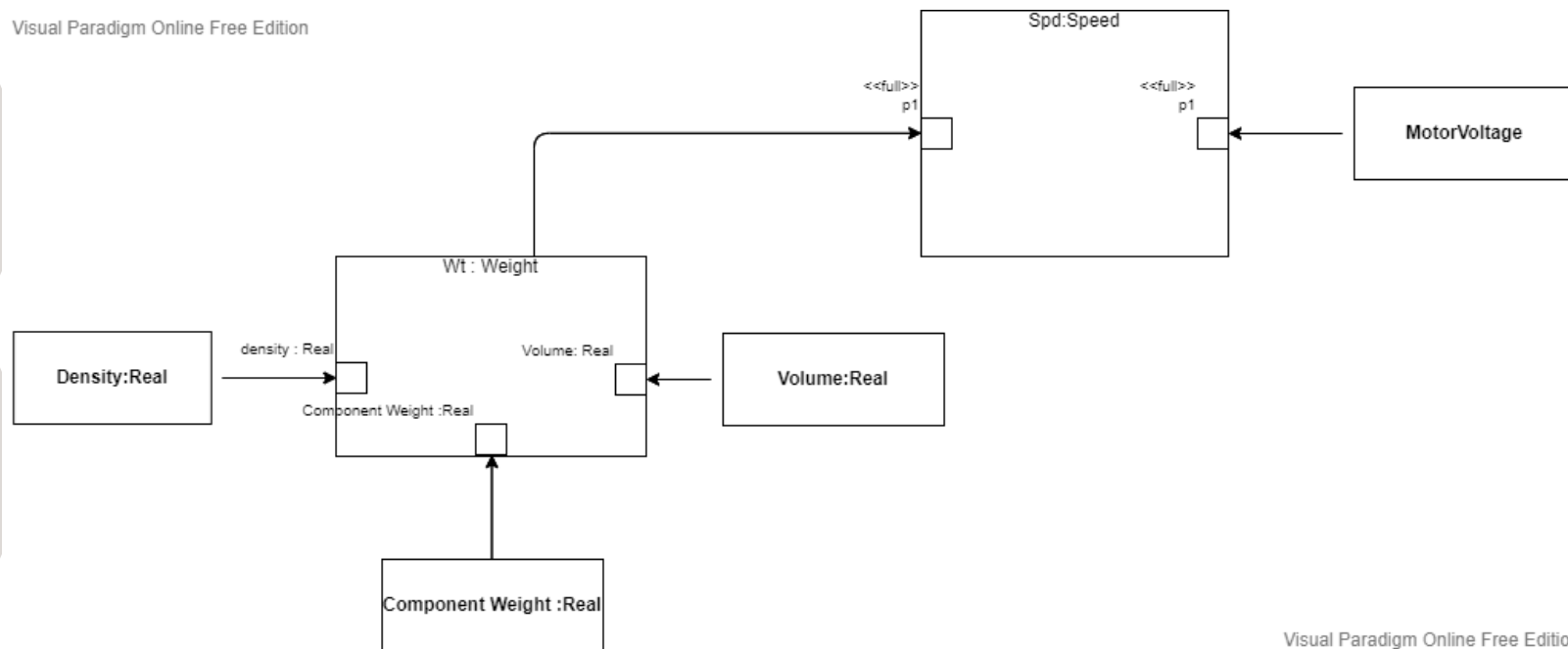
Visual Paradigm Online Free Edition





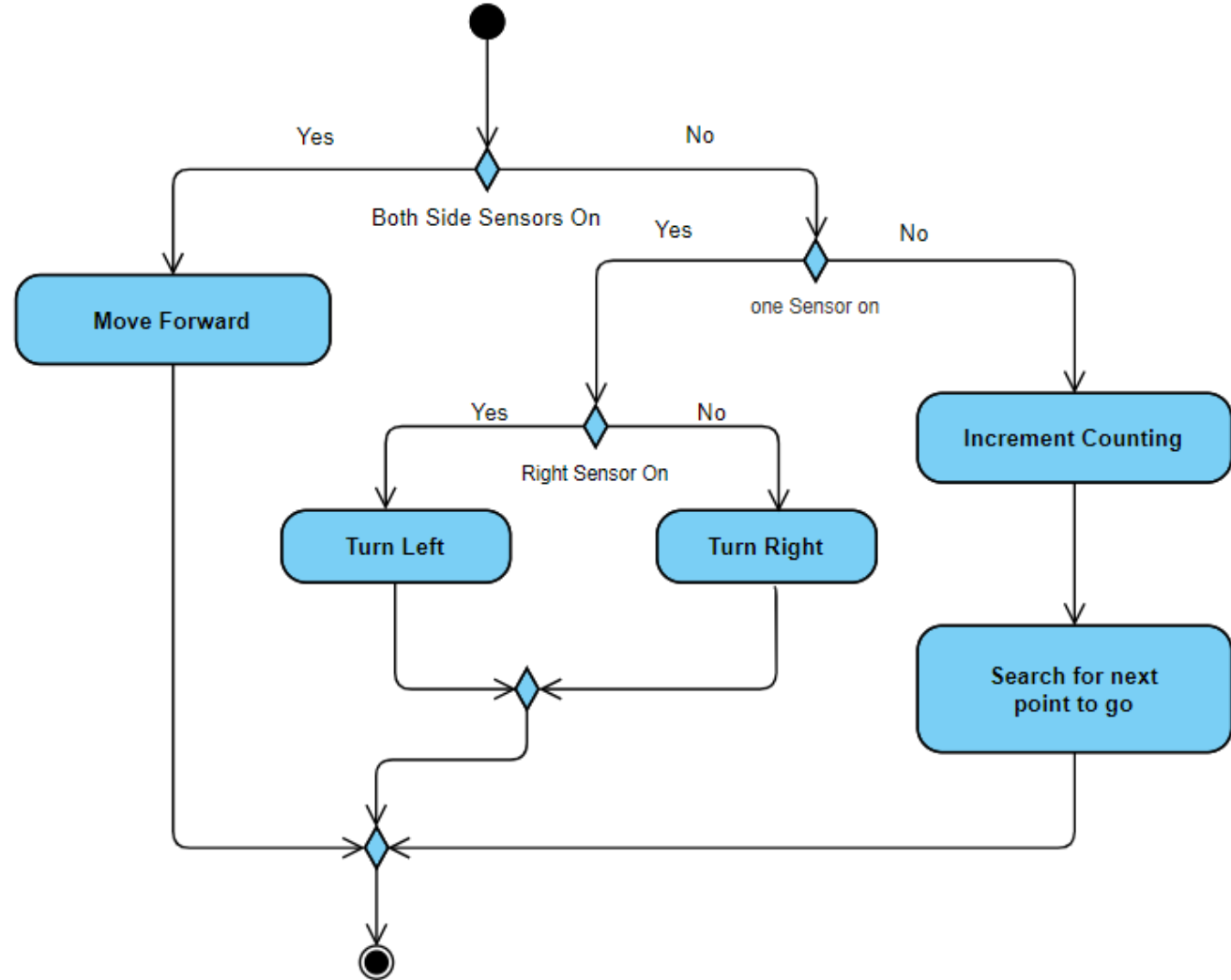
# Parametric Diagram

Visual Paradigm Online Free Edition



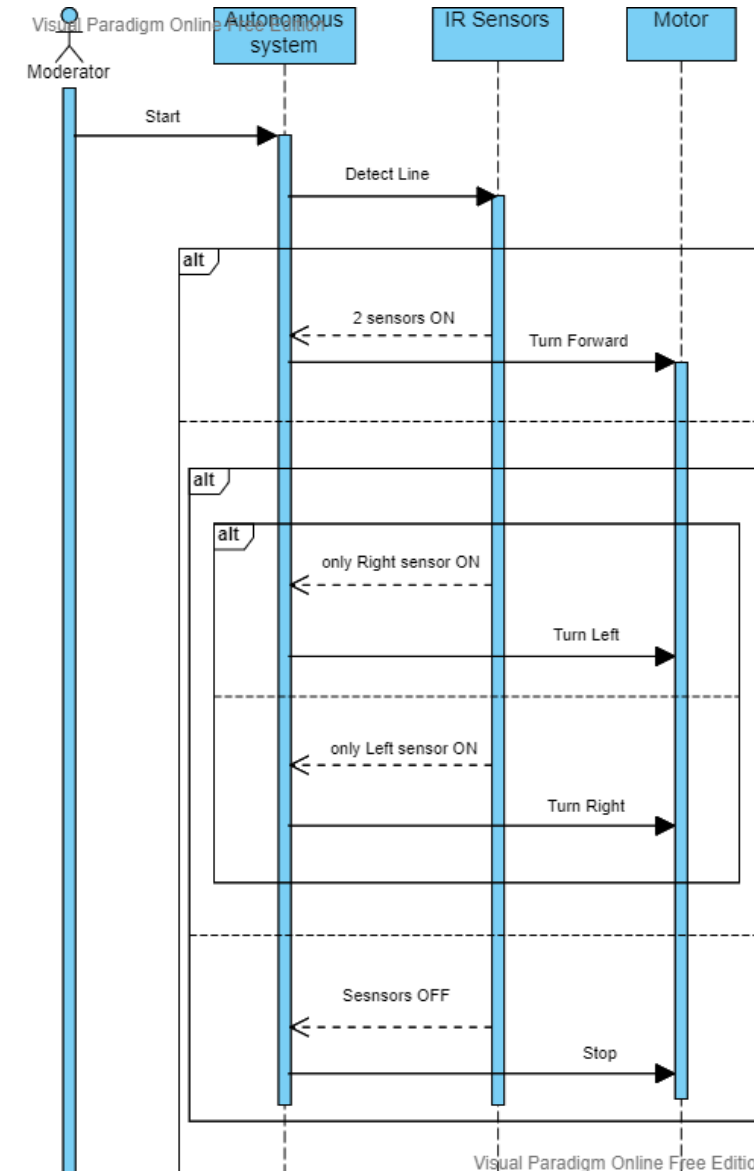
