Bluetooth-Controlled Robot Vehicle

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Introduction

I built a robot vehicle implementing with the pulse-width modulation, bluetooth communication, and differential wheels as one of my personal projects. This project is intended to investigate the application of differential drives on a robot vehicle. Furthermore, it can be served as a basic guideline for building robots of any kind since it is simple to build and easy to make further improvement. The fabrication cost is about $60.

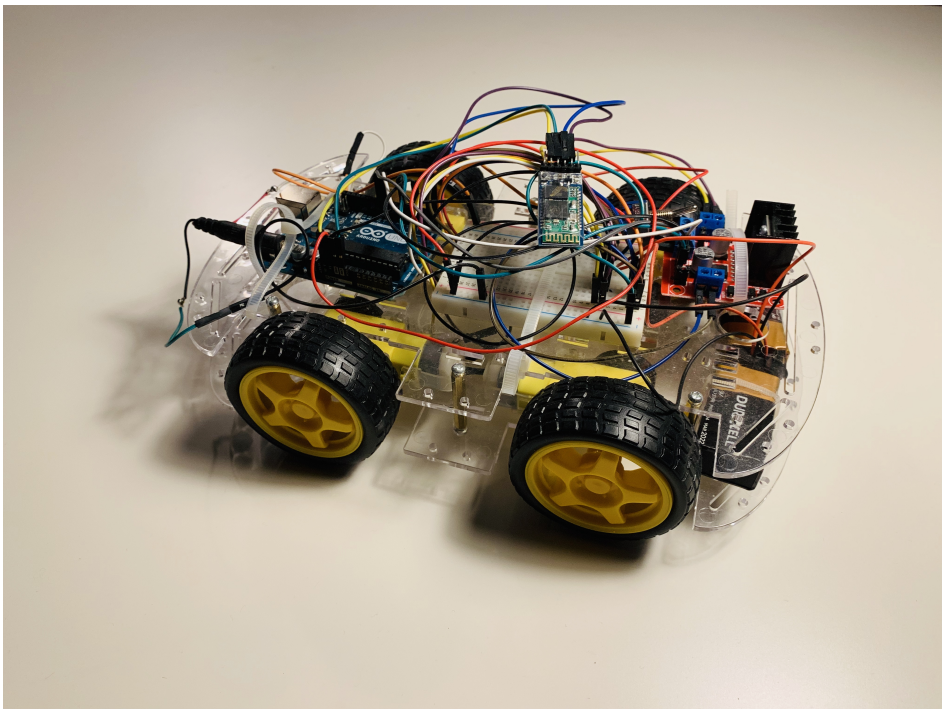

Figure 1: The completed bluetooth controlled robotic vehicle.

1 Mechanical System

The main component consists:

- Car Chassis: I brought two acrylic boards and four wheels on Amazon for quick prototyping purposes.
- 4 Motors: Four motors are brushed gear motors with DC 6 - 9 voltage power supply. These motors are standard and simple to control with PWM.
- Bread Board: Breadboard is used to organize all wires.
- Arduino Uno: Arduino Uno is used as the microcontroller.
- H-Bridge: L298N Motor Drive Controller Board DC Dual H-Bridge is used as the intermediate component between the microcontroller and the motors. It allows speed and direction control by reading four PWM signals from the microcontroller.

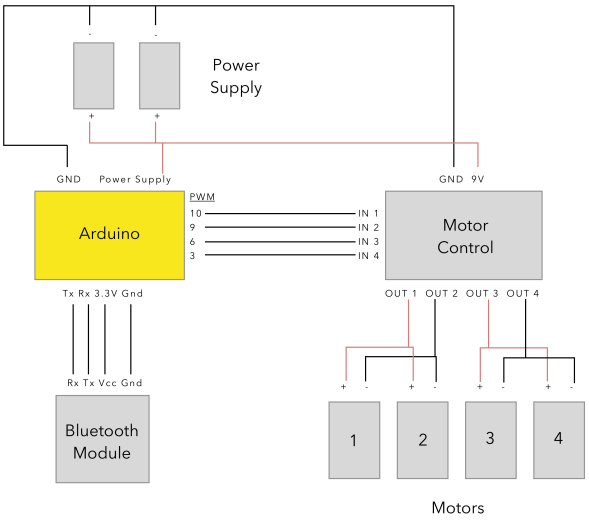

Figure 2: Overall electronics schematics.

