

LAMPIRAN A

Listing Program Arduino

```
#include <Wire.h>
#include <SoftwareSerial.h>
#include <Servo.h>
#define S0 2
#define S1 3
#define S2 8
#define S3 9
#define sensorOut 10

int instruksi = 1;
int redValue;
int greenValue;
int blueValue;
int color = 0;
int a1 = A0;
int a2 = A1;
int a3 = A2;
int a4 = A3;
int a5 = A4;
int a6 = A5;
const int enA = 12;
const int enB = 4;
const int lmf = 5;
const int lmb = 6;
const int rmf = 11;
const int rmb = 7;
const int PIN_SERVO1 = 50;
Servo motorServo1;
const int PIN_SERVO2 = 48;
Servo motorServo2;
const int PIN_SERVO3 = 52;
Servo motorServo3;

void setup() {
  motorServo1.attach(PIN_SERVO1);
  motorServo2.attach(PIN_SERVO2);
```

```

motorServo3.attach(PIN_SERVO3);
pinMode(S0, OUTPUT);
pinMode(S1, OUTPUT);
pinMode(S2, OUTPUT);
pinMode(S3, OUTPUT);
pinMode(sensorOut, INPUT);
pinMode(A0, INPUT);
pinMode(A1, INPUT);
pinMode(A2, INPUT);
pinMode(A3, INPUT);
pinMode(A4, INPUT);
pinMode(A5, INPUT);
pinMode(enA, OUTPUT);
pinMode(enB, OUTPUT);
pinMode(lmf, OUTPUT);
pinMode(lmb, OUTPUT);
pinMode(rmf, OUTPUT);
pinMode(rmb, OUTPUT);
digitalWrite(S0, HIGH);
digitalWrite(S1, LOW);
Serial.begin(9600);
}

void loop() {
servoStay();
a1 = digitalRead(A0);
a2 = digitalRead(A1);
a3 = digitalRead(A2);
a4 = digitalRead(A3);
a5 = digitalRead(A4);
switch (instruksi) {
case 0:
color = readColor();
if (color == 3) {
Serial.println("Deteksi warna: Merah");
instruksi = 11;
}
else if (color == 4) {
Serial.println("Deteksi warna: Hijau");
}
}
}

```

```

    instruksi = 31;
  }
  else if (color == 5) {
    Serial.println("Deteksi warna: Biru");
    instruksi = 51;
  }
  else if (color == 0) {
    servoTurun2();
    instruksi = 6;
  }
  else if (color == 1) {
    servoTurun2();
    instruksi = 6;
  }
  else if (color == 2) {
    servoTurun2();
    instruksi = 6;
  }
  else if (color == 6) {
    servoTurun2();
    instruksi = 6;
  }
  else if (color == 7) {
    servoTurun2();
    instruksi = 6;
  }
  break;
case 23:
  color = readColor();
  if (color == 3) {
    Serial.println("Deteksi warna: Merah");
    instruksi = 11;
  }
  else if (color == 4) {
    Serial.println("Deteksi warna: Hijau");
    instruksi = 31;
  }
  else if (color == 5) {
    Serial.println("Deteksi warna: Biru");

```

```

    instruksi = 51;
  }
  else if (color == 0) {
    servoTurun2();
    instruksi = 22;
  }
  else if (color == 1) {
    servoTurun2();
    instruksi = 22;
  }
  else if (color == 2) {
    servoTurun2();
    instruksi = 22;
  }
  else if (color == 6) {
    servoTurun2();
    instruksi = 22;
  }
  break;
case 45:
  color = readColor();
  if (color == 3) {
    Serial.println("Deteksi warna: Merah");
    instruksi = 11;
  }
  else if (color == 4) {
    Serial.println("Deteksi warna: Hijau");
    instruksi = 31;
  }
  else if (color == 5) {
    Serial.println("Deteksi warna: Biru");
    instruksi = 51;
  }
  else if (color == 0) {
    servoTurun2();
    instruksi = 44;
  }
  else if (color == 1) {
    servoTurun2();

