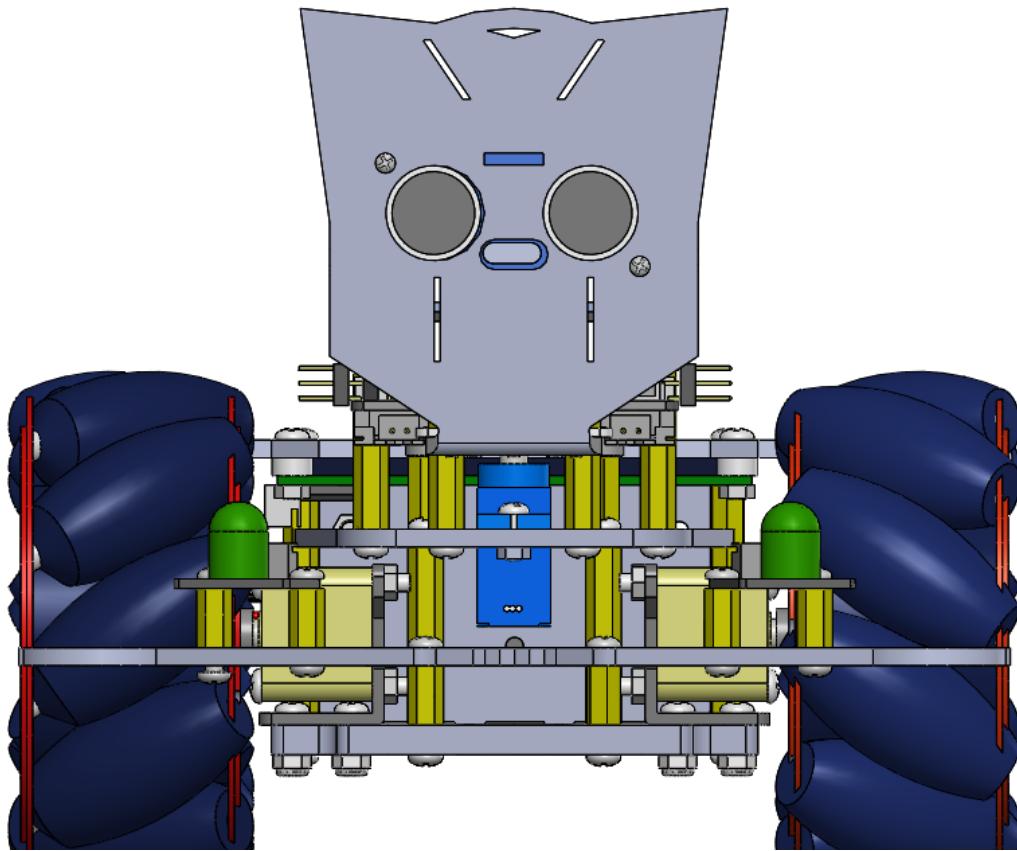# The 4WD Mecanum Wheels Robot Car For Arduino

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## Table

1 Overview

This is a 4WD Robot Car based on Arduino. The use of Mecanum wheels is different from traditional wheels, and Mecanum wheels have the characteristics of flexibility, precision, and efficiency, making them a controllable universal wheel. The operation mode of this type of car is different from traditional cars, as it has a special lateral motion mode. Each wheel can be individually controlled, making the motion of the car diverse and freely defined.

The Robot Control Board, as the main control board of this kit, is compatible with Arduino UNO R3 and more powerful than its functionality. You can use it as a development board to conduct more interesting experiments with other modules.

Robot APP, as the WIFI control APP of this kit, is compatible with ESP8266-01; ESP8266-01S; You can use this app with WiFi modules such as ESP32 to conduct more WiFi control experiments.
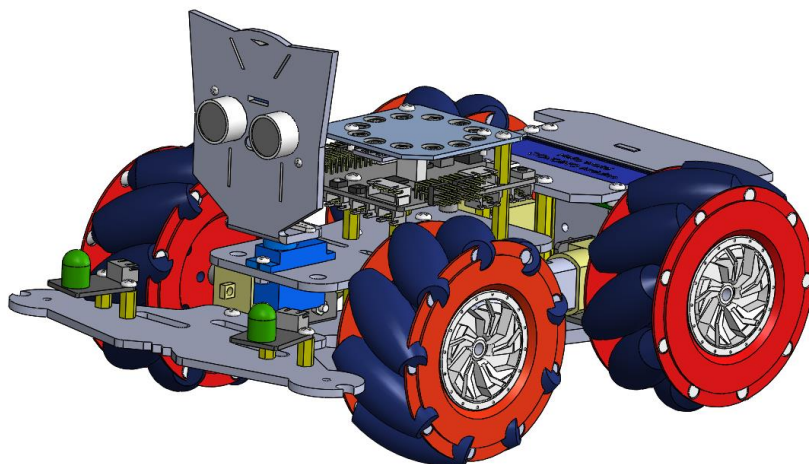
2 Introduction to the Mecanum wheel

Mecanum Wheel is a patent of the Swedish company Mecanum. This omnidirectional movement is based on the principle of a center wheel with many axles located around the wheel, and these angular peripheral axles convert part of the wheel steering force into a normal force of the wheel.

Depending on the direction and speed of the respective wheels, the final combination of these forces produces a resultant force vector in any desired direction, thus ensuring that the platform can move freely in the direction of the resultant force vector without changing the direction of the wheels themselves. Many small rollers are distributed diagonally on its rim, so the wheel can slip laterally. The bus bar of the small roller is very special, when the wheel rotates around the fixed wheel mandrel, the envelope of each small roller is a cylinder, so the wheel can continuously roll forward. The McNamum wheel is a very successful all-round wheel with compact structure and flexible movement. There are four of these new wheels in combination, which can be more flexible and convenient to achieve all-round mobility.
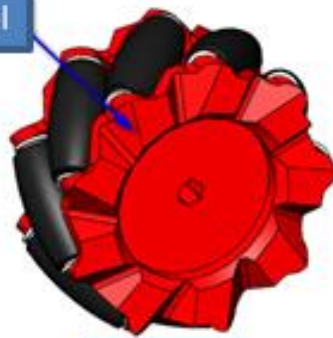
3 Mecanum wheel drive Robot Car movement mode