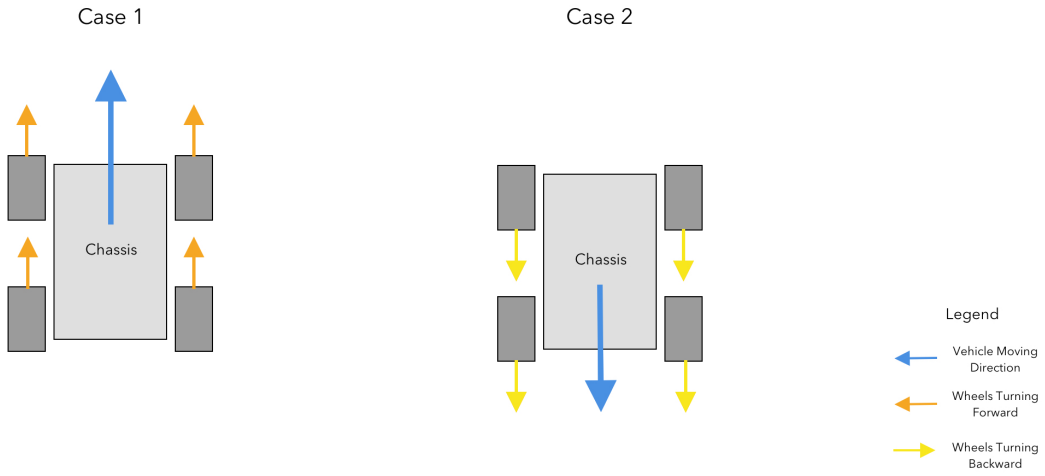

Figure 3: Four wheels are activated in the same spin direction to drive the vehicle forward and backward.

- 9 V Batteries: Two 9-V Batteries are used for powering the microcontroller and the four motors.
- Bluetooth Module: Bluetooth module is used to communicate between the microcontroller and the laptop monitor. The microcontroller reads the command received from the bluetooth module.

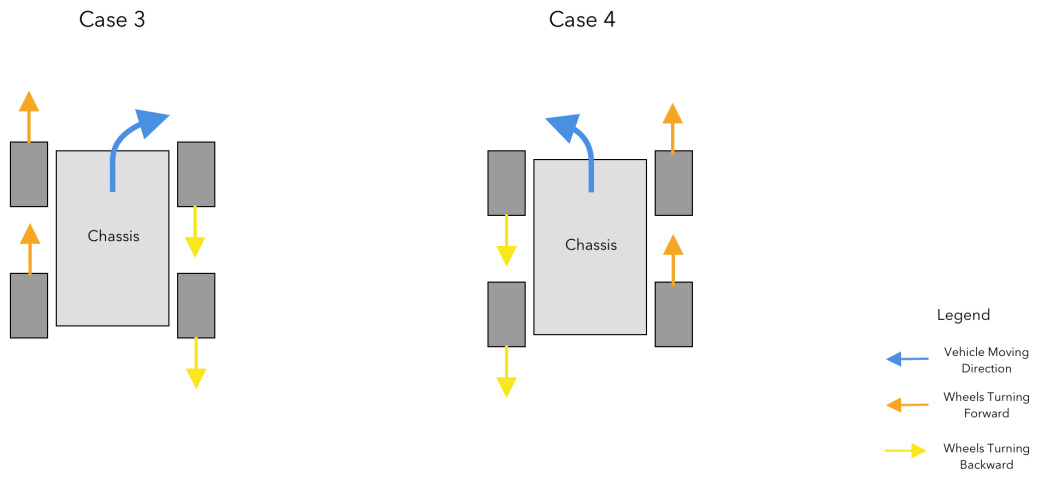

Figure 4: Two sides of wheels spin in an opposite direction, resulting in chassis spinning along the central axis.

2 Design Analysis

This project uses differential drive to change direction. Motors on two sides can run at a different speed or in the opposite direction. The difference of the wheel's spinning speed would cause the chassis to turn. According to Fig 2., case 2 and case 3 represent two sides of wheels spin in an opposite direction. As a result, the chassis will spin along the central axis.

3 Code

This is the Arduino code implemented for the hardware.

```
int v = 200;

void setup() {
  // initialize serial:
  Serial.begin(9600);
  // initialize the led pin
}

void loop() {
  while (Serial.available()) {
    char inChar = (char)Serial.read();
    switch(inChar) {
      case 'd':
        analogWrite(3,v);
       analogWrite(6,0);
       analogWrite(9,v);
```

```
        analogWrite(10,0);
      break;
      case 'a':
        analogWrite(3,0);
        analogWrite(6,v);
        analogWrite(9,0);
        analogWrite(10,v);
      break;
      case 's':
        analogWrite(3,v);
        analogWrite(6,0);
        analogWrite(9,0);
        analogWrite(10,v);
      break;
      case 'w':
        analogWrite(3,0);
        analogWrite(6,v);
        analogWrite(9,v);
        analogWrite(10,0);
      break;
      case '0':
        analogWrite(3,0);
        analogWrite(6,0);
        analogWrite(9,0);
        analogWrite(10,0);
      break;
    }
    Serial.println(inChar);
  }
}
```