```

```

    instruksi = 44;
  }
  else if (color == 2) {
    servoTurun2();
    instruksi = 44;
  }
  else if (color == 6) {
    servoTurun2();
    instruksi = 44;
  }
  else if (color == 7) {
    servoTurun2();
    instruksi = 44;
  }
  break;
case 1:
  if (detekPerempatan()) {
    lurus2();
    instruksi++;
  }
  break;
case 2:
  otomatis();
  if (detekSimpangan()) {
    lurus();
    robotStop();
    instruksi++;
  }
  break;
case 3:
  belokKanan();
  if (detekTengah()) {
    robotStop();
    instruksi++;
  }
  break;
case 4:
  otomatis();
  if (detekSimpangkiri()) {

```

```

    lurus2();
    instruksi++;
}
break;
case 5:
    otomatis();
    if (detekPerempatan()) {
        robotStop();
        mundurMerah();
        instruksi++;
    }
    break;
case 6:
    if (detekBox()) {
        servoNaikmerah();
        instruksi = 0;
    }
    break;
case 11:
    servoStay();
    mundur();
    instruksi++;
    break;
case 12:
    if (detekSimpangkiri()) {
        robotStop();
        lurus();
        robotStop();
        belokKiri();
        instruksi++;
    }
    break;
case 13:
    if (detekTengah()) {
        robotStop();
        instruksi++;
    }
    break;
case 14:

```

```

otomatis();
if (detekSimpangan()) {
    lurus();
    robotStop();
    belokKanan();
    instruksi++;
}
break;
case 15:
if (detekTengah()) {
    robotStop();
    instruksi++;
}
break;
case 16:
otomatis();
if (detekPerempatan()) {
    robotStop();
    servoTurun();
    mundur();
    instruksi++;
}
break;
case 17:
if (detekPerempatan()) {
    robotStop();
    lurus();
    robotStop();
    belokKanan();
    instruksi++;
}
break;
case 18:
if (detekTengah()) {
    robotStop();
    instruksi++;
}
break;
case 19:

```

```

otomatis();
if (detekPerempatan()) {
    lurus();
    robotStop();
    belokKiri();
    instruksi++;
}
break;
case 20:
if (detekTengah()) {
    robotStop();
    instruksi++;
}
break;
case 21:
otomatis();
if (detekPerempatan()) {
    robotStop();
    mundurHijau();
    instruksi++;
}
break;
case 22:
if (detekBox()) {
    servoNaikhijau();
    instruksi = 23;
}
break;
case 31:
servoStay();
mundur();
instruksi++;
break;
case 32:
if (detekSimpangkiri()) {
    robotStop();
    lurus();
    robotStop();
    belokKiri();
}

```



```

    instruksi++;
}
break;
case 33:
    if (detekTengah()) {
        robotStop();
        instruksi++;
    }
    break;
case 34:
    otomatis();
    if (detekSimpangkanan()) {
        lurus2();
        instruksi++;
    }
    break;
case 35:
    otomatis();
    if (detekSimpangkanan()) {
        lurus();
        robotStop();
        belokKanan();
        instruksi++;
    }
    break;
case 36:
    if (detekTengah()) {
        robotStop();
        instruksi++;
    }
    break;
case 37:
    otomatis();
    if (detekPerempatan()) {
        robotStop();
        servoTurun();
        mundur();
        instruksi++;
    }

```

```

break;
case 38:
if (detekPerempatan()) {
robotStop();
lurus();
robotStop();
belokKanan();
instruksi++;
}
break;
case 39:
if (detekTengah()) {
robotStop();
instruksi++;
}
break;
case 40:
otomatis();
if (detekSimpangkiri()) {
lurus2();
instruksi++;
}
break;
case 41:
otomatis();
if (detekPerempatan()) {
lurus();
robotStop();
belokKiri();
instruksi++;
}
break;
case 42:
if (detekTengah()) {
robotStop();
instruksi++;
}
break;
case 43:

```

```

otomatis();
if (detekPerempatan()) {
    robotStop();
    mundurBiru();
    instruksi++;
}
break;
case 44:
if (detekBox()) {
    servoNaikbiru();
    instruksi = 45;
}
break;
case 51:
servoStay();
mundur();
instruksi++;
break;
case 52:
if (detekSimpangkiri()) {
    robotStop();
    lurus();
    robotStop();
    belokKiri();
    instruksi++;
}
break;
case 53:
if (detekTengah()) {
    robotStop();
    instruksi++;
}
break;
case 54:
otomatis();
if (detekSimpangkanan()) {
    lurus2();
    instruksi++;
}

```

```
break;
case 55:
  otomatis();
  if (detekSimpangkalan()) {
    lurus2();
    instruksi++;
  }
  break;
case 56:
  otomatis();
  if (detekSimpangkalan()) {
    lurus();
    robotStop();
    belokKanan();
    instruksi++;
  }
  break;
case 57:
  if (detekTengah()) {
    robotStop();
    instruksi++;
  }
  break;
case 58:
  otomatis();
  if (detekPerempatan()) {
    robotStop();
    servoTurun();
    mundur();
    instruksi++;
  }
  break;
case 59:
  if (detekSimpangkalan()) {
    robotStop();
    lurus();
    robotStop();
    belokKanan();
    instruksi++;
```

```

    }
    break;
case 60:
    if (detekTengah()) {
        robotStop();
        instruksi++;
    }
    break;
case 61:
    otomatis();
    if (detekSimpangkiri()) {
        lurus2();
        instruksi++;
    }
    break;
case 62:
    otomatis();
    if (detekSimpangkiri()) {
        lurus2();
        instruksi++;
    }
    break;
case 63:
    otomatis();
    if (detekPerempatan()) {
        lurus();
        robotStop();
        instruksi++;
    }
    break;
case 64:
    belokKanan();
    if (detekTengah()) {
        robotStop();
        instruksi++;
    }
    break;
case 65:
    otomatis();

```

```

    if (detekSimpangkiri()) {
        lurus();
        robotStop();
        belokKiri();
        instruksi++;
    }
    break;
case 66:
    if (detekTengah()) {
        robotStop();
        instruksi++;
    }
    break;
case 67:
    otomatis();
    if (detekPerempatan()) {
        robotStop();
        putarBalik();
        instruksi++;
    }
    break;
case 68:
    if (detekTengah()) {
        robotStop();
        mundur();
        instruksi++;
    }
    break;
case 69:
    if (detekPerempatan()) {
        robotStop();
        instruksi = 1;
    }
    break;
}
}

int readColor() {
    digitalWrite(S2, LOW);

```

```

digitalWrite(S3, LOW);
redValue = pulseIn(sensorOut, LOW);
Serial.print("R = ");
Serial.print(redValue);
delay(100);
digitalWrite(S2, HIGH);
digitalWrite(S3, HIGH);
greenValue = pulseIn(sensorOut, LOW);
Serial.print(" G = ");
Serial.print(greenValue);
delay(100);
digitalWrite(S2, LOW);
digitalWrite(S3, HIGH);
blueValue = pulseIn(sensorOut, LOW);
Serial.print(" B = ");
Serial.println(blueValue);
delay(100);
if (redValue < 21 && redValue > 38) {
    delay(2500);
    Serial.println("Warna tidak dikenali, tidak ada respon");
    return 0;
}
else if (greenValue < 20 || greenValue > 70) {
    delay(2500);
    Serial.println("Warna tidak dikenali, tidak ada respon");
    return 1;
}
else if (blueValue < 22 || blueValue > 60) {
    delay(2500);
    Serial.println("Warna tidak dikenali, tidak ada respon");
    return 2;
}
else if (warnaMerah() && redValue < greenValue && redValue <
blueValue) {
    Serial.println("Warna merah");
    delay(2000);
    return 3;
}