Visual Paradigm Online Free Edition

# Activity Diagram

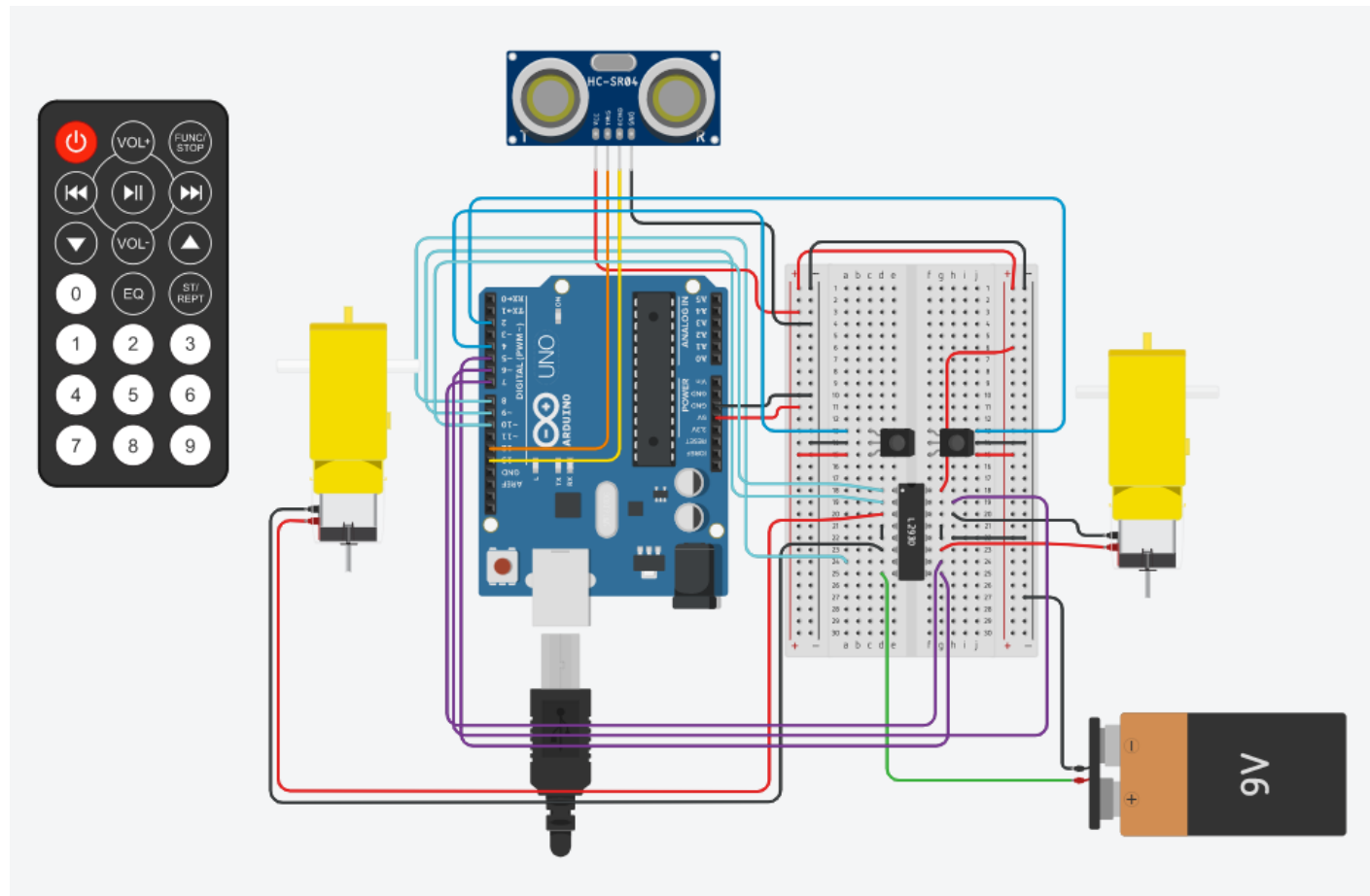




# Sequence Diagram



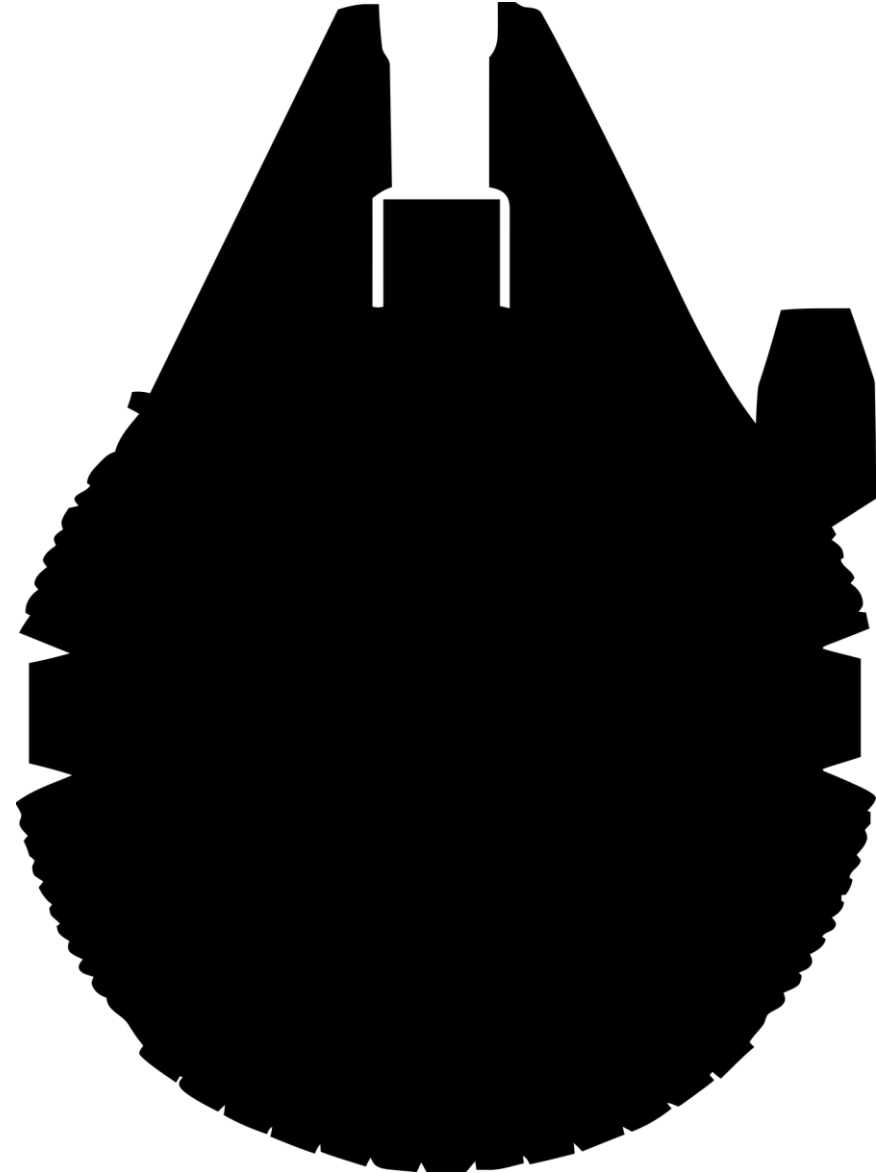
# TinkerCad simulation



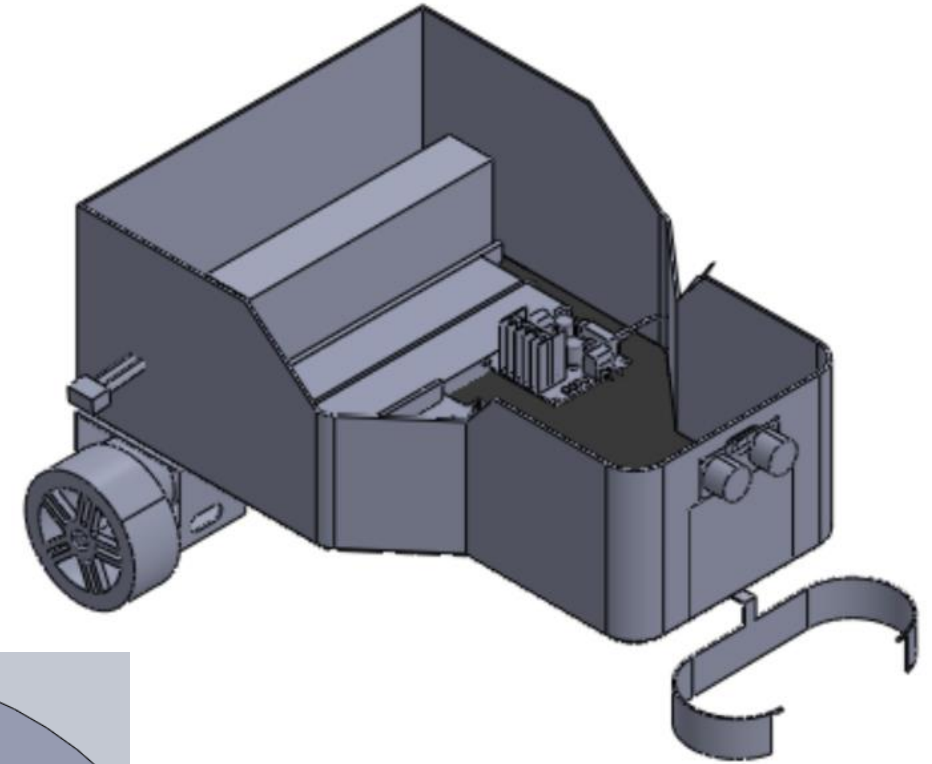
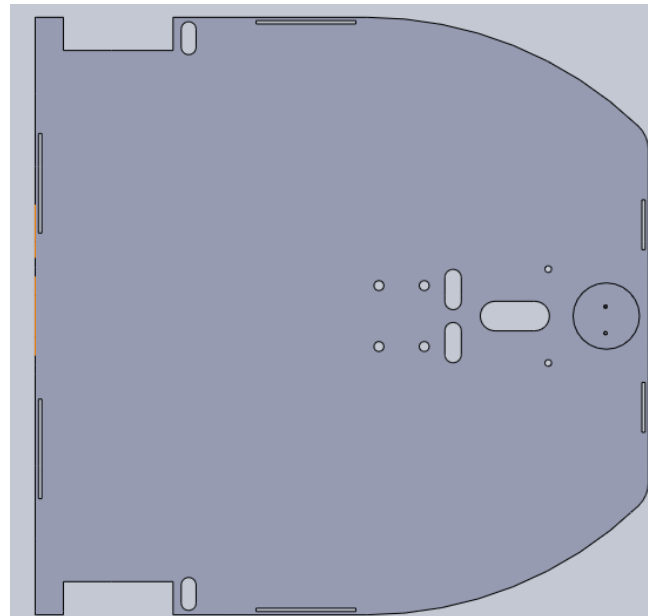