3.1 Distribution of Mecanum wheels on the Robot Car

We define the wheel with the "L"character as the A wheel and the "R"character as the B wheel. Wheel A (left) and wheel B (right) are mirror images of each other.
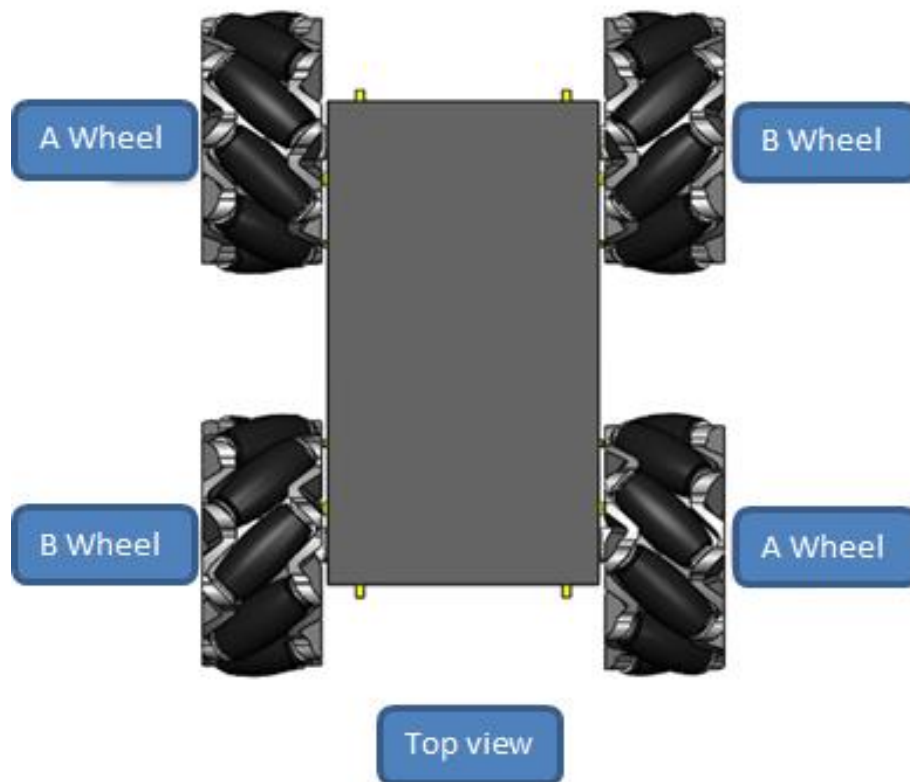
Shooting wheel
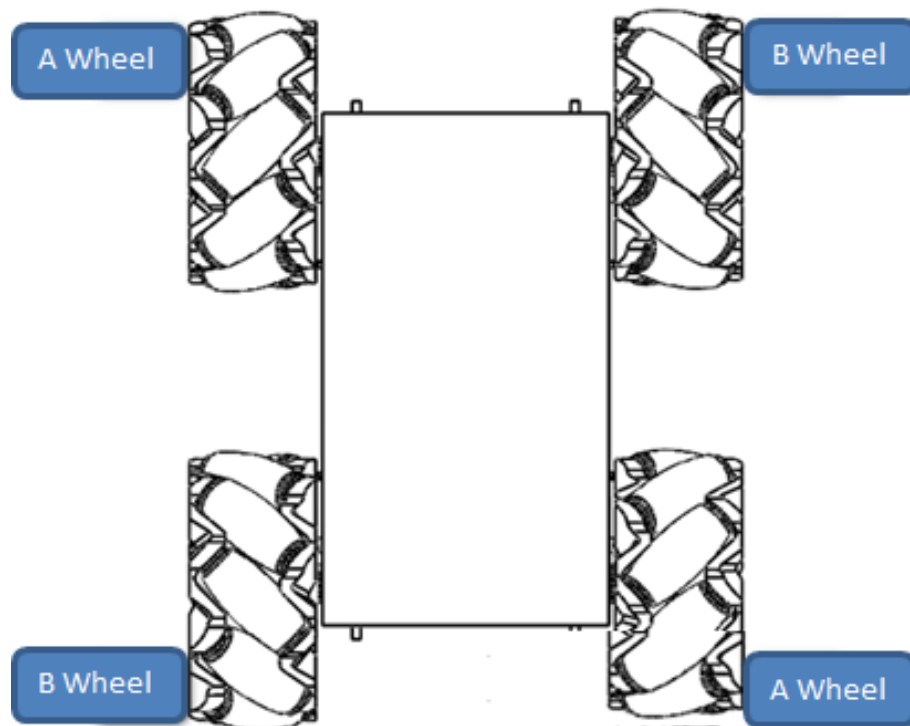
A wheel

B wheel

roller

Top view of the A wheel

Top view of the B wheel
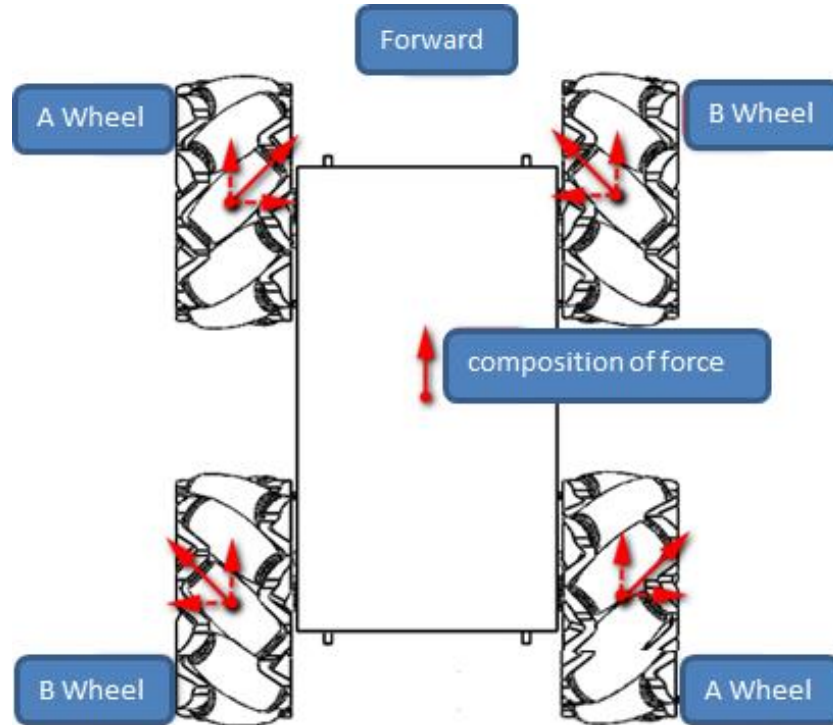
A/B Wheel is assembled diagonally

