

Autonomous Car Project

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Concept & Ideation

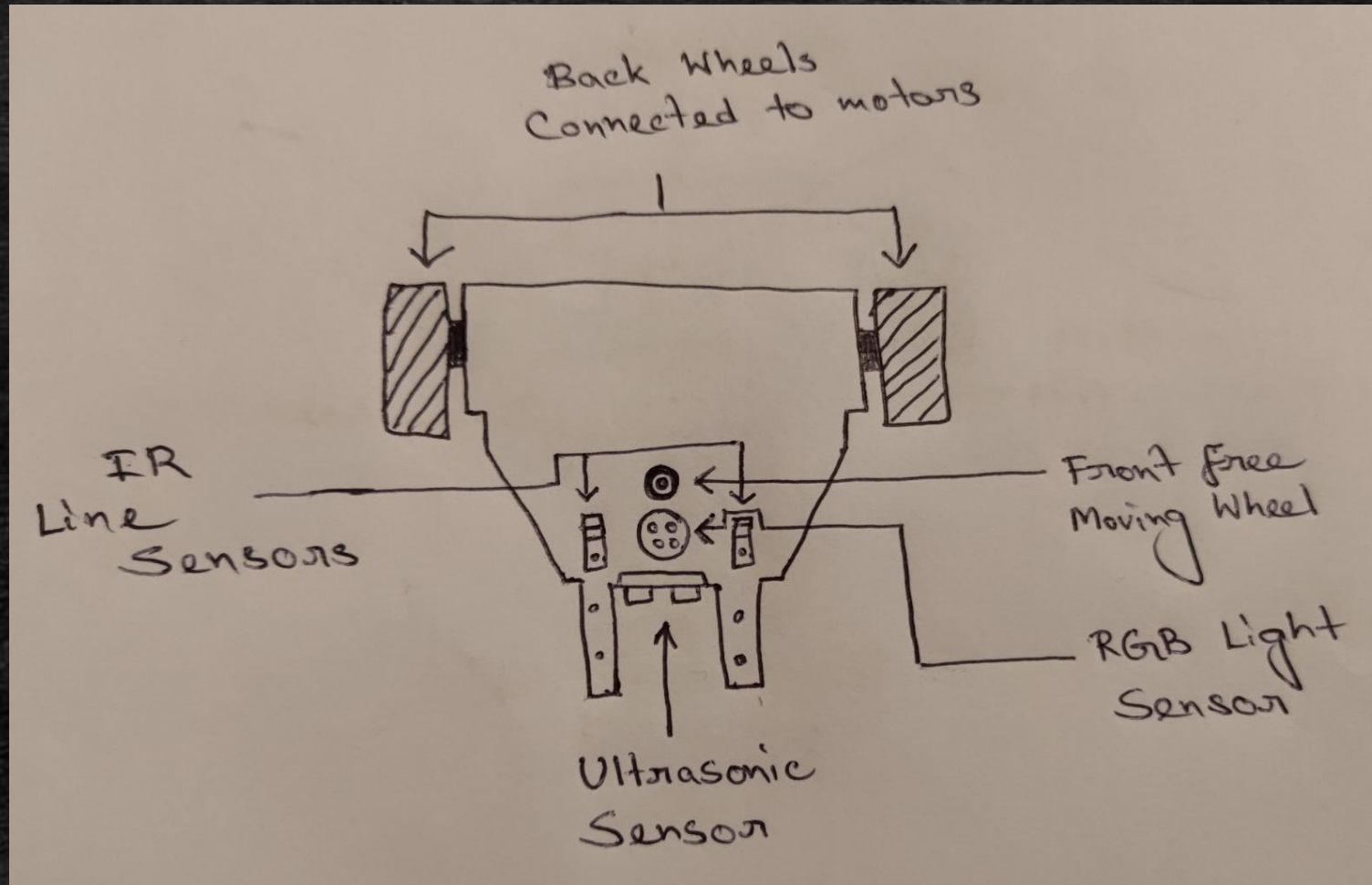


Figure 1: Bottom view of the vehicle

Concept Sketches