# The Hardware Modelling

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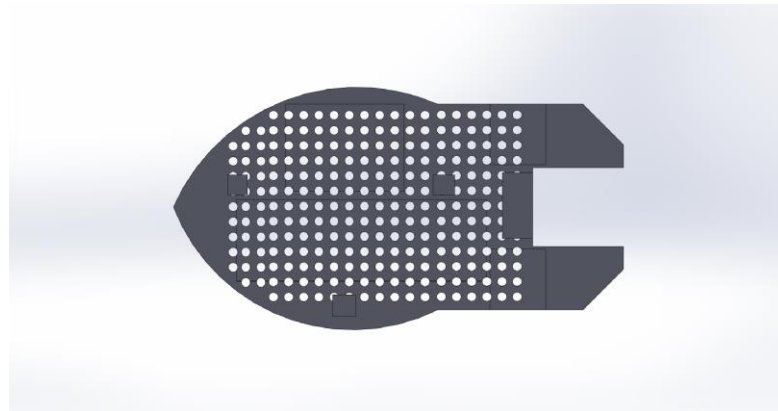
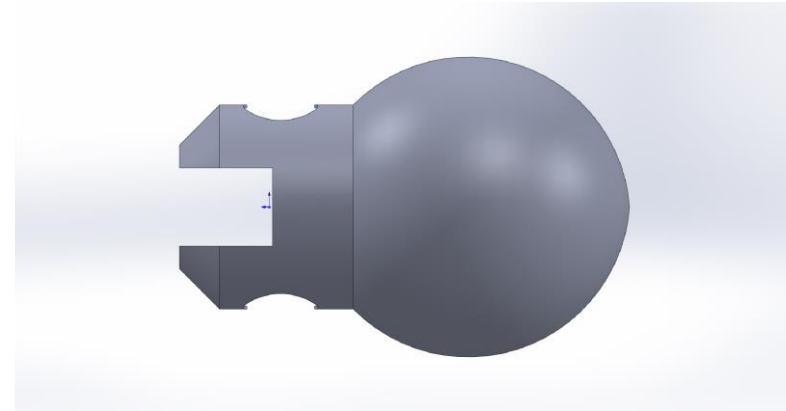
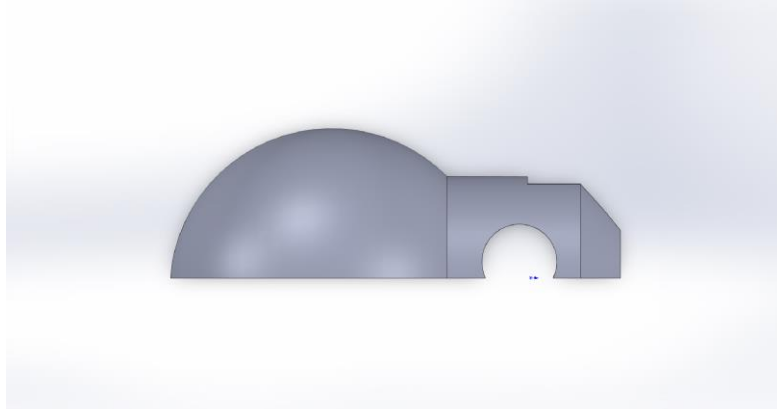
# Design Inspiration