A Wheel

B Wheel

B Wheel

A Wheel

Top view

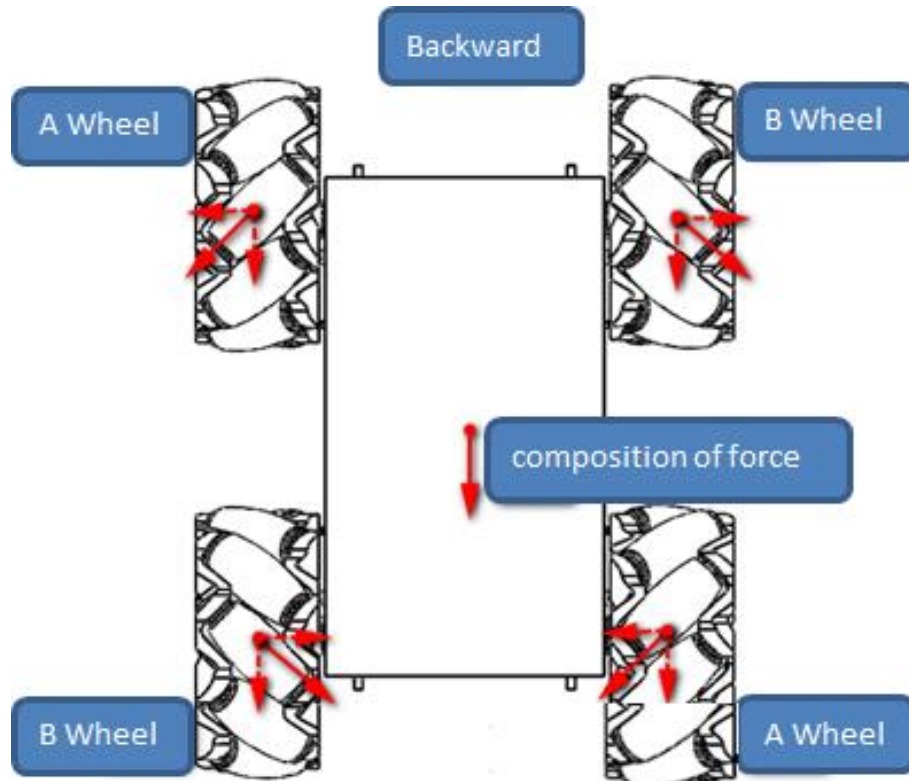**Ground projection：**

A Wheel

B Wheel

B Wheel

A Wheel

3.2 Mecanum wheels drive the Robot Car movement
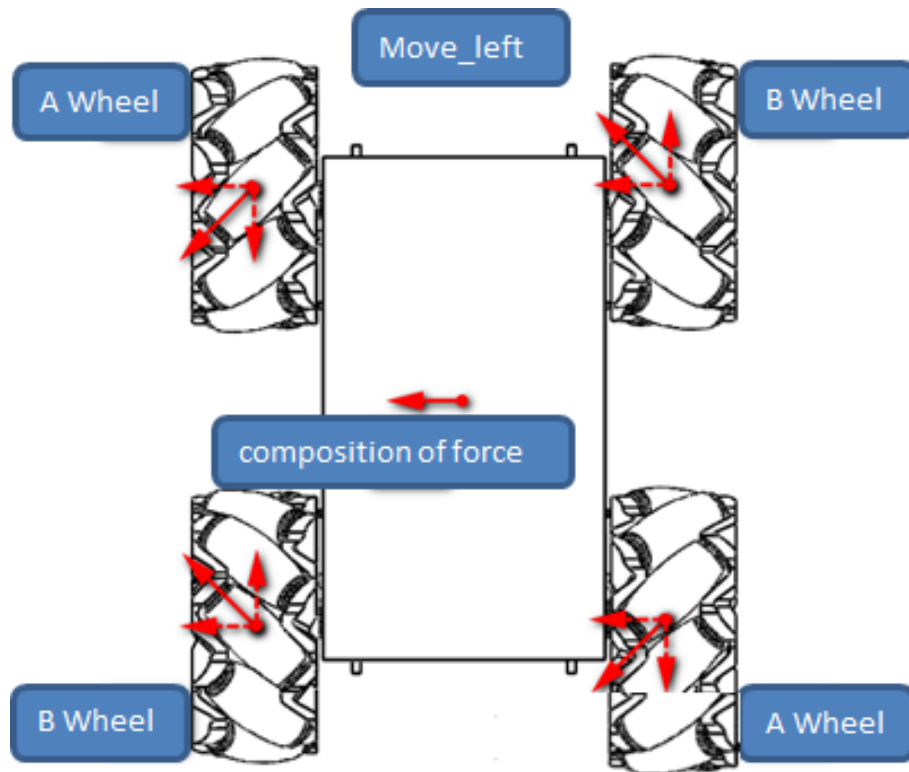
3.2.1 Forward：（A/B wheel can offset each other's axial speed, positive : up along the roller axis; Reverse: down the roller axis）
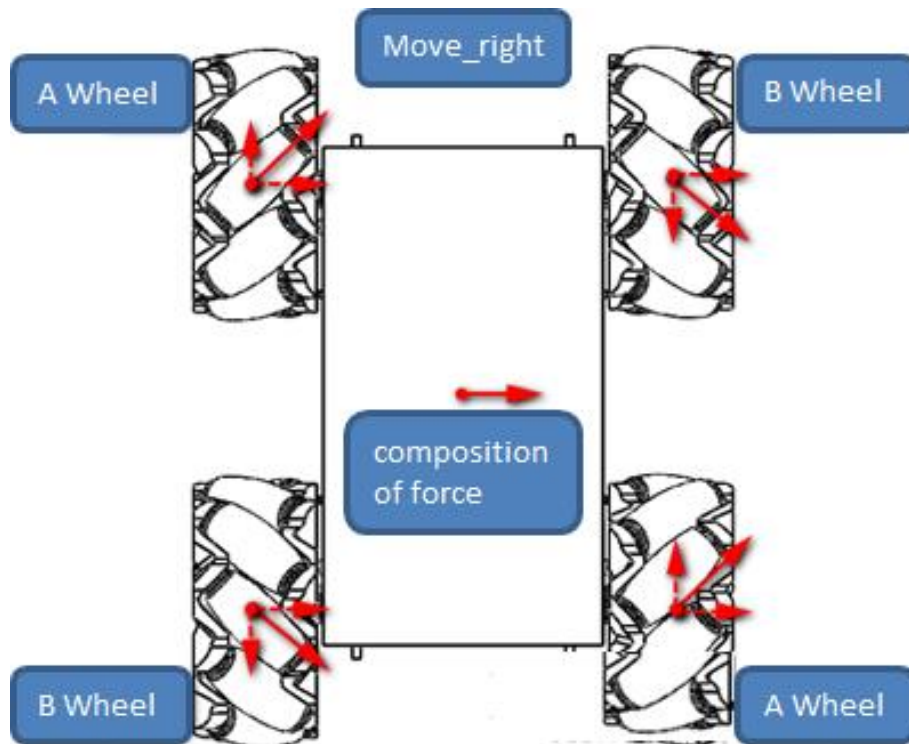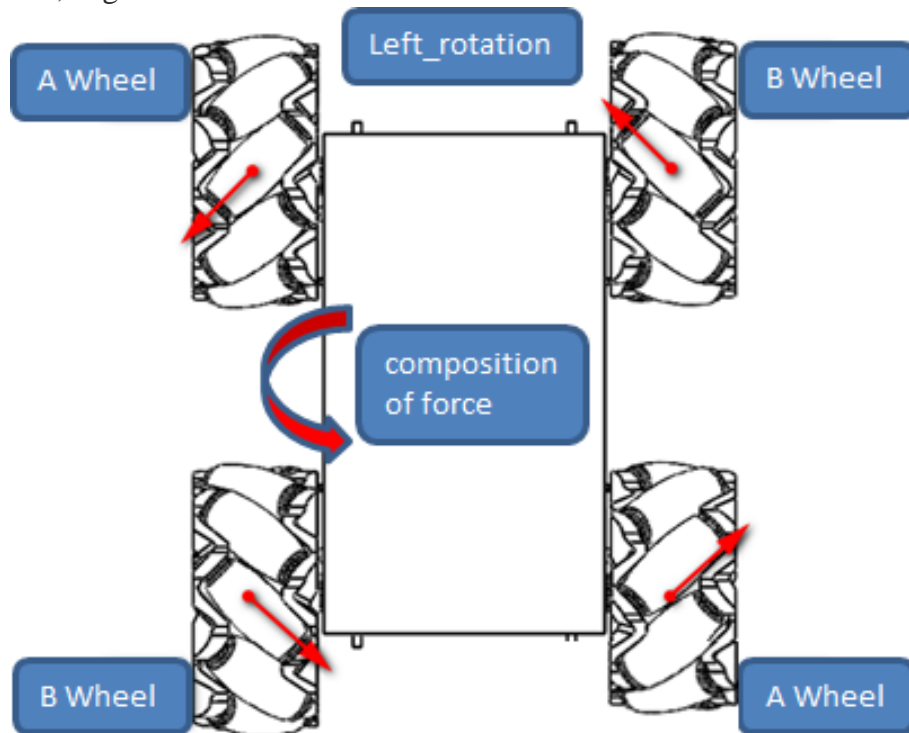