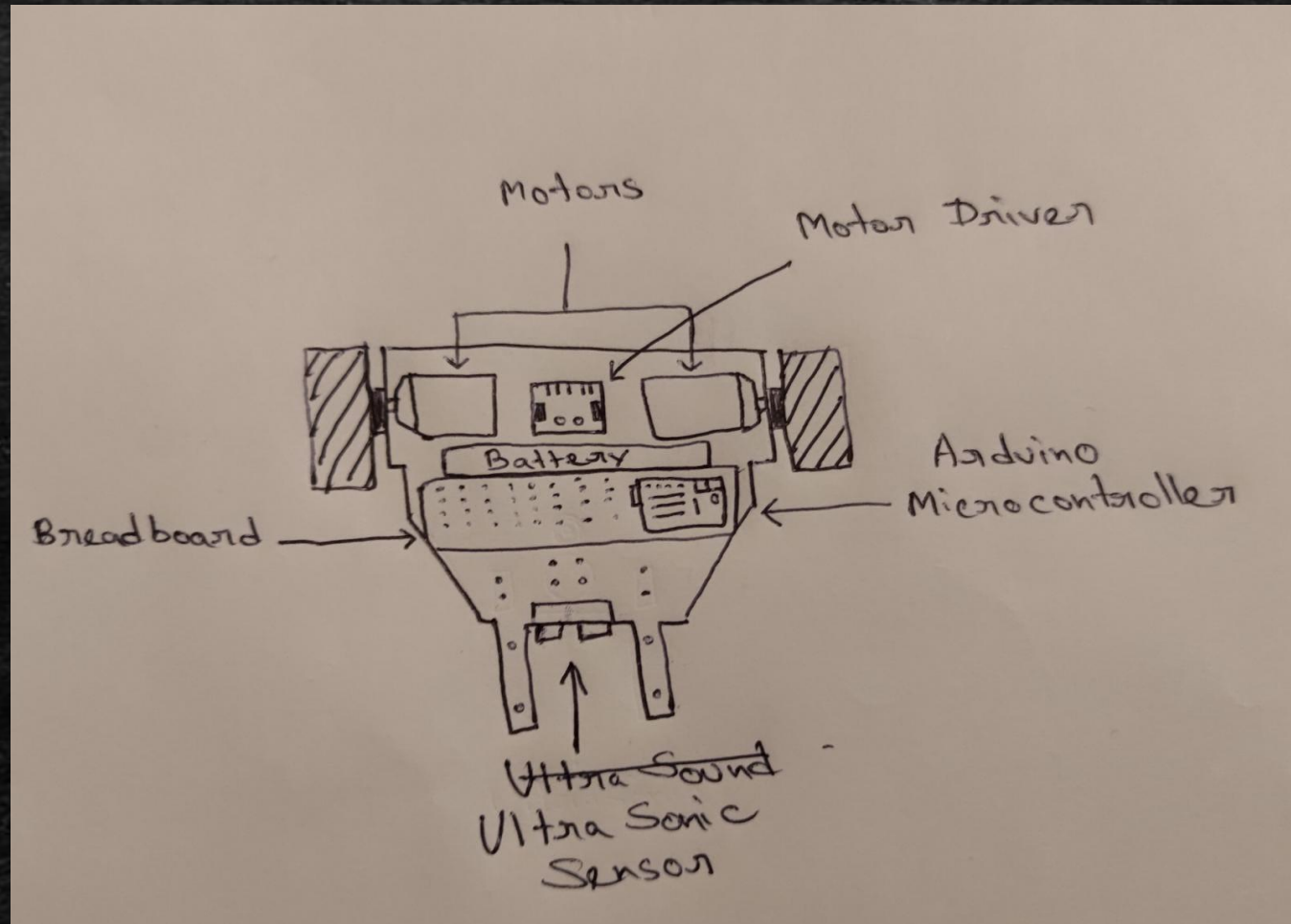


Figure 2: Top view of the vehicle

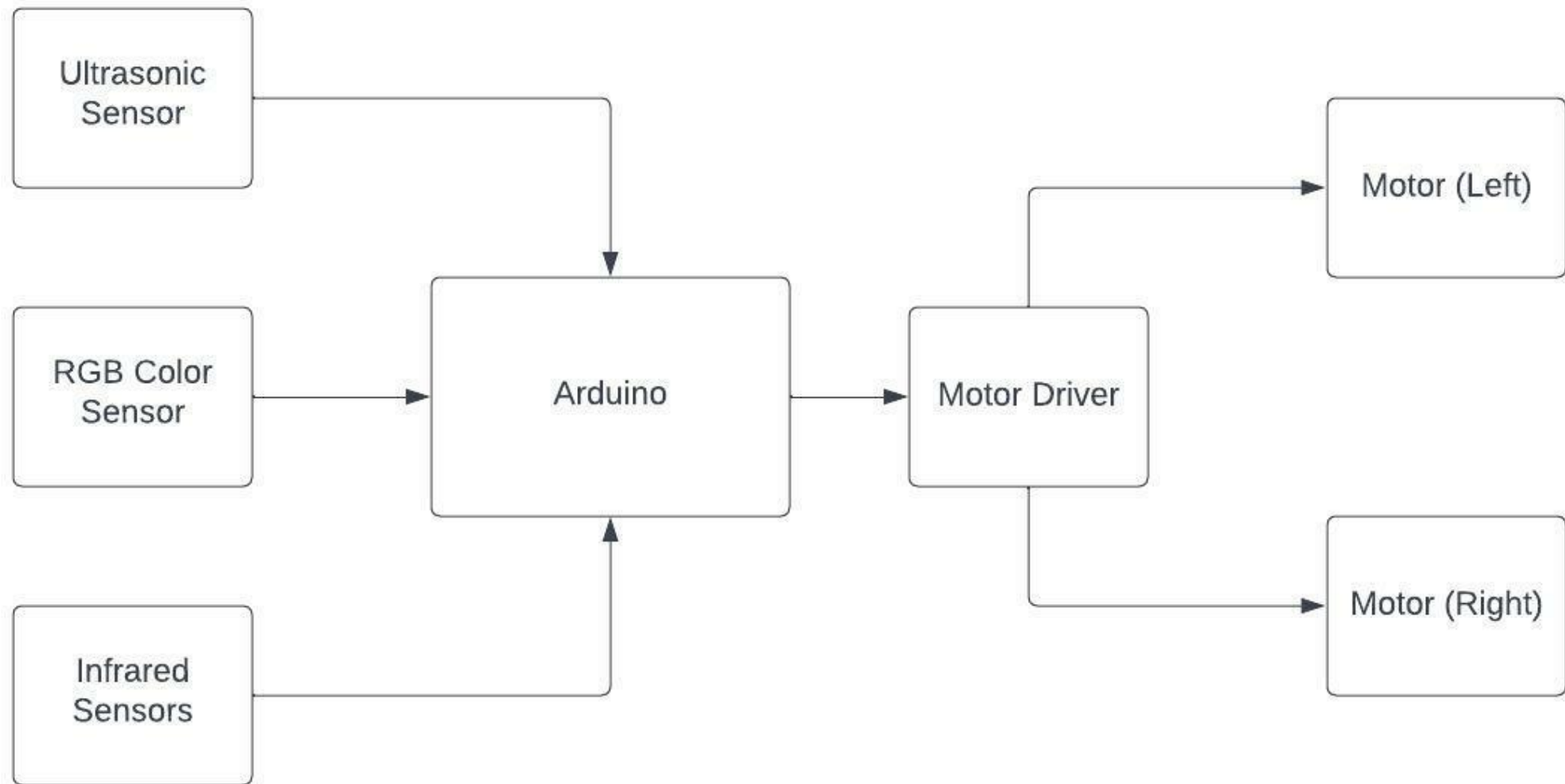


Figure 3: Basic block diagram

Hardware Components

- Arduino Uno Wifi R2 (1 unit)
- Motor with gearbox (2 units)
- Motor Driver (1 unit)
- Line tracking module (2 units)
- Ultrasonic sensor (1 unit)
- RGB color sensor (1 unit)
- Battery (1 units)