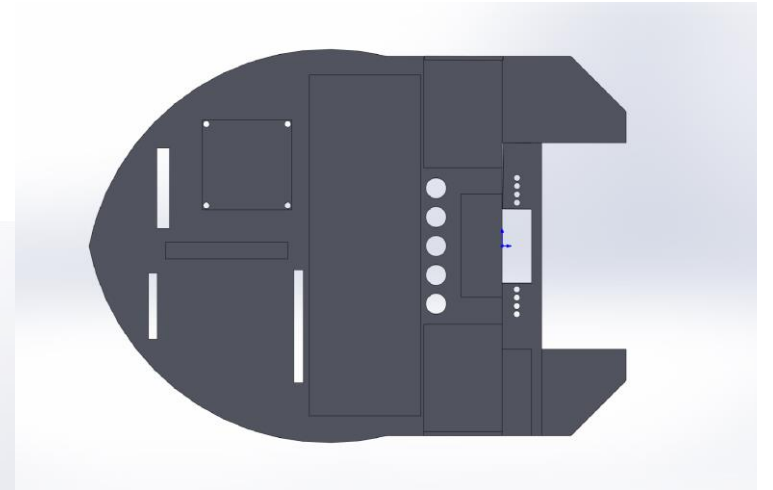
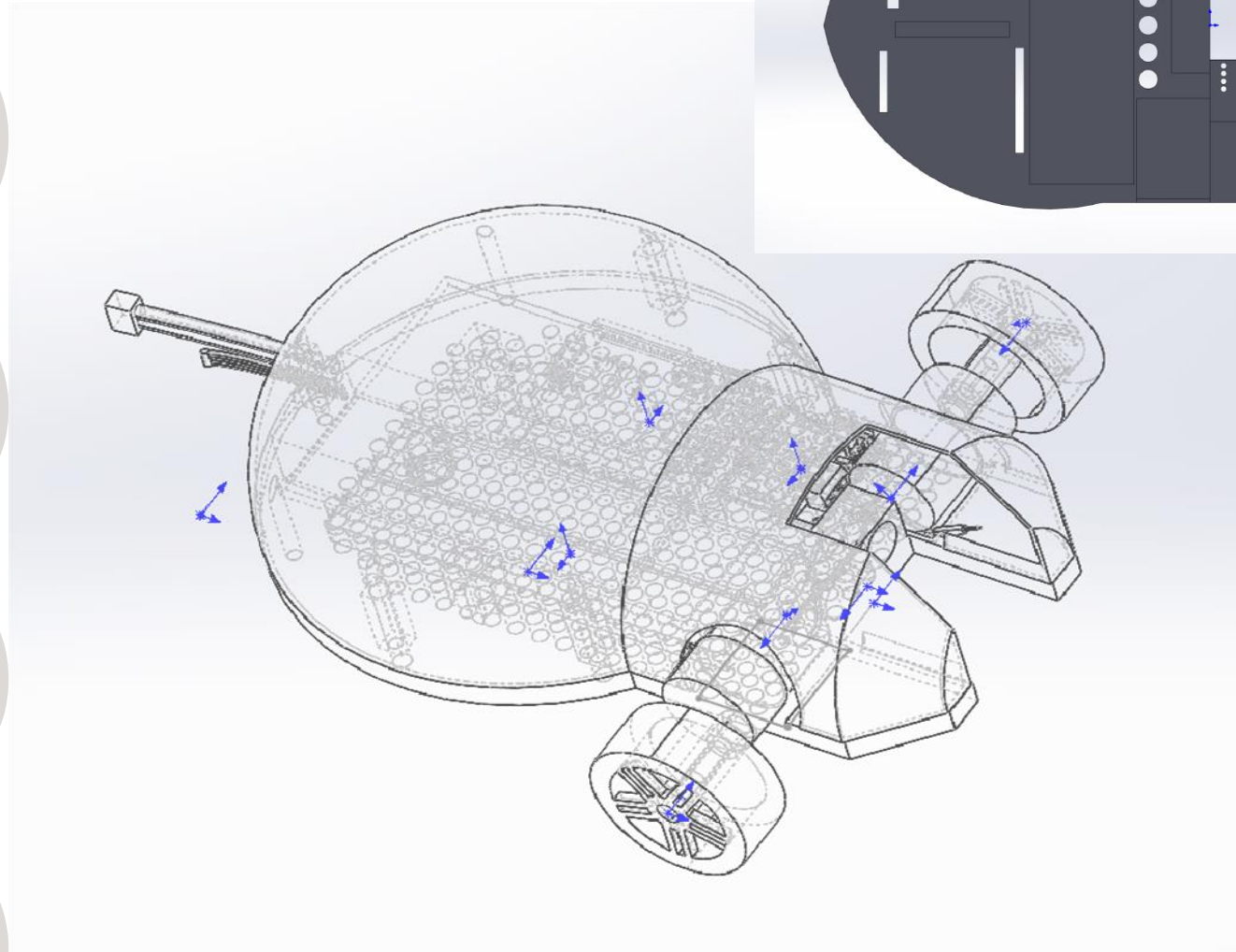
# Design1



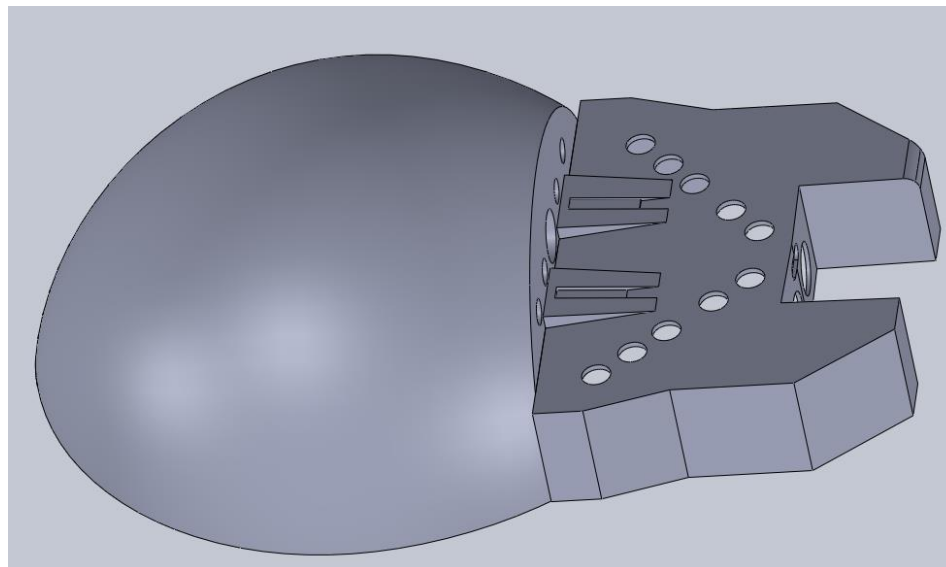
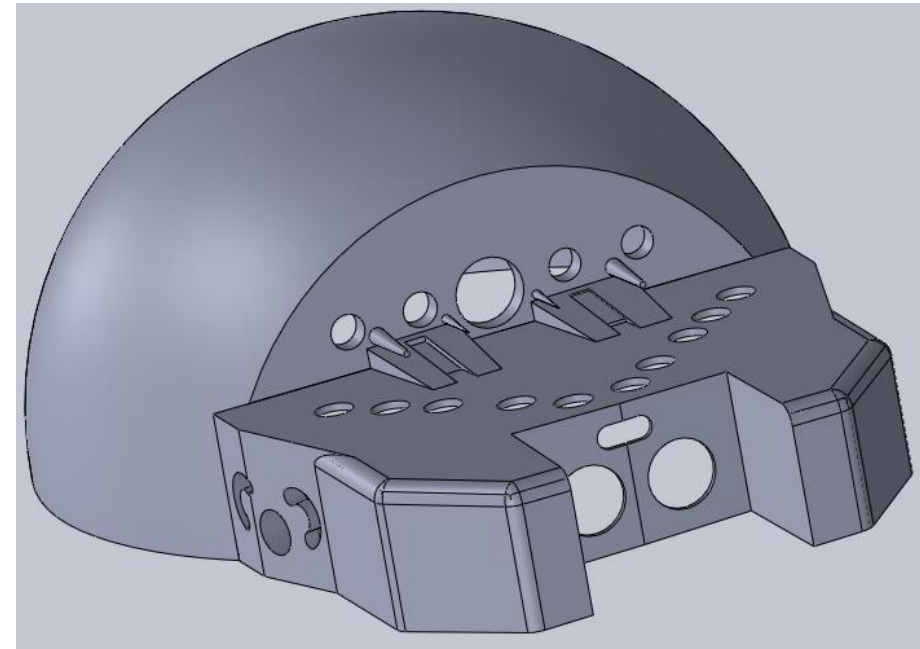
# Design2