3.2.2 Backward： （A/B wheel reverse）

### 3.2.3 Move to left：（Round A wheel reverse, round B wheel forward）

3.2.4 Move to right：（Round B wheel reverse, round A wheel forward）

3.2.5 Left_rotation：（Left front wheel reverse; Right front wheel forward; Left rear wheel reverse; Right rear wheel forward）
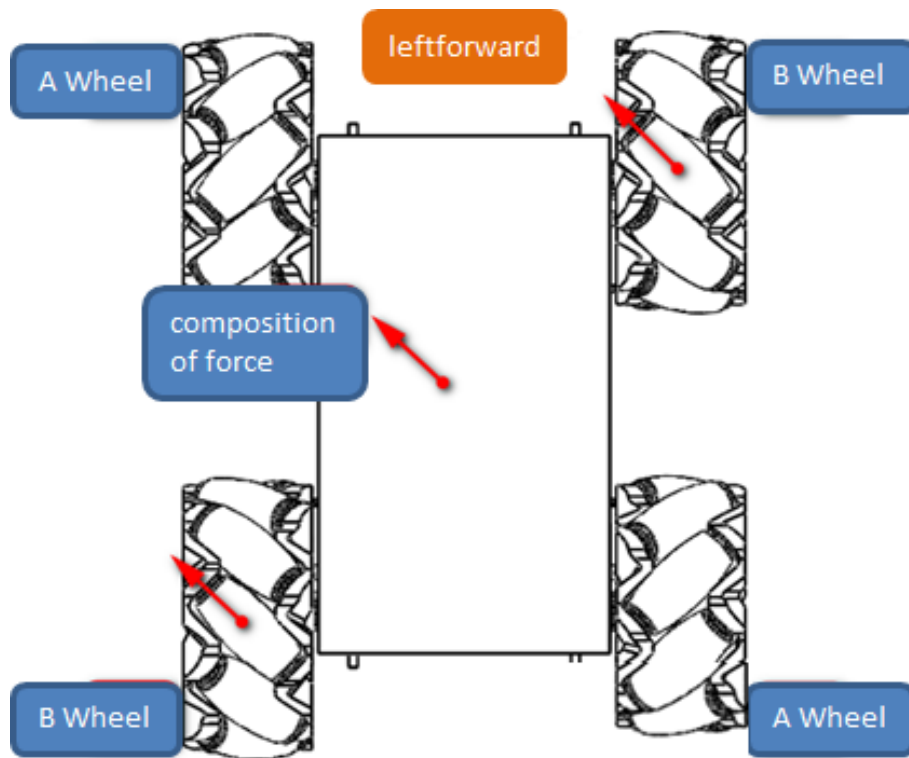

3.2.6 Right_rotation：（Left front wheel forward rotation; Reverse the right front wheel; Left rear wheel forward rotation; Reverse the right rear wheel.）
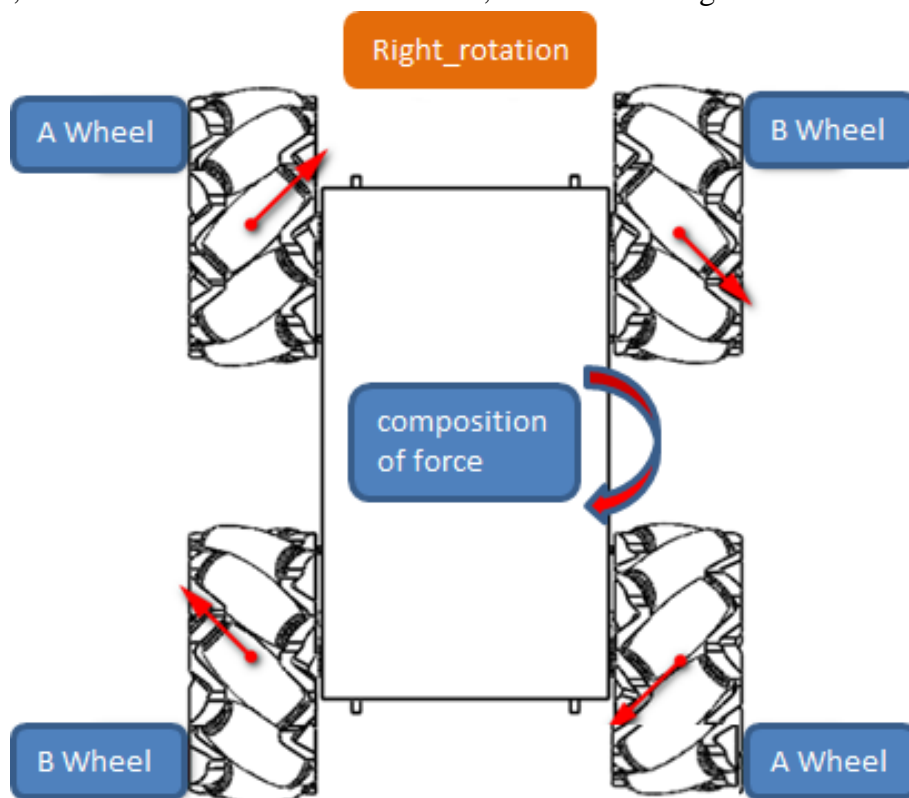
3.2.7 **leftforward**:(Two B wheels rotate forward, while two A wheels do not rotate)