3d Modeling

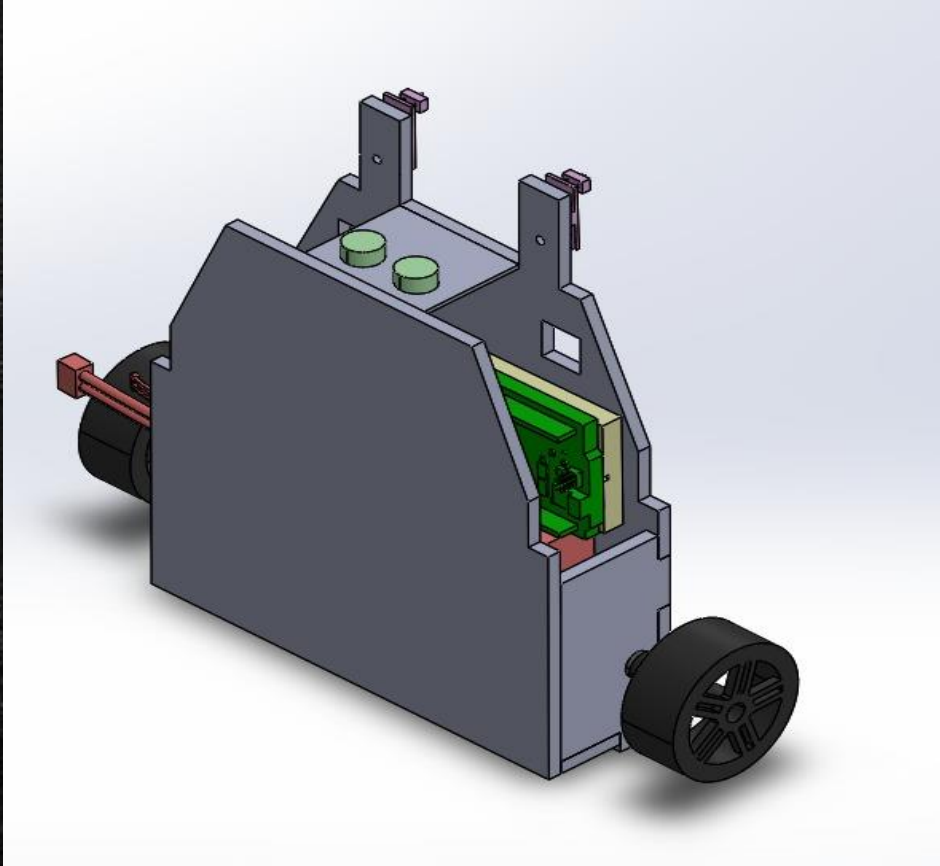


Figure 4: Assembled model

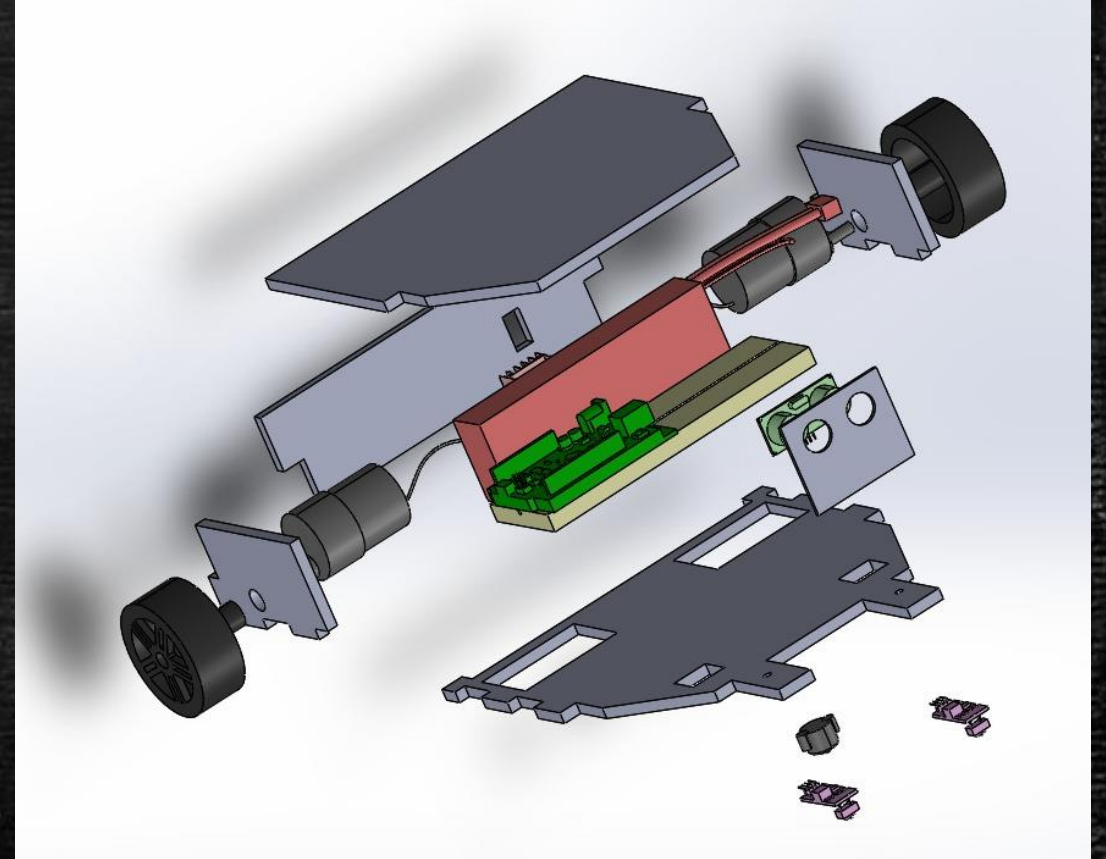


Figure 5: Unassembled model

Design Style

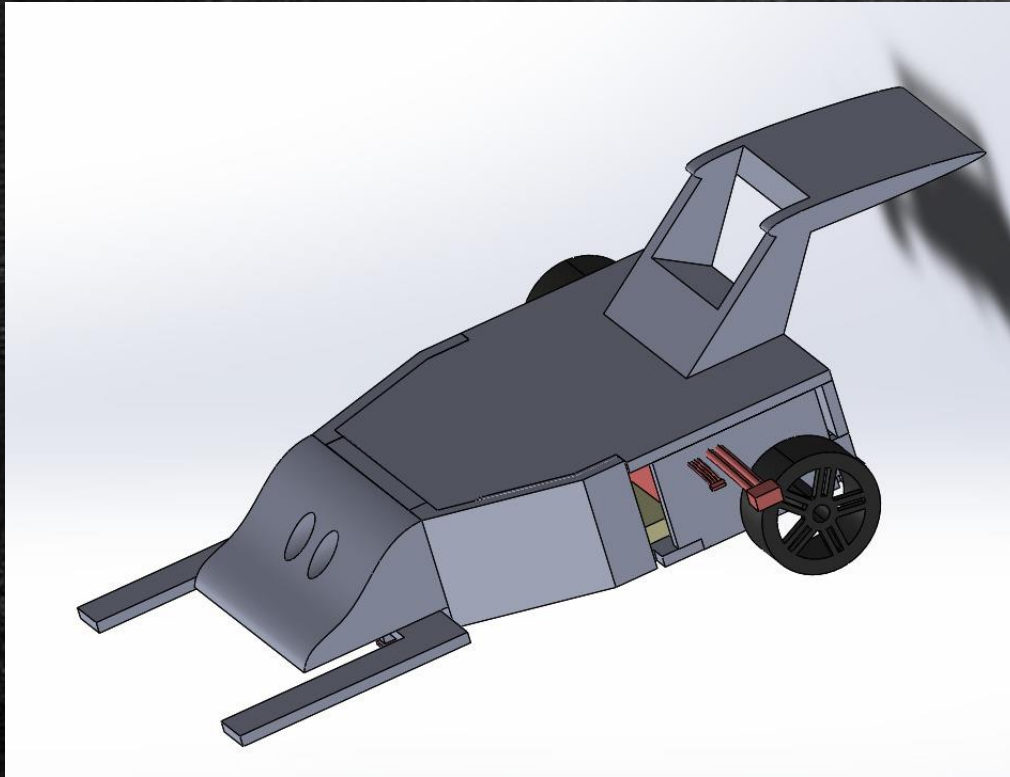


Figure 6: Retro Design



Figure 7: Mood board

System Engineering

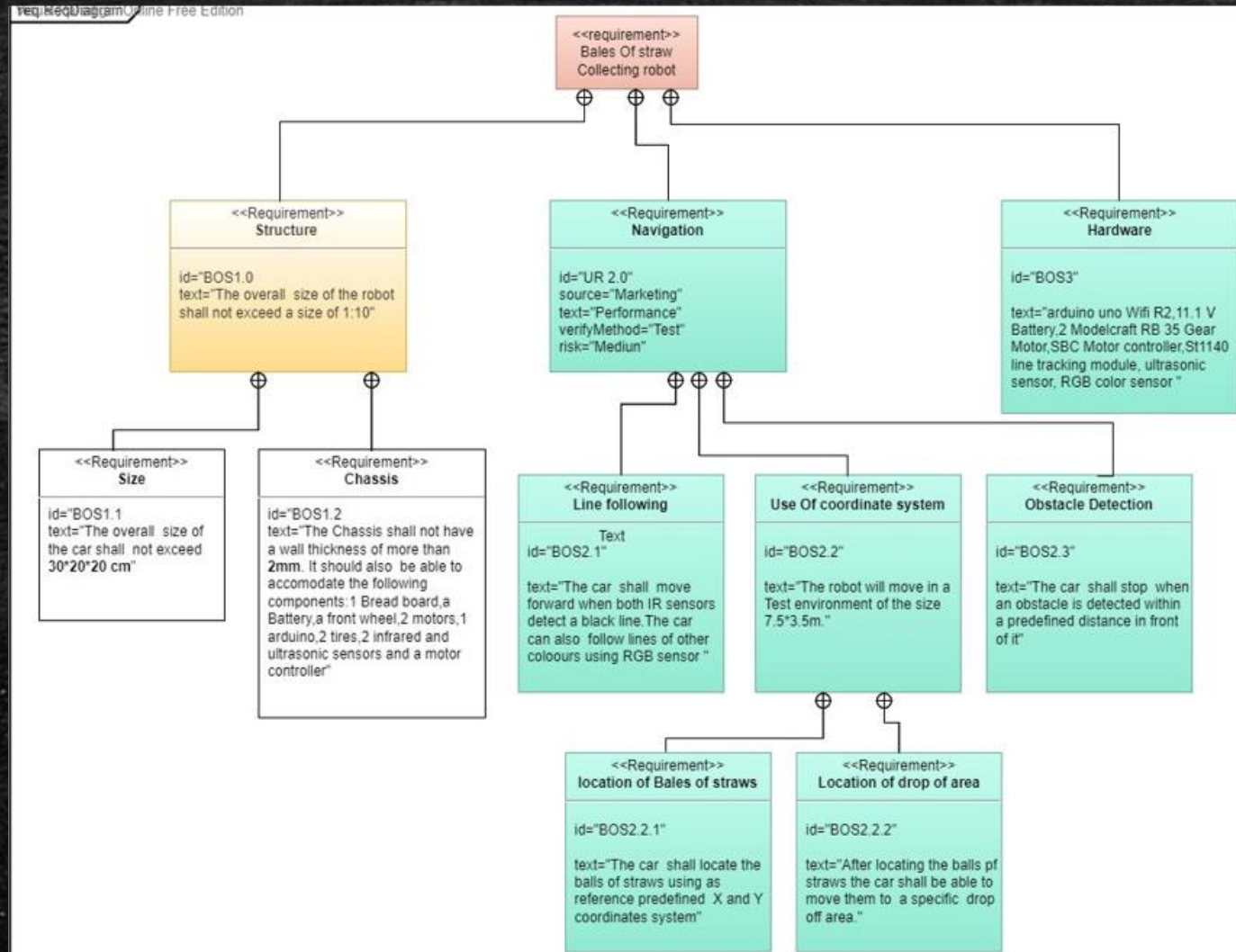


Figure : Requirements Diagram

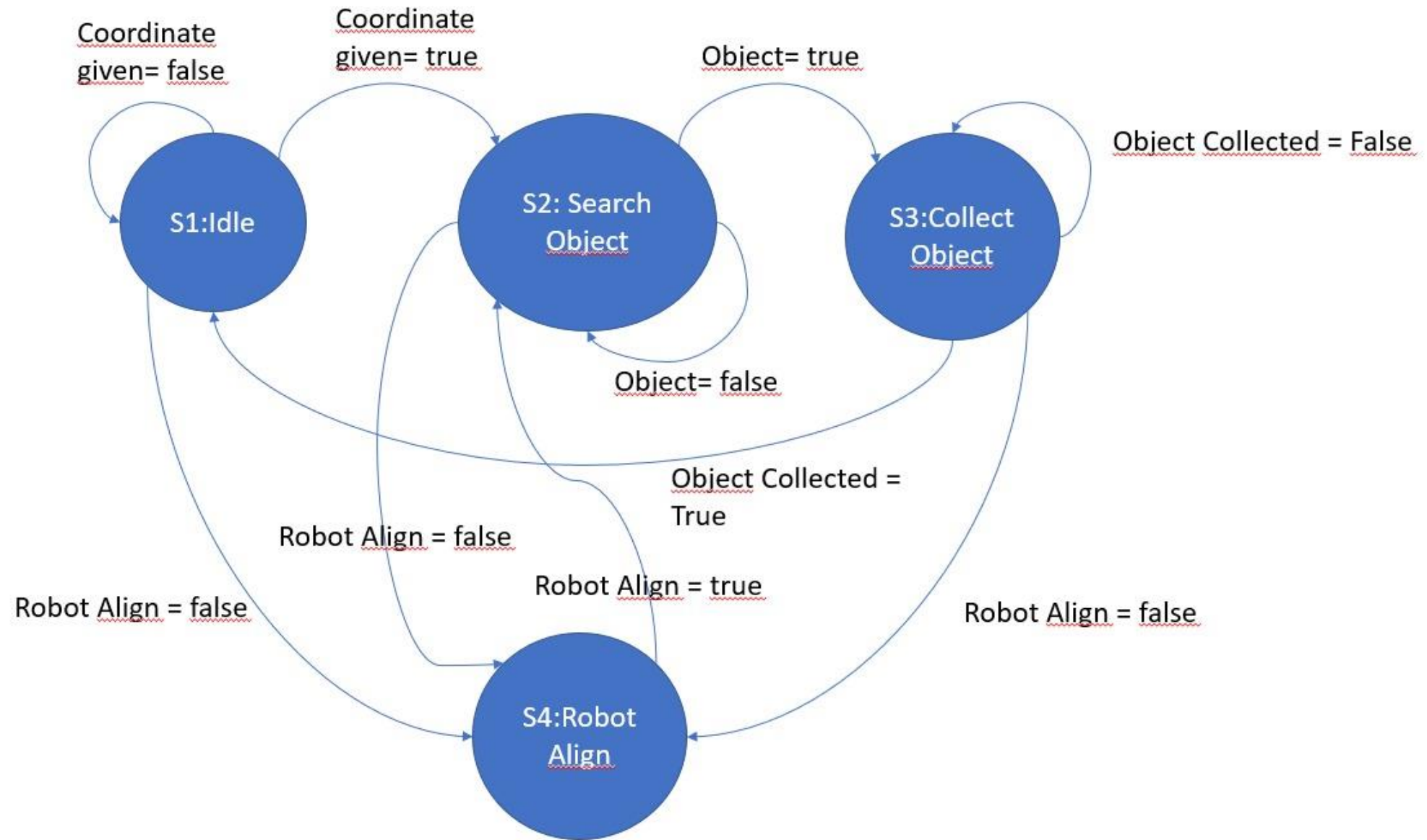


Figure : State Machine Diagram

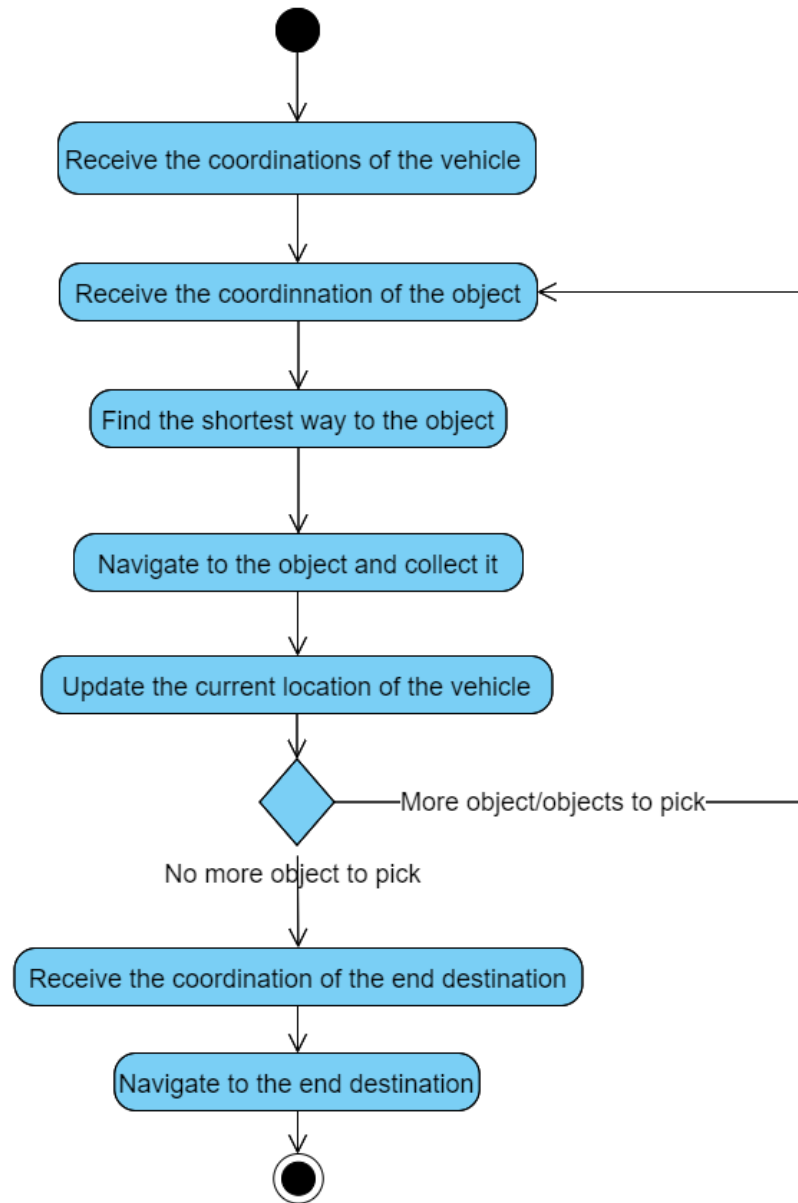


Figure : Activity Diagram

Software Development

Robot_Project_Prototyping

```
#define enA 10
#define enB 5

/*Port assignment*/
int trigPin=12;
int echoPin=13;
int motor1L =A1;
int motor1R =A0;

int motor2L = A2;