```

```

else if (warnaHijau() && greenValue < redValue && greenValue <
blueValue) {
    Serial.println("Warna hijau");
    delay(2000);
    return 4;
}
else if (warnaBiru() && blueValue < redValue && blueValue <
greenValue) {
    Serial.println("Warna biru");
    delay(2000);
    return 5;
}
else if (redValue >= 42 && greenValue >= 50 && blueValue >= 76) {
    delay(2500);
    Serial.println("Warna tidak dikenali, tidak ada respon");
    return 6;
}
else {
    delay(2500);
    Serial.println("Warna tidak dikenali, tidak ada respon");
    return 7;
}
}
}
bool detekSimpangkanan() {
    if (a5 == 1) {
        return true;
    } else {
        return false;
    }
}
bool detekSimpangkiri() {
    if (a1 == 1) {
        return true;
    } else {
        return false;
    }
}
bool detekPerempatan() {
    if (a5 == 1 && a1 == 1) {

```



```

    return true;
  } else {
    return false;
  }
}
bool detekTengah() {
  if (a3 == 1) {
    return true;
  } else {
    return false;
  }
}
bool detekBox() {
  a6 = digitalRead(A5);
  if (a6 == 0) {
    return true;
  } else {
    return false;
  }
}
bool warnaMerah() {
  if (redValue >= 22 && redValue <= 35) {
    return true;
  } else {
    return false;
  }
}
bool warnaHijau() {
  if (greenValue >= 30 && greenValue <= 55) {
    return true;
  } else {
    return false;
  }
}
bool warnaBiru() {
  if (blueValue >= 23 && blueValue <= 35) {
    return true;
  } else {
    return false;
  }
}

```

```

}
}

void belokKanan() {
    digitalWrite(rmf, LOW);
    digitalWrite(rmb, HIGH);
    digitalWrite(lmf, HIGH);
    digitalWrite(lmb, LOW);
    analogWrite(enA, 160);
    analogWrite(enB, 180);
    delay(1000);
    digitalWrite(rmf, LOW);
    digitalWrite(rmb, HIGH);
    digitalWrite(lmf, HIGH);
    digitalWrite(lmb, LOW);
    analogWrite(enA, 160);
    analogWrite(enB, 180);
    a1 = digitalRead(A0);
    a2 = digitalRead(A1);
    a3 = digitalRead(A2);
    a4 = digitalRead(A3);
    a5 = digitalRead(A4);
}

void belokKiri() {
    digitalWrite(rmf, HIGH);
    digitalWrite(rmb, LOW);
    digitalWrite(lmf, LOW);
    digitalWrite(lmb, HIGH);
    analogWrite(enA, 160);
    analogWrite(enB, 180);
    delay(1000);
    digitalWrite(rmf, HIGH);
    digitalWrite(rmb, LOW);
    digitalWrite(lmf, LOW);
    digitalWrite(lmb, HIGH);
    analogWrite(enA, 160);
    analogWrite(enB, 180);
    a1 = digitalRead(A0);
    a2 = digitalRead(A1);
}

```

```

a3 = digitalRead(A2);
a4 = digitalRead(A3);
a5 = digitalRead(A4);
}
void lurus() {
  digitalWrite(rmf, HIGH);
  digitalWrite(rmb, LOW);
  digitalWrite(lmf, HIGH);
  digitalWrite(lmb, LOW);
  analogWrite(enA, 220);
  analogWrite(enB, 255);
  delay(2400);
}
void lurus2() {
  digitalWrite(rmf, HIGH);
  digitalWrite(rmb, LOW);
  digitalWrite(lmf, HIGH);
  digitalWrite(lmb, LOW);
  analogWrite(enA, 220);
  analogWrite(enB, 255);
  delay(900);
}
void mundur() {
  digitalWrite(rmf, LOW);
  digitalWrite(rmb, HIGH);
  digitalWrite(lmf, LOW);
  digitalWrite(lmb, HIGH);
  analogWrite(enA, 150);
  analogWrite(enB, 200);
  delay(1200);
}
void mundurBiru() {
  digitalWrite(rmf, LOW);
  digitalWrite(rmb, HIGH);
  digitalWrite(lmf, LOW);
  digitalWrite(lmb, HIGH);
  analogWrite(enA, 150);
  analogWrite(enB, 200);
  delay(100);
}