leftforward

A Wheel

B Wheel

composition
of force

B Wheel

A Wheel

3.2.8 rightforward:(Two A wheels rotate forward, while two B wheels do not rotate)

rightforward

A Wheel

B Wheel

composition
of force
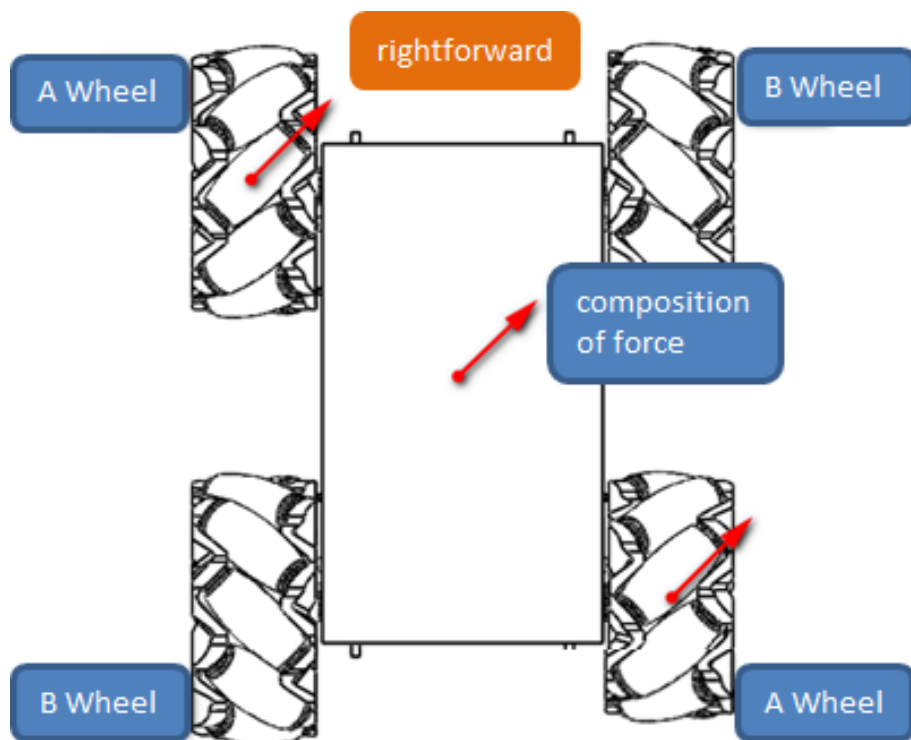
B Wheel

A Wheel

3.2.9 **Leftbackward**:(Two A wheels reverse, while two B wheels do not rotate)
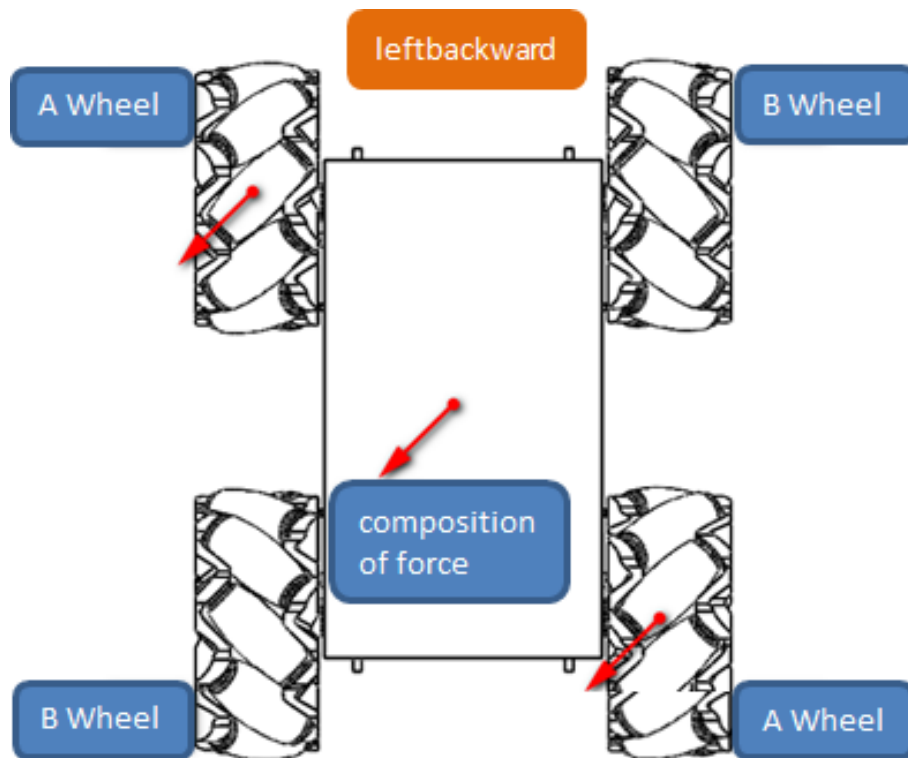
3.2.10 **Rightbackward:**（Two B wheels reverse, while two A wheels do not rotate）
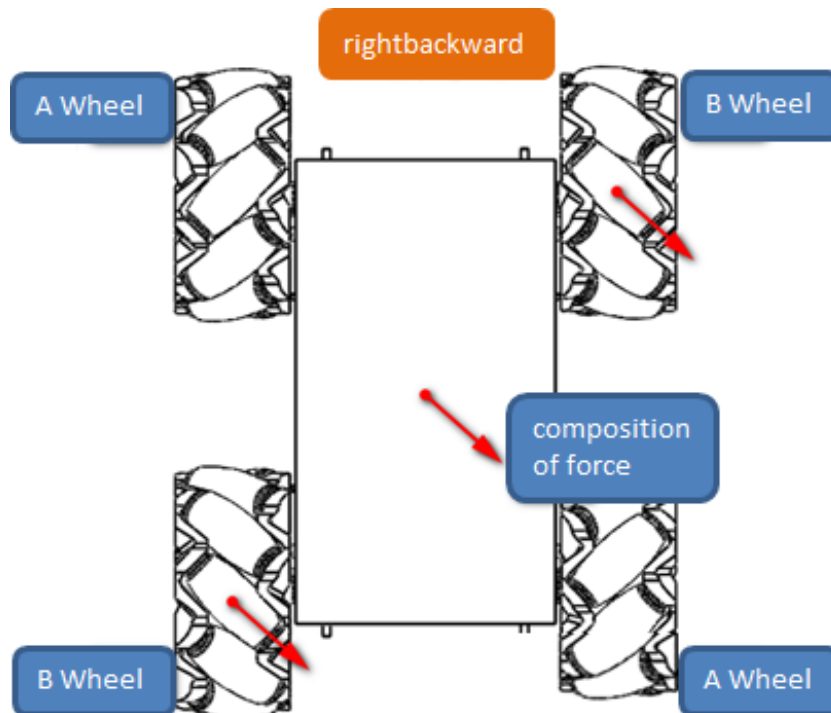