# Design2

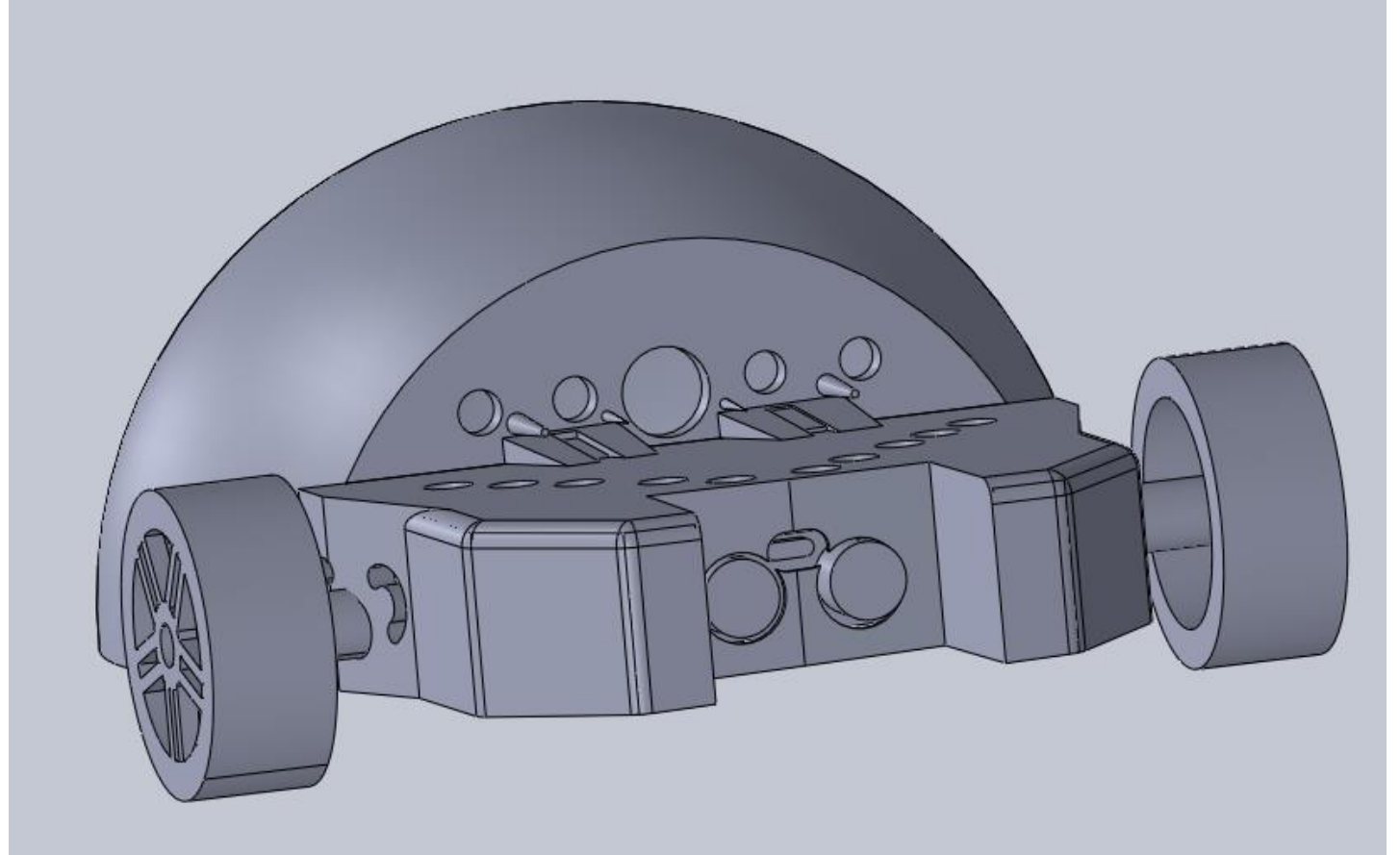


# Final Design





# Final Design



# Code Implementation

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# Motor Pins Configuration

```
// This is to rotate motor
void switchState()
{
    switch (state)
    {
        case Stop:
            digitalWrite(motorA1, LOW);
            digitalWrite(motorB1, LOW);
            digitalWrite(motorA2, LOW);
            digitalWrite(motorB2, LOW);
            break;

        case Forward:
            digitalWrite(motorA1, HIGH);
            digitalWrite(motorB1, HIGH);
            digitalWrite(motorA2, LOW);
            digitalWrite(motorB2, LOW);
            break;
```

```
        case Right:
            digitalWrite(motorA1, HIGH);
            digitalWrite(motorB1, LOW);
            digitalWrite(motorA2, LOW);
            digitalWrite(motorB2, HIGH);
            break;

        case Left:
            digitalWrite(motorA1, LOW);
            digitalWrite(motorB1, HIGH);
            digitalWrite(motorA2, HIGH);
            digitalWrite(motorB2, LOW);
            break;

        case Backward:
            digitalWrite(motorA1, LOW);
            digitalWrite(motorB1, LOW);
            digitalWrite(motorA2, HIGH);
            digitalWrite(motorB2, HIGH);
            break;
    }
}
```

# Line Follower Logic

```
void onLine()  
{  
    if (digitalRead(ln1) == HIGH && digitalRead(ln2) == HIGH)  
    {  
        change = true;  
        state = Forward;  
    }  
    if (digitalRead(ln1) == HIGH && digitalRead(ln2) == LOW)  
    {  
        state = Left;  
    }  
    if (digitalRead(ln1) == LOW && digitalRead(ln2) == HIGH)  
    {  
        state = Right;  
    }  
}
```

# Line Follower Logic

```
if (digitalRead(ln1) == LOW && digitalRead(ln2) == LOW)
{
    if (change == true)
    {
        change = false;
        mapp(); // Here we are updating the position on map
    }
    state = Stop;
    switchState();
    Movement();
}
switchState();
}
```

# Color Detection

```
// This is to update the color variable and also to calibrate the readings
void getColor(){
    if ((redPW >= 114 && redPW <= 150) && (greenPW >= 324 && greenPW <= 350) && (bluePW >= 364 && bluePW <= 395))
    {
        currentColor = 0;} // orange
    else if ((redPW >= 320 && redPW <= 340) && (greenPW >= 505 && greenPW <= 520) && (bluePW >= 235 && bluePW <= 355))
    {
        currentColor = 3;} // purple
    else if ((redPW >= 174 && redPW <= 230) && (greenPW >= 190 && greenPW <= 210) && (bluePW >= 320 && bluePW <= 335))
    {
        currentColor = 2;} // green
    else if ((redPW >= 232 && redPW <= 290) && (greenPW >= 170 && greenPW <= 190) && (bluePW >= 130 && bluePW <= 160))
    {
        currentColor = 1;} // cyan
    else if ((redPW >= 90 && redPW <= 108) && (greenPW >= 95 && greenPW <= 115) && (bluePW >= 80 && bluePW <= 95))
    {
        currentColor = 4;} // white
    else if (((redPW >= 900 && redPW <= 960) && (greenPW >= 1000 && greenPW <= 1065) && (bluePW >= 800 && bluePW <= 860))
    || ((redPW >= 622 && redPW <= 750) && (greenPW >= 710 && greenPW <= 810) && (bluePW >= 500 && bluePW <= 677)))
    { // if it detects gray or black will consider it black
        currentColor = 5;} // black
    }
```

# Color Detection

```
// This is to get Green using filter s2 s3
```

```
int getGreenPW()
```

```
{
```

```
    digitalWrite(S2, HIGH);
```

```
    digitalWrite(S3, HIGH);
```

```
    int PW;
```

```
    PW = pulseIn(sensorOut, LOW);
```

```
    return PW;
```

```
}
```

```
// This is to get Blue using filter s2 s3
```

```
int getBluePW()
```

```
{
```

```
    digitalWrite(S2, LOW);
```

```
    digitalWrite(S3, HIGH);
```

```
    int PW;
```

```
    PW = pulseIn(sensorOut, LOW);
```

```
    return PW;
```

```
}
```

```
void loop()
```

```
{
```

```
    Serial.println(currentColor);
```

```
// This is to get red using filter s2 s3
```

```
int getRedPW()
```

```
{
```

```
    digitalWrite(S2, LOW);
```

```
    digitalWrite(S3, LOW);
```

```
    int PW;
```

```
    PW = pulseIn(sensorOut, LOW);
```

```
    return PW;
```

```
}
```

```
// This code is to get current color
```

```
void colorCall()
```

```
{
```

```
    redPW = getRedPW();
```