```

```

    robotStop();
}
void mundurMerah() {
    digitalWrite(rmf, LOW);
    digitalWrite(rmb, HIGH);
    digitalWrite(lmf, LOW);
    digitalWrite(lmb, HIGH);
    analogWrite(enA, 150);
    analogWrite(enB, 200);
    delay(1350);
    robotStop();
}
void mundurHijau() {
    digitalWrite(rmf, LOW);
    digitalWrite(rmb, HIGH);
    digitalWrite(lmf, LOW);
    digitalWrite(lmb, HIGH);
    analogWrite(enA, 150);
    analogWrite(enB, 200);
    delay(1000);
    robotStop();
}
void otomatis() {
    a1 = digitalRead(A0);
    a2 = digitalRead(A1);
    a3 = digitalRead(A2);
    a4 = digitalRead(A3);
    a5 = digitalRead(A4);
    if (a3 == 1) {
        digitalWrite(rmf, HIGH);
        digitalWrite(rmb, LOW);
        digitalWrite(lmf, HIGH);
        digitalWrite(lmb, LOW);
        analogWrite(enA, 150);
        analogWrite(enB, 190);
    }
    if (a4 == 1) {
        digitalWrite(rmf, HIGH);
        digitalWrite(rmb, LOW);
    }
}

```

```

    digitalWrite(lmf, HIGH);
    digitalWrite(lmb, LOW);
    analogWrite(enA, 90);
    analogWrite(enB, 255);
}
if (a2 == 1) {
    digitalWrite(rmf, HIGH);
    digitalWrite(rmb, LOW);
    digitalWrite(lmf, HIGH);
    digitalWrite(lmb, LOW);
    analogWrite(enA, 255);
    analogWrite(enB, 90);
}
}
void putarBalik() {
    digitalWrite(rmf, HIGH);
    digitalWrite(rmb, LOW);
    digitalWrite(lmf, LOW);
    digitalWrite(lmb, HIGH);
    analogWrite(enA, 145);
    analogWrite(enB, 210);
    delay(5000);
}
void robotStop() {
    digitalWrite(rmf, LOW);
    digitalWrite(rmb, LOW);
    digitalWrite(lmf, LOW);
    digitalWrite(lmb, LOW);
    analogWrite(enA, 0);
    analogWrite(enB, 0);
    delay(400);
}
void servoNaikbiru() {
    motorServo3.write(0);
    delay(1000);
    motorServo1.write(10);
    delay(1000);
    motorServo2.write(18);
    delay(1000);
}

```

```

motorServo1.write(100);
delay(1000);
motorServo3.write(180);
delay(1000);
motorServo1.write(73);
delay(1000);
motorServo2.write(0);
delay(1000);
motorServo1.write(100);
delay(1000);
}
void servoNaikhijau() {
motorServo3.write(0);
delay(1000);
motorServo1.write(45);
delay(1000);
motorServo2.write(18);
delay(1000);
motorServo1.write(100);
delay(1000);
motorServo3.write(180);
delay(1000);
motorServo1.write(73);
delay(1000);
motorServo2.write(0);
delay(1000);
motorServo1.write(100);
delay(1000);
}

void servoNaikmerah() {
motorServo3.write(0);
delay(1000);
motorServo1.write(70);
delay(1000);
motorServo2.write(19);
delay(1000);
motorServo1.write(100);
delay(1000);
}

```

```

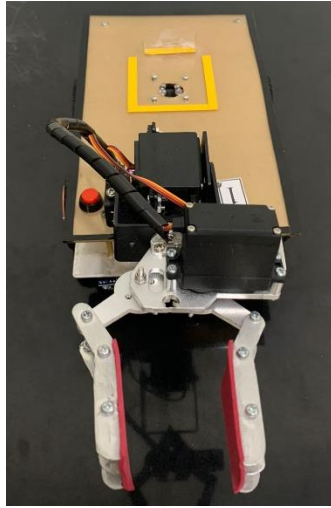
motorServo3.write(180);
delay(1000);
motorServo1.write(73);
delay(1000);
motorServo2.write(0);
delay(1000);
motorServo1.write(100);
delay(1000);
}
void servoNaikmerah() {
motorServo3.write(0);
delay(1000);
motorServo1.write(70);
delay(1000);
motorServo2.write(19);
delay(1000);
motorServo1.write(100);
delay(1000);
motorServo3.write(180);
delay(1000);
motorServo1.write(73);
delay(1000);
motorServo2.write(0);
delay(1000);
motorServo1.write(100);
delay(1000);
}
void servoNaik() {
motorServo3.write(0);
delay(1000);
motorServo1.write(10);
delay(1000);
motorServo2.write(18);
delay(1000);
motorServo3.write(30);
delay(1000);
motorServo1.write(100);
delay(1000);
motorServo3.write(180);