3.2.11 **Turn left around the center of the front axle:**（Front axle A/B wheel does not rotate; Rear axle B wheel reverse, rear axle A wheel forward rotation）
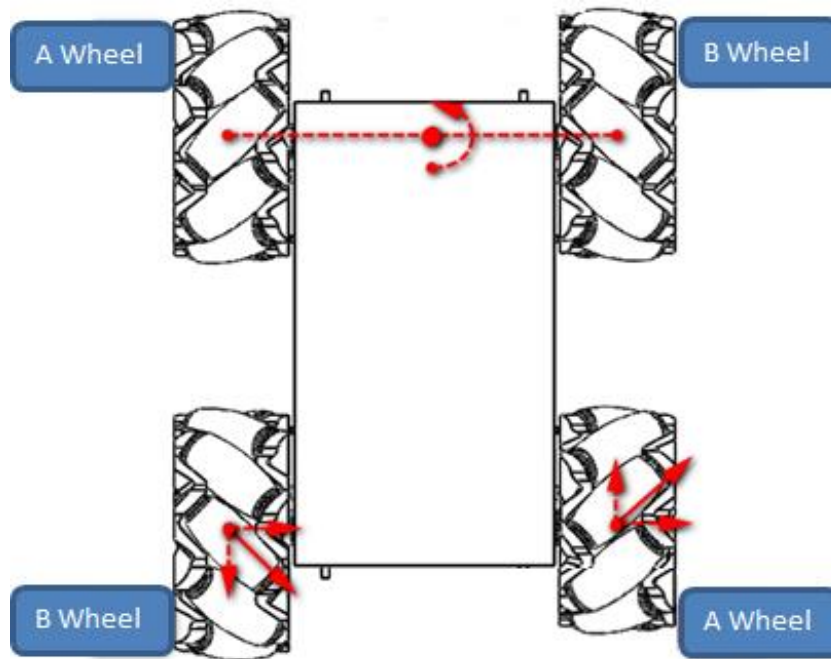
3.2.12 **Turn right around the center of the front axle:**（Front axle A/B wheel does not rotate; Forward rotation of rear axle B wheel, reverse rotation of rear axle A wheel)
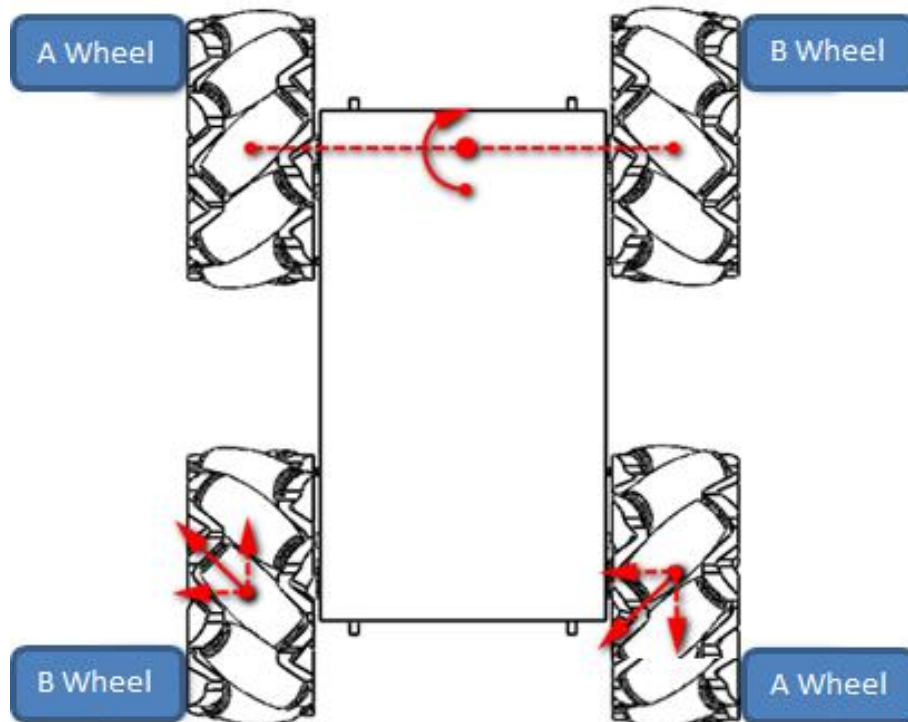
3.2.13 Turn left around the center of the rear axle:（Rear axle A/B wheel does not rotate; Forward rotation of front axle B wheel, reverse rotation of front axle A wheel）
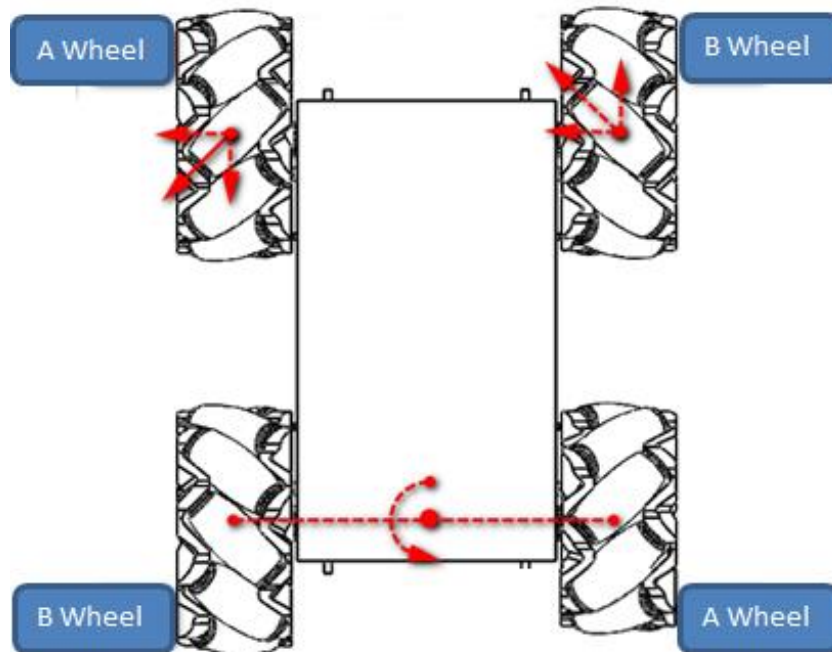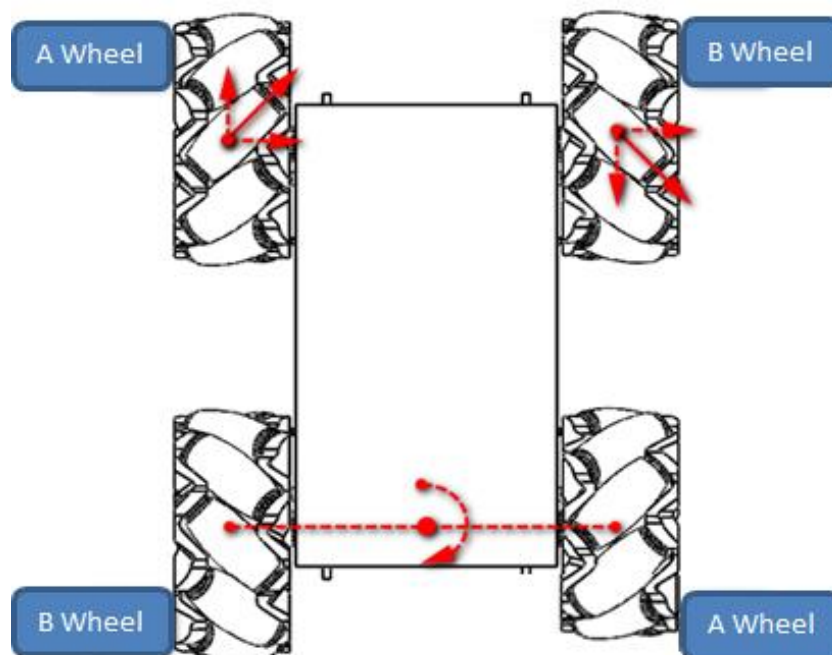

