OBSTACLE AVOIDING AND BLUETOOTH CONTROL ROBOT
A PROJECT REPORT

For
Product Realization Lab

Submitted by

Prathamesh Bajaj (2203051130024)

Bachelor of Technology in Mechatronics Engineering

Under the Guidance of

Dr. Prince Jain
Assistant Professor

Mechatronics Engineering Department
Parul Institute of Technology
Parul University, Vadodara (2023-24)

Table of Contents

1. Introduction

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read inputs – light on a sensor, a finger on a button, or even a Twitter message – and turn it into an output, such as activating a motor, turning on an LED, or publishing something online. The board is programmed using the Arduino programming language (based on Wiring) and the Arduino IDE (based on Processing).

This project presents a multifunctional robot built using Arduino. With appropriate coding, it can function as an obstacle avoiding robot or a Bluetooth-controlled robot.

2. Project Components

Arduino UNO
Based on the ATmega328P microcontroller with digital and analog I/O pins, widely used for prototyping.

Gear Motor
Motors with integrated gear systems for high torque and low speed applications.

Robot Wheels
Four wheels required to enable robot movement.

Motor Driver (L293D)
Provides bidirectional drive currents of up to 600mA, suitable for DC and stepper motors.

Ultrasonic Sensor
Measures distance using sound waves, commonly used for obstacle detection.

Bluetooth Module
Enables wireless communication between devices for control signals.

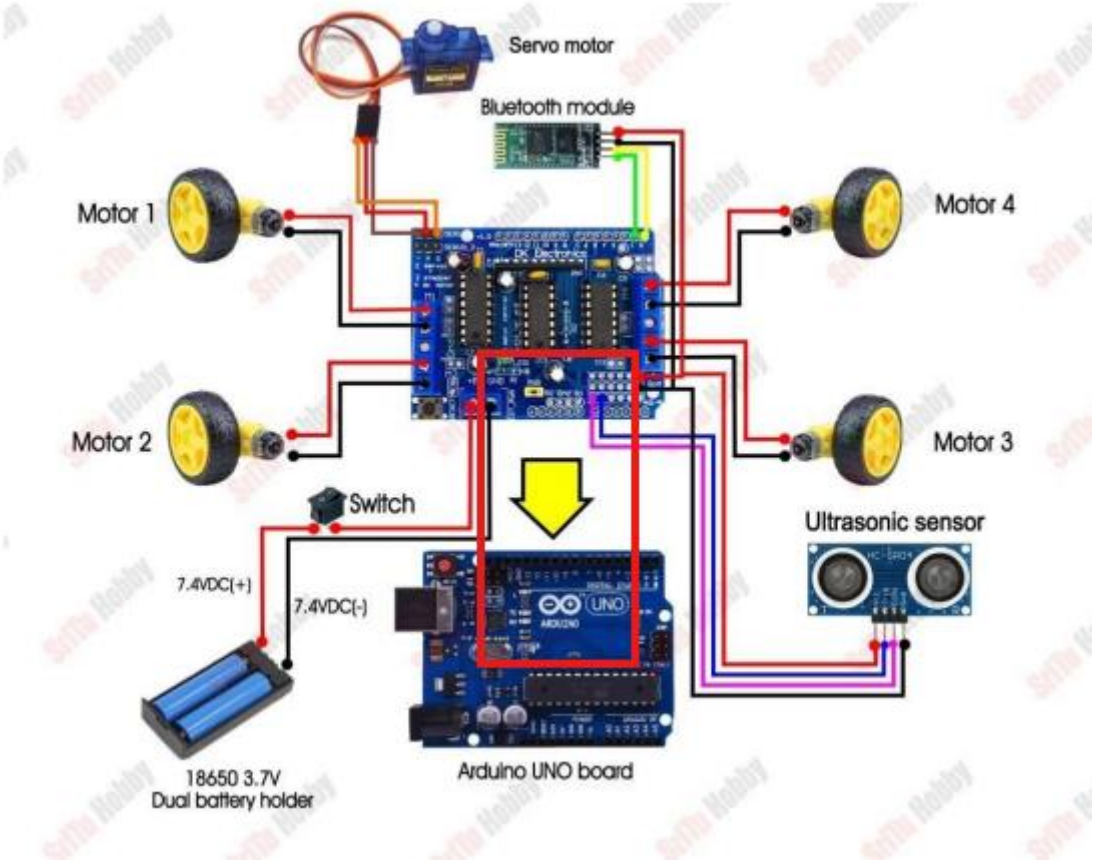
Li-ion Battery
Rechargeable battery with high energy density, typically using graphite as an anode.