int motor2R = A3;
const int sensorPin1 = 2;
const int sensorPin2 = 4;
int L_Sensor = 2;
int R_Sensor = 4;

/*Variable declaration*/
int sensorValue1 = 0;
int sensorValue2 = 0;
int fd;
int sp=150;
long distance;

void setup() {
  Serial.begin(9600);

  /*Defining what get to be input or output*/

  pinMode (trigPin, OUTPUT);
  pinMode (echoPin, INPUT);

  analogWrite(enA, sp);
  analogWrite(enB, sp);
  pinMode(motor1L, OUTPUT);
  pinMode(motor1R, OUTPUT);

  pinMode(motor2L, OUTPUT);
  pinMode(motor2R, OUTPUT);
  pinMode(enA, OUTPUT);
  pinMode(enB, OUTPUT);

  pinMode(L_Sensor, INPUT);
  pinMode(R_Sensor, INPUT);
```

```

void loop() {

    /*Checking how far the obstacle is*/
    if ( distance<5){stop_V();/*delay(1)*/;}

    /*Testing the ultrasonic sensor*/
    fd=data();
    Serial.print("FD ");
    Serial.println(fd);
    delay(500);

    /*Calibration of the IR sensors*/
    sensorValue1 = digitalRead(sensorPin1);
    sensorValue2 = digitalRead(sensorPin2);
    Serial.print("Pin 1: ");
    Serial.print(sensorValue1);
    Serial.print(" / Pin 2: ");
    Serial.println(sensorValue2);
    Serial.println("-----");
    delay(2000);

    /*If both sensors dont see any black color car stop*/
    if ((digitalRead(L_Sensor) == 0)&&(digitalRead(R_Sensor) == 0)){stop_V();delay(1);}

    if ((digitalRead(L_Sensor) == 1)&&(digitalRead(R_Sensor) == 1)){forward();delay(1);}