### 3.2.14 Turn right around the center of the rear axle：(Rear axle A/B wheel does not rotate; Front axle B wheel reverse, front axle A wheel forward rotation)

| Direction of movement	Left front A wheel	Right front B wheel	Left rear B wheel	Right rear B wheel
Forward	positive	positive	positive	positive
Backward	reverse	reverse	reverse	reverse
Move to left	reverse	positive	positive	reverse
Move to right	positive	reverse	reverse	positive
Left_rotation	reverse	positive	reverse	positive
Right_rotaiton	positive	reverse	positive	reverse
leftforward	Not rotate	positive	positive	Not rotate
rightforward	positive	Not rotate	Not rotate	positive
leftbackward	reverse	Not rotate	Not rotate	reverse
rightbackward	Not rotate	reverse	reverse	Not rotate
Turn left around the center of the front axle	Not rotate	Not rotate	reverse	positive
Turn right around the center of the front axle	Not rotate	Not rotate	positive	reverse
Turn left around the center of the rear axle	reverse	positive	Not rotate	Not rotate
Turn right around the center of the rear axle	positive	reverse	Not rotate	Not rotate

4 Robot Car Circuit Connection Diagram
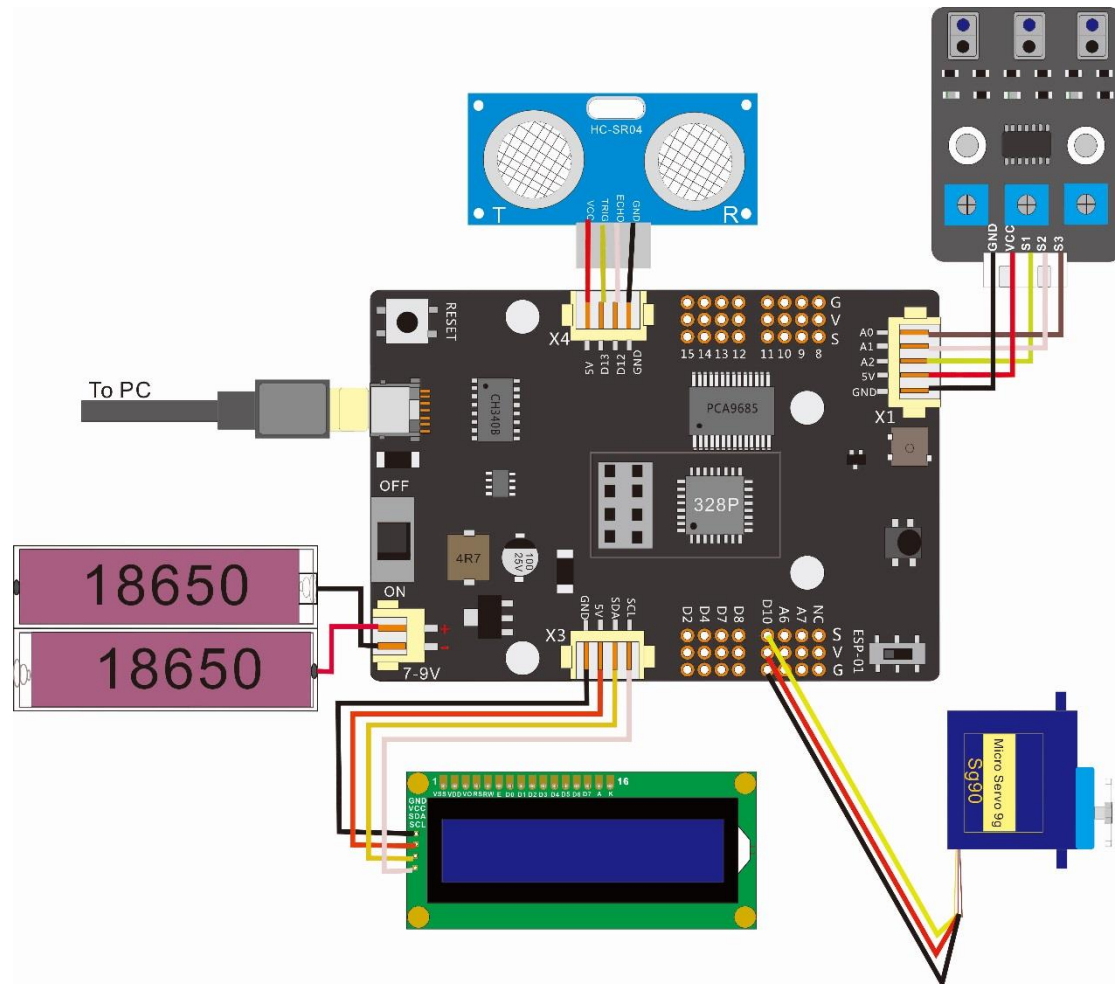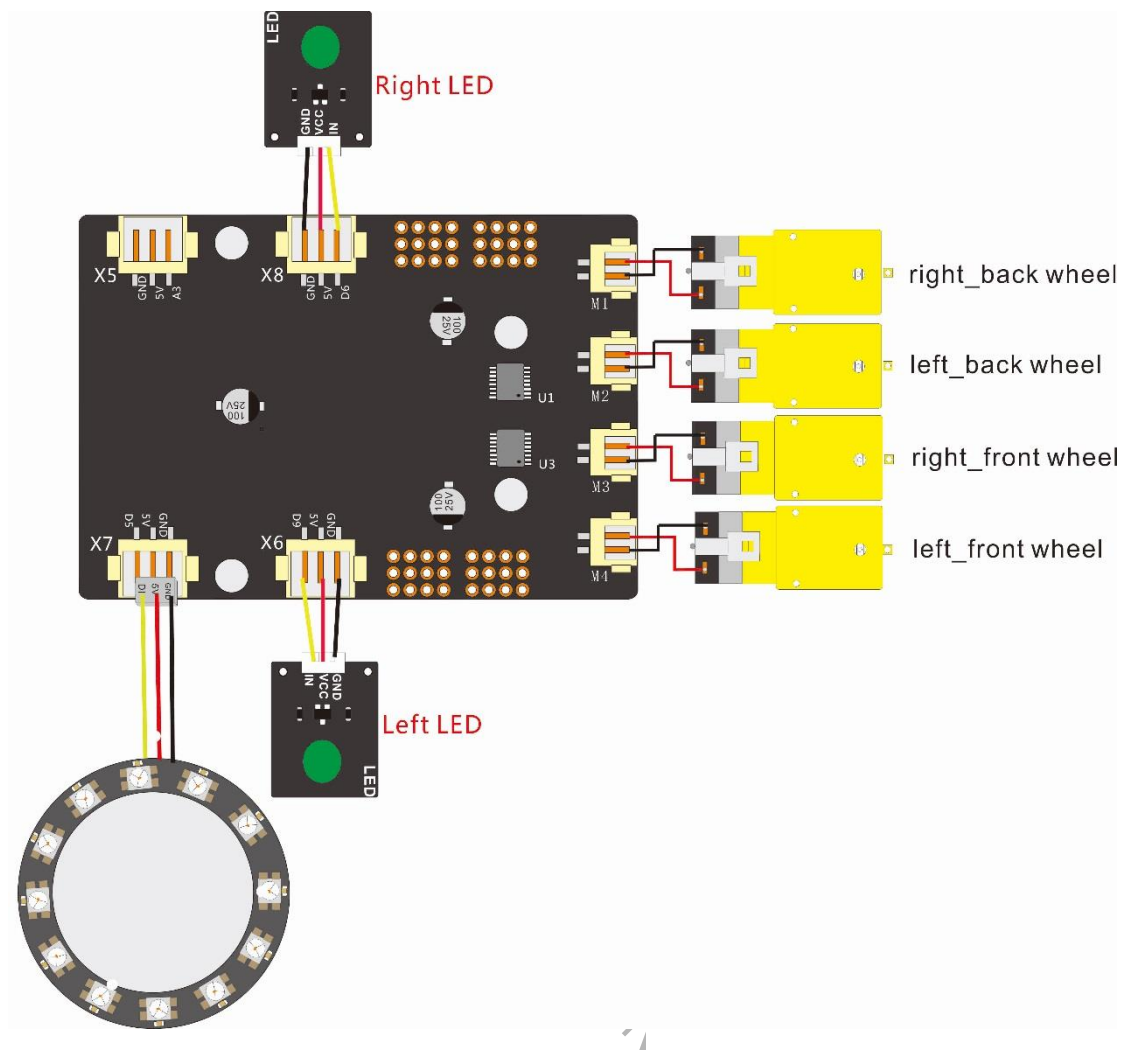
5 Function Introduction

