

```

/*obstacle avoiding, Bluetooth control, voice control robot car.
*/
#include <Servo.h>
#include <AFMotor.h>
#define Echo A0
#define Trig A1
#define motor 10
#define Speed 170
#define spoint 103
char value;
int distance;
int Left;
int Right;
int L = 0;
int R = 0;
int L1 = 0;
int R1 = 0;
Servo servo;
AF_DCMotor M1(1);
AF_DCMotor M2(2);
AF_DCMotor M3(3);
AF_DCMotor M4(4);
void setup() {
  Serial.begin(9600);
  pinMode(Trig, OUTPUT);
  pinMode(Echo, INPUT);
  servo.attach(motor);
  M1.setSpeed(Speed);
  M2.setSpeed(Speed);
  M3.setSpeed(Speed);
  M4.setSpeed(Speed);
}
void loop() {
  //Obstacle();
  //Bluetoothcontrol();
  //voicecontrol();
}
void Bluetoothcontrol() {
  if (Serial.available() > 0) {
    value = Serial.read();
    Serial.println(value);
  }
  if (value == 'F') {
    forward();
  } else if (value == 'B') {
    backward();
  } else if (value == 'L') {
    left();
  } else if (value == 'R') {
    right();
  }
}

```

```

    } else if (value == 'S') {
    Stop();
    }
    }

    void Obstacle() {
    distance = ultrasonic();
    if (distance <= 12) {
    Stop();
    backward();
    delay(100);
    Stop();
    L = leftsee();
    servo.write(spoint);
    delay(800);
    R = rightsee();
    servo.write(spoint);
    if (L < R) {
    right();
    delay(500);
    Stop();
    delay(200);
    } else if (L > R) {
    left();
    delay(500);
    Stop();
    delay(200);
    }
    } else {
    forward();
    }
    }

    void voicecontrol() {
    if (Serial.available() > 0) {
    value = Serial.read();
    Serial.println(value);
    if (value == '^') {
    forward();
    } else if (value == '-') {
    backward();
    } else if (value == '<') {
    L = leftsee();
    servo.write(spoint);
    if (L >= 10 ) {
    left();
    delay(500);
    Stop();
    } else if (L < 10) {
    Stop();
    }
    } else if (value == '>') {

```

```

R = rightsee();
servo.write(spoint);
if (R >= 10 ) {
  right();
  delay(500);
  Stop();
} else if (R < 10) {
  Stop();
}
} else if (value == '*') {
  Stop();
}
}
}

// Ultrasonic sensor distance reading function
int ultrasonic() {
  digitalWrite(Trig, LOW);
  delayMicroseconds(4);
  digitalWrite(Trig, HIGH);
  delayMicroseconds(10);
  digitalWrite(Trig, LOW);
  long t = pulseIn(Echo, HIGH);
  long cm = t / 29 / 2; //time convert distance
  return cm;
}

void forward() {
  M1.run(FORWARD);
  M2.run(FORWARD);
  M3.run(FORWARD);
  M4.run(FORWARD);
}

void backward() {
  M1.run(BACKWARD);
  M2.run(BACKWARD);
  M3.run(BACKWARD);
  M4.run(BACKWARD);
}

void right() {
  M1.run(BACKWARD);
  M2.run(BACKWARD);
  M3.run(FORWARD);
  M4.run(FORWARD);
}

void left() {
  M1.run(FORWARD);
  M2.run(FORWARD);
  M3.run(BACKWARD);
  M4.run(BACKWARD);
}

void Stop() {

```

```
M1.run(RELEASE);
M2.run(RELEASE);
M3.run(RELEASE);
M4.run(RELEASE);
}
int rightsee() {
servo.write(20);
delay(800);
Left = ultrasonic();
return Left;
}
int leftsee() {
servo.write(180);
delay(800);
Right = ultrasonic();
return Right;
}
```

- **Code explanation**

- Firstly, libraries are included.

```
#include <Servo.h>
#include <AFMotor.h>
```

- Secondly, ultrasonic sensor pins, servo motor pin, motor speed, and servo motor starting point are defined.

```
#define Echo A0
#define Trig A1
#define motor 10
#define Speed 170
#define spoint 103
```