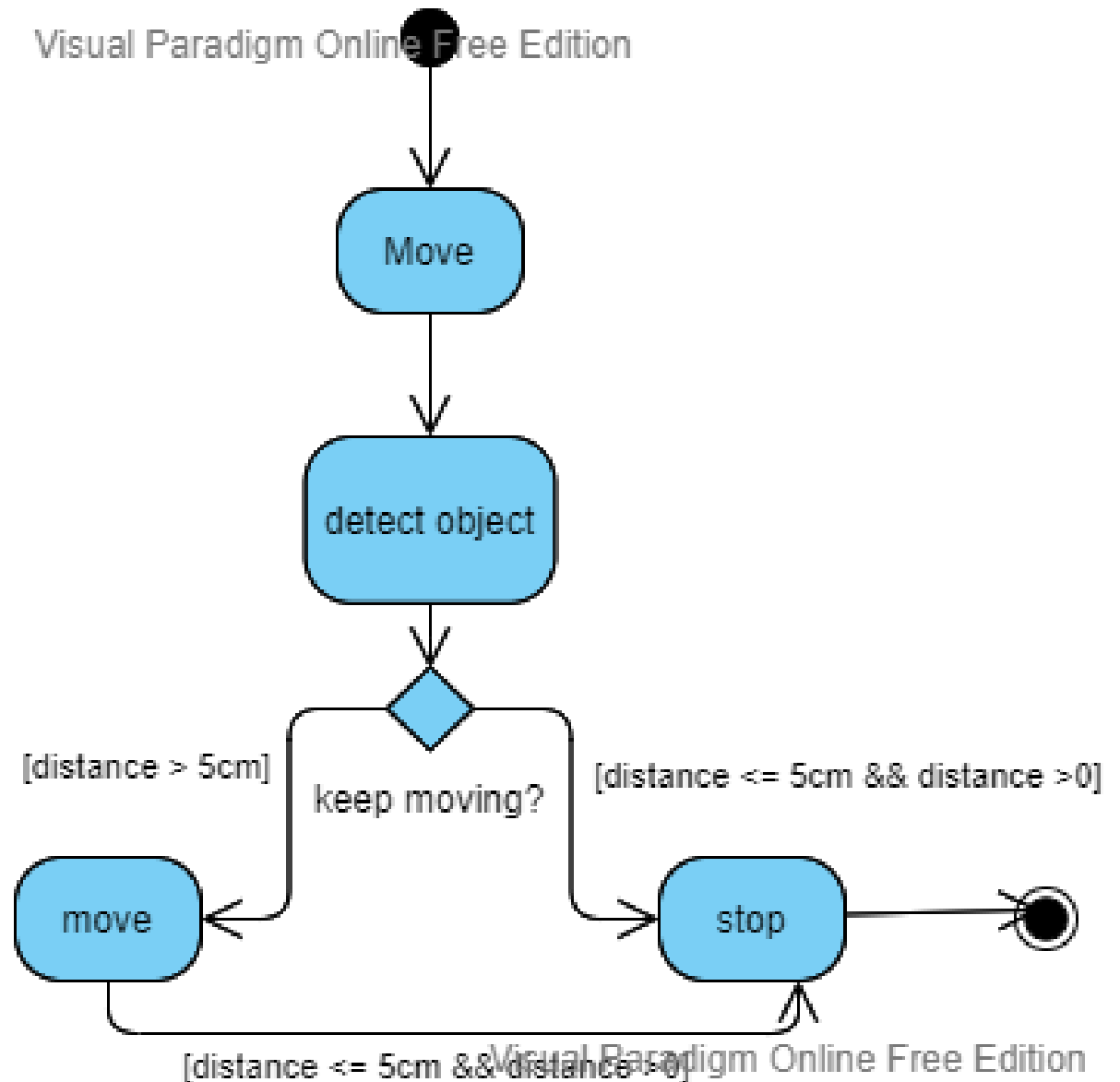
```
    bluePW = getBluePW();
```

```
    greenPW = getGreenPW();
```

```
    getColor();
```

```
}
```

# Object Detection



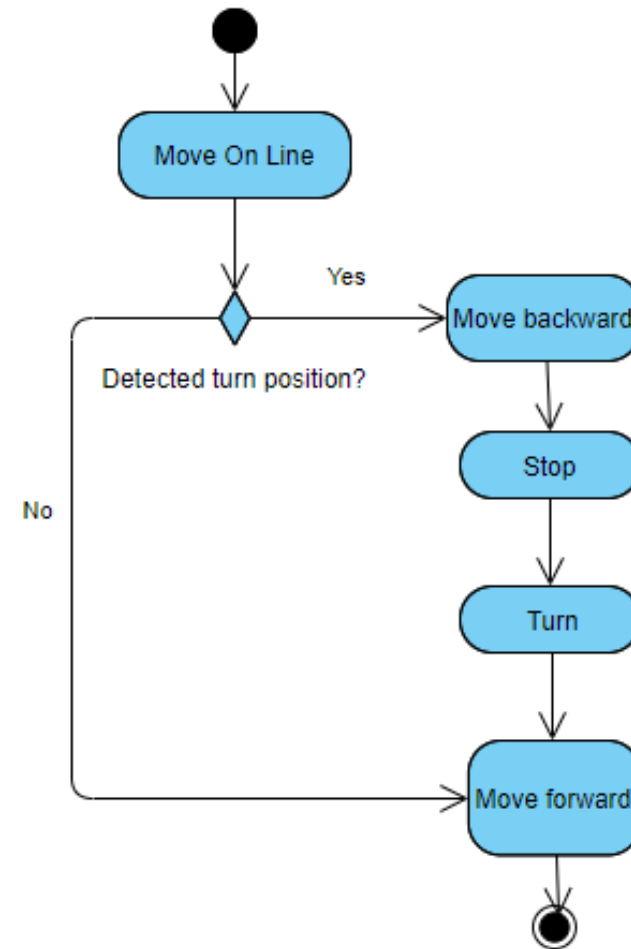


# Object Detection

```
#define sonicTrig 12
#define sonicEcho 11
volatile int duration, distance;
volatile bool objectDetected= false;
void setup() {
    pinMode(sonicTrig,OUTPUT);
    pinMode(sonicEcho,INPUT);
    Serial.begin(9600);
}

void loop() {
void ultraSonic()
{
    digitalWrite(sonicTrig,HIGH);
    digitalWrite(sonicTrig,LOW);
    duration = pulseIn(sonicEcho,HIGH);
    distance = duration*0.0343/2;
    Serial.print("The Distance: ");
    Serial.println(distance);
/* the distance should be positive because at some points
 * the ultrasonic detects with negative numbers*/
*/
    if (distance <=50 && distance >= 0)
    {
        Serial.println ("Object detected" );
        Serial.print ("Distance of the object from the car is " );
        Serial.print ( distance);
        Serial.println ( " cm");// print out the distance in cm.
        objectDetected = true;}
    else{ objectDetected = false;}
}
```

# 90° Turn



# 90° Turn

```
case Backward:  
  //analogWrite(motorPowerA,180);  
  //analogWrite(motorPowerB,100);
```

```
digitalWrite(motorA1,LOW);  
digitalWrite(motorB1,LOW);  
digitalWrite(motorA2,HIGH);  
digitalWrite(motorB2,HIGH);  
break;
```

```
void rotateLeft()  
{  
  
  state = Backward;  
  switchState();  
  state = Stop;  
  digitalWrite(motorA1,LOW);  
  digitalWrite(motorB1,HIGH);  
  digitalWrite(motorA2,HIGH);  
  digitalWrite(motorB2,LOW);  
  delay(500);  
}
```