5.1 Infrared remote control

Upload the code"11_1_Infrared_Remote_Controlled_Car.ino"to the control board，
which is stored in：
E:\CKK0014-main\Tutorial\sketches\11_1_Infrared_Remote_Controlled_Car

Use the infrared remote control to control the 4WD Mecanum Wheels Robot Car.
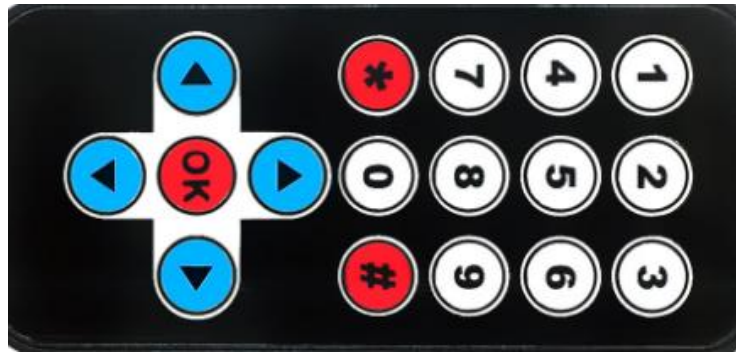
The functions of the buttons on the remote control:

① two_wheel_drive ② buzzer sounds ③ turn on the green LED ④ IDLE

⑤ Shake head ⑥ LED Blinking ⑦ move backleft ⑧ move backright

⑨ right rotation ⓪ left rotation ▲ move forward ▼ move backward

◀ turn left ▶ turn right OK stop * move left # move right

5.2 Robot Car follow line moving

Upload the code"12_1_Automatic_Tracking_Line.ino"to the control board， which is stored in： E:\CKK0014-main\Tutorial\sketches\ 12_1_Automatic_Tracking_Line.

The Robot Car will moving follow the black line

5.3 Robot Car avoid obstacles

Upload the code"13_1_Automatic_Obstacle_Avoidance.ino"to the control board，which is stored in：
E:\CKK0014-main\Tutorial\sketches\ 13_1_Automatic_Obstacle_Avoidance.

The Robot Car will automatic moving and avoid obstacles

5.4 WIFI Control

Upload the code"14_1_Wifi_Controlled_Car.ino"to the control board, which is stored in：

E:\CKK0014-main\Tutorial\sketches\14_1_Wifi_Controlled_Car

Download our APP on the mobile phone, connect the ESP8266-01 module of the robot car through wifi to control the car.

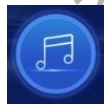The functions of the buttons on the APP interface are as follows:

 Following the line

 Avoid obstacles

 Light Show on the car
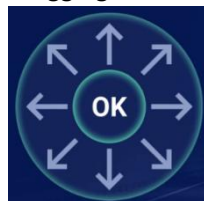
 Buzzer sounds

 Left Rotaiton

 Right Rotaiton

 Shake head

Drag bar button, ML >"Left Speed"、 MR >"Right Speed"

Dragging these two buttons will change the rotation speed of the left and right wheels of the car.

 The arrow is the direction button of the car, and there are 8 directions in total, namely "forward", "left forward", "left_move", "left backward", "backward", "right backward", "right_move", "right forward", and the middle "OK" is defined as the stop button. Press these buttons to control the car to move in the corresponding direction.

6 Any questions and suggestions are welcome