Jumper Wires
Used for electrical connections between components.

Dot Board
Used for mounting and soldering components in circuit design.

3. System / Circuit Design

The Arduino UNO board is connected to all components as per the designed circuit diagram. The motor driver controls the motors, the ultrasonic sensor detects obstacles, and the Bluetooth module allows wireless control.



4. Software Development

The Arduino platform has been the foundation of thousands of projects worldwide. In this project, Arduino IDE is used for coding in C/C++ to implement obstacle avoidance and Bluetooth-based control.

Code Snippet

Sample implementation for obstacle avoidance and Bluetooth control is provided below:

/* Arduino Obstacle Avoiding & Bluetooth Control Robot */

```
#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);

XIII 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();
}
XIV 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
XV <= 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();
}
XVI }
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();
XVII 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;
}
XVIII  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);
```

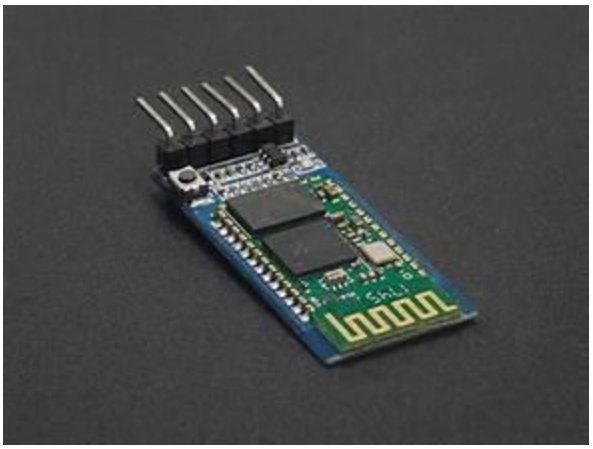
```
XIX  M2.run(FORWARD);
M3.run(BACKWARD);
M4.run(BACKWARD);
}
void Stop() {
M1.run(RELEASE);
M2.run(RELEASE);
M3.run(RELEASE);
M4.run(RELEASE);
} int rightsee() {
servo.write(20);
delay(800);  Left =
ultrasonic();  return
Left;
} int leftsee() {
servo.write(180);
delay(800);  Right =
XX ultrasonic();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

5. Hardware Implementation

The Arduino UNO board is interfaced with various hardware components. The Bluetooth module receives signals from a mobile device, while the ultrasonic sensor detects obstacles in real-time. The motor driver provides sufficient current to drive the motors.

6. Bluetooth Control

Bluetooth is a short-range wireless technology standard for data exchange between devices. In this project, the robot is controlled wirelessly using Bluetooth signals from a mobile device.



7. Conclusion

This multifunctional robot demonstrates two modes of operation – obstacle avoidance and Bluetooth control. Such robots can be applied in areas such as surveillance, automated transport, and personal assistance, making everyday tasks more efficient.

8. References

- https://youtu.be/aE_J7B-O4VQ
- https://en.wikipedia.org/wiki/Bluetooth
- https://docs.arduino.cc/learn/starting-guide/whats-arduino
- https://en.wikipedia.org/wiki/Lithium-ion_battery