```

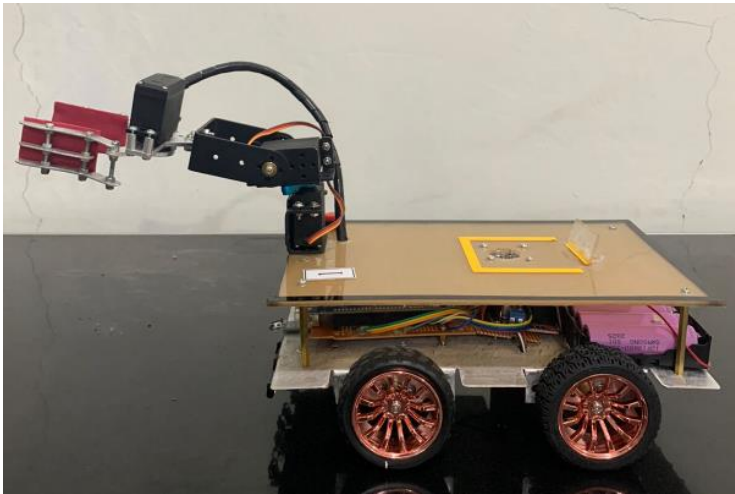
```
delay(1000);
motorServo1.write(65);
delay(1000);
motorServo2.write(0);
delay(1000);
motorServo1.write(100);
delay(1000);
}
void servoStay() {
  motorServo1.write(100);
  motorServo2.write(0);
  motorServo3.write(180);
}
```


LAMPIRAN B

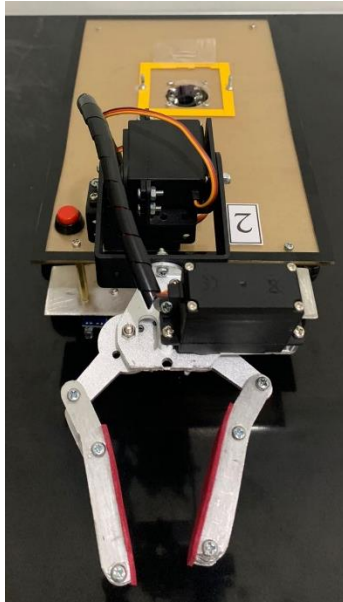
Dokumentasi Alat



Gambar 1 Tampak Depan Robot 1



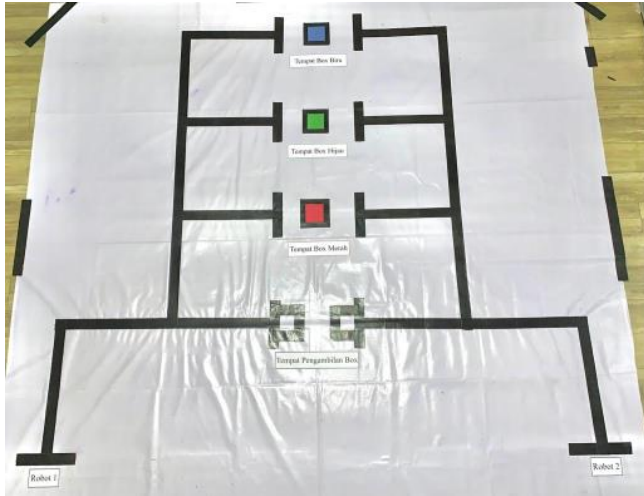
Gambar 2 Tampak Samping Robot 1



Gambar 3 Tampak Depan Robot 2



Gambar 4 Tampak Samping Robot 2



Gambar 5 Jalur Lintasan



Gambar 6 Box