- Thirdly, some variables have been created to help the program.

```
char value;
int distance;
int Left;
int Right;
int L = 0;
int R = 0;
int L1 = 0;
int R1 = 0;
```

- Then, objects are created for the Servo Library and the AFMotor Library.

```
Servo servo;
AF_DCMotor M1(1);
AF_DCMotor M2(2);
AF_DCMotor M3(3);
AF_DCMotor M4(4);
```

- In the setup function, Ultrasonic pins are set to INPUT and OUTPUT. Also, the gear motor speeds have been included.

```
void setup() {
  Serial.begin(9600);
  pinMode(Trig, OUTPUT);
  pinMode(Echo, INPUT);
  servo.attach(motor);
  M1.setSpeed(Speed);
```

```
M2.setSpeed(Speed);
M3.setSpeed(Speed);
M4.setSpeed(Speed);
}
```

- In the loop function, the three main functions are included. we can run these functions one by one. These are described below.

```
void loop() {
  //Obstacle();
  //Bluetoothcontrol();
  //voicecontrol();
}
```

- This function includes the Bluetooth control code. The code lines are described one by one in the code

```
void Bluetoothcontrol() {
```

```
//gets the serial communication values and puts them into the char variable.
```

```
  if (Serial.available() > 0) {
    value = Serial.read();
    Serial.println(value);
  }
  //Next, these values are checked using the IF condition.
  //Then, if the char value is 'F', the car moves forward.
  if (value == 'F') {
    forward();
  }
  //If the char value is "B", the car moves backward.
  } else if (value == 'B') {
    backward();
  }
  //If the char value is "L", the car moves left.
  } else if (value == 'L') {
    left();
  }
  //If the char value is "R", the car moves right.
  } else if (value == 'R') {
    right();
  }
  //If the char value is "S", the car is stopped.
  } else if (value == 'S') {
    Stop();
  }
}
```

- This function includes the obstacle-avoiding code. The code lines are described one by one in the code.

```
void Obstacle() {  
  
  //gets the ultrasonic sensor reading and puts it into the variable.  
  distance = ultrasonic();  
  
  //then, these values are checked using the IF condition.  
  //If the value is less than or equal to 12,  
  //the robot is stopped and the servo motor rotate left and right.  
  // Also, gets both side distance.  
  if (distance <= 12) {  
    Stop();  
    backward();  
    delay(100);  
    Stop();  
    L = leftsee();  
    servo.write(spoint);  
    delay(800);  
    R = rightsee();  
    servo.write(spoint);  
  
    //After, if the left side distance less than the right-side distance. The robot turns right.  
    if (L < R) {  
      right();  
      delay(500);  
      Stop();  
      delay(200);  
  
      //After, if the left side distance more than the right-side distance. The robot turns left.  
    } else if (L > R) {  
      left();  
      delay(500);  
      Stop();  
      delay(200);  
    }  
  
    //Otherwise, the robot moves forward.  
  } else {  
    forward();  
  }  
}
```

- This function includes the voice control code. The code lines are described one by one in the code.

```
void voicecontrol() {  
  
  //gets the serial communication values and puts them into the char variable.  
  if (Serial.available() > 0) {  
    value = Serial.read();  
    Serial.println(value);  
  
    //If the char value is "^", the car moves forward.  
    if (value == '^') {  
      forward();  
  
      //If the char value is "-", the car moves backward.  
    } else if (value == '-') {  
      backward();  
  
      //If the char value is "<", the car moves left.  
    } else if (value == '<') {  
      L = leftsee();  
      servo.write(spoint);  
      if (L >= 10 ) {  
        left();  
        delay(500);  
        Stop();  
      } else if (L < 10) {  
        Stop();  
      }  
  
      //If the char value is ">", the car moves right.  
    } else if (value == '>') {  
      R = rightsee();  
      servo.write(spoint);  
      if (R >= 10 ) {  
        right();  
        delay(500);  
        Stop();  
      } else if (R < 10) {  
        Stop();  
      }  
  
      //If the char value is "*", the car is stopped.  
    } else if (value == '*') {  
      Stop();  
    }  
  }  
}
```