# 90° Turn

```
void rotateRight()  
{
```

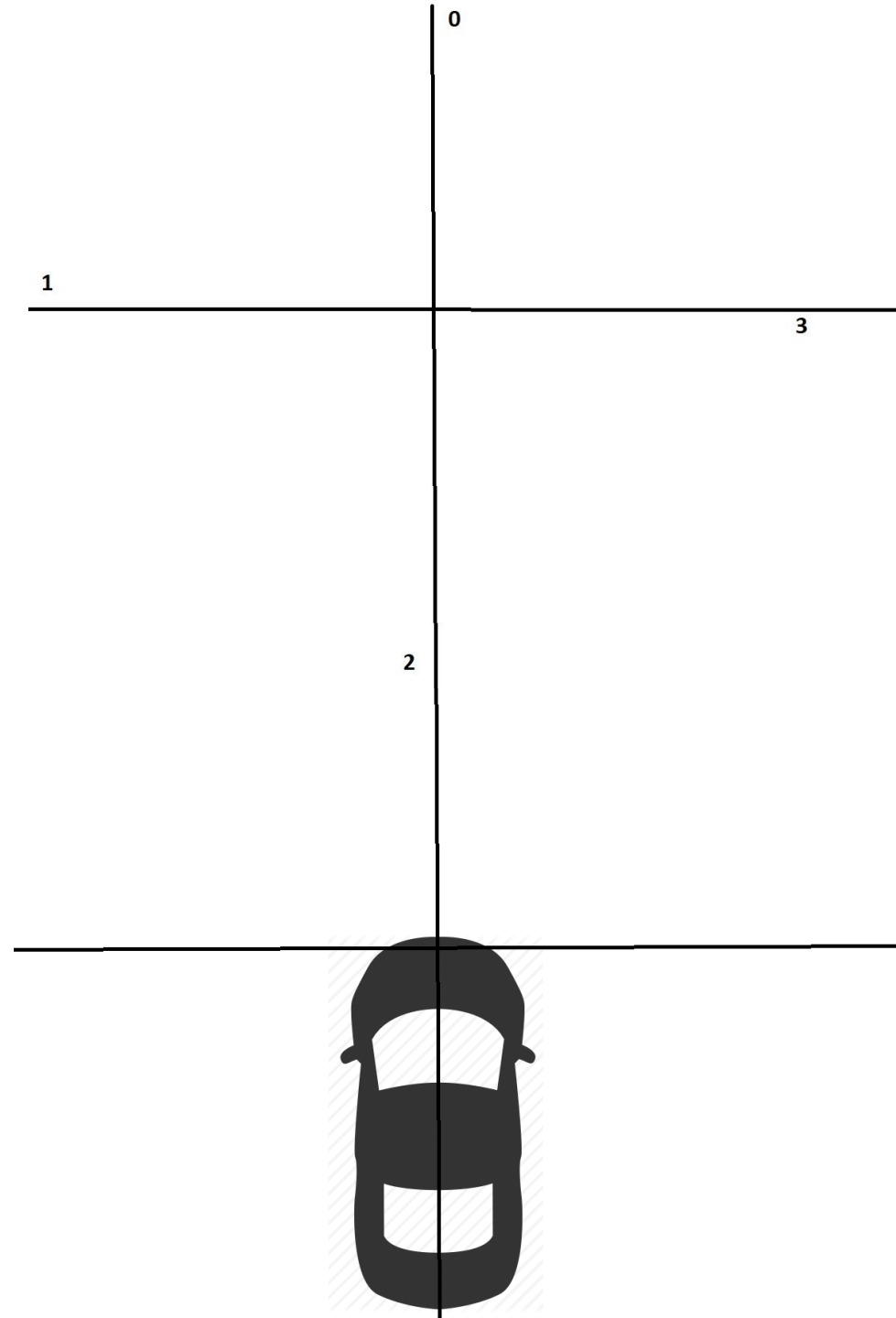
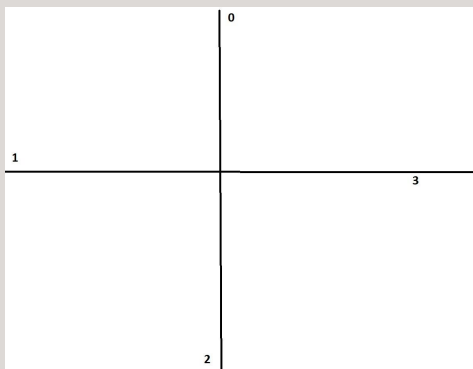
```
    state = Backward;  
    switchState();  
    state = Stop;  
    digitalWrite(motorA1,HIGH);  
    digitalWrite(motorB1,LOW);  
    digitalWrite(motorA2,LOW);  
    digitalWrite(motorB2,HIGH);  
    delay(500);
```

```
}
```

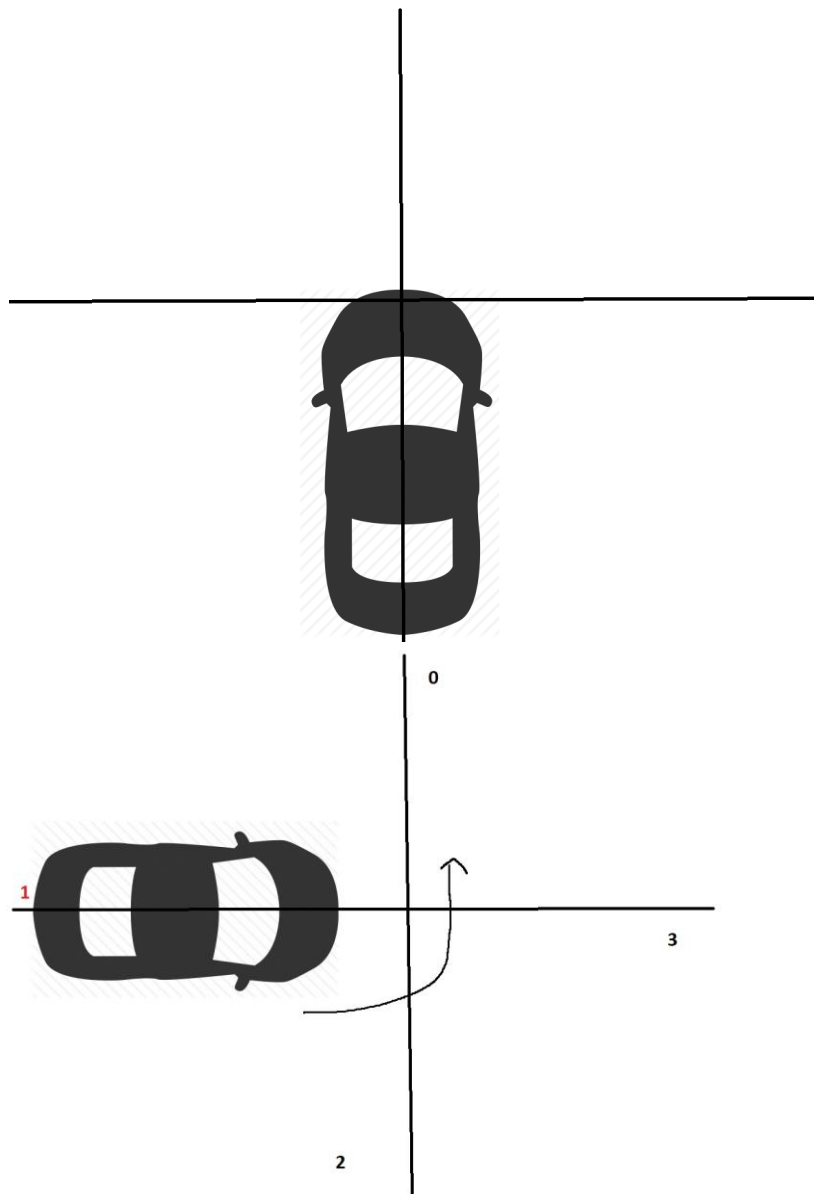
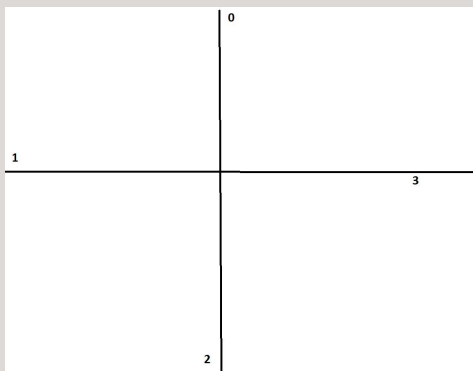
```
if (digitalRead (ln1)== LOW && digitalRead(ln2)== LOW)  
{  
    rotateRight();  
    state= Forward;  
    switchState();  
}
```

```
.. ..
```