    if ((digitalRead(L_Sensor) == 0)&&(digitalRead(R_Sensor) == 1)){turnLeft();delay(1);}

    if ((digitalRead(L_Sensor) == 1)&&(digitalRead(R_Sensor) == 0)){turnRight();delay(1);}

}

long data(){
int duration;
int dist;

    digitalWrite(trigPin,LOW);
    delayMicroseconds(2);
    digitalWrite(trigPin,HIGH);
    delayMicroseconds(20);
    digitalWrite(trigPin,LOW);
    duration=pulseIn(echoPin,HIGH);

```



```

    delay(25);
    dist = (duration*765.*5280.*12) / (3600.*1000000);
    distance=dist/2;
    return distance;
    if ( distance<5){stop_V();delay(1);}
}

/*function that brings the car to a stop*/
void stop_V(){
    digitalWrite(motor1L, LOW);
    digitalWrite(motor1R, LOW);
    digitalWrite(motor2L, LOW);
    digitalWrite(motor2R, LOW);
}

/*function to make robot move forward*/
void forward(){
    digitalWrite(motor1L, HIGH);
    digitalWrite(motor1R, LOW);
    digitalWrite(motor2L, HIGH);
    digitalWrite(motor2R, LOW);
}

/*function that turns the car to the right*/
void turnRight(){
    digitalWrite(motor1L, HIGH);
    digitalWrite(motor1R, LOW);
    digitalWrite(motor2L, LOW);
    digitalWrite(motor2R, LOW);
}

/*function that turns the car to the left*/
void turnLeft(){
    digitalWrite(motor1L, LOW);
    digitalWrite(motor1R, LOW);
    digitalWrite(motor2L, HIGH);
    digitalWrite(motor2R, LOW);
}

```

Conclusion

- Future work
- Improvements