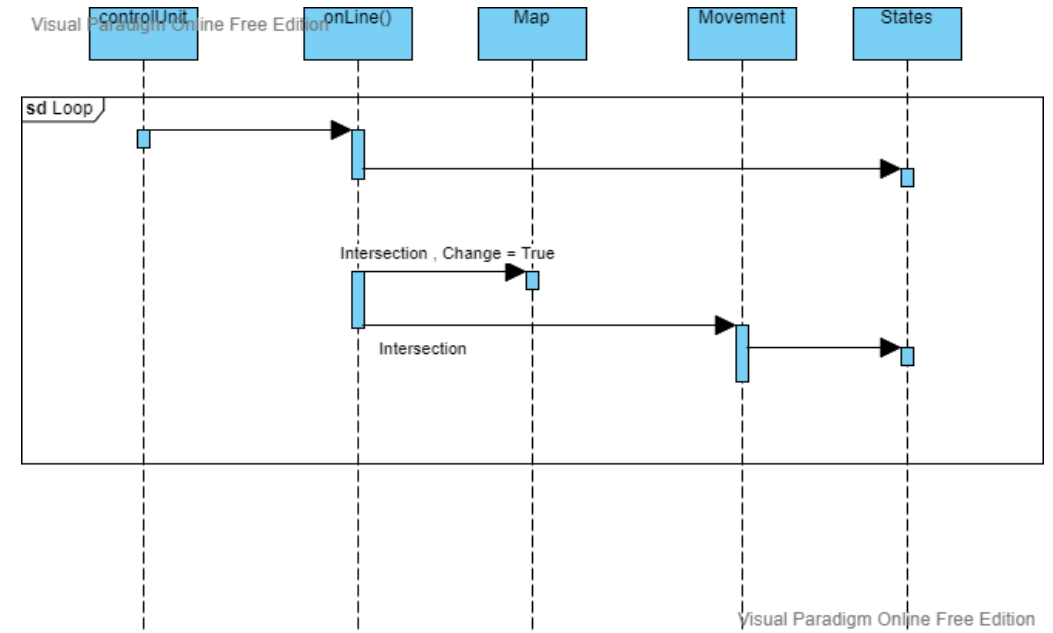
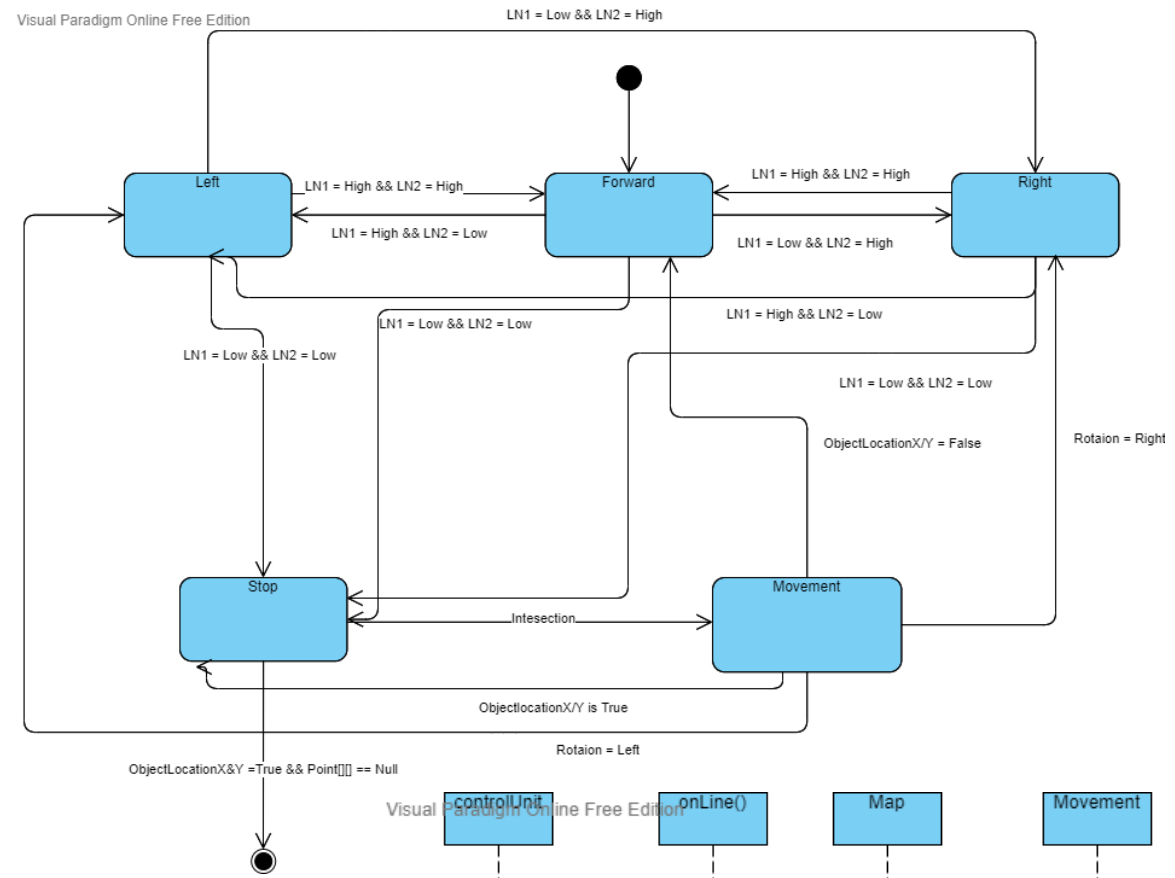
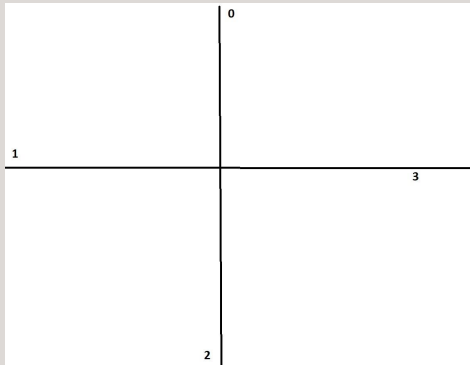
# Mapping



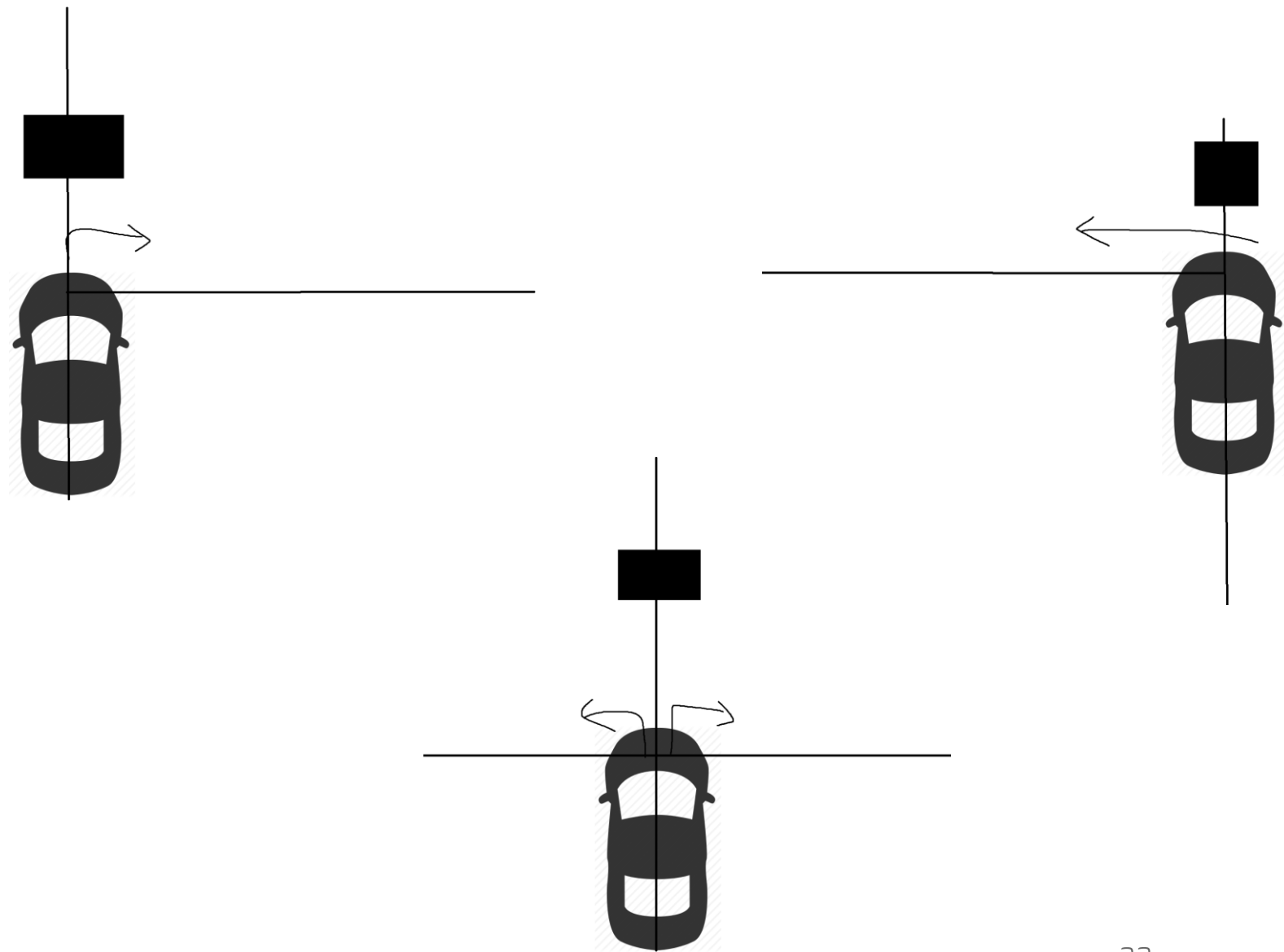
# Algorithm



# Algorithm



# Obstacle Avoidance





# Sources

1: [pixabay.com](https://pixabay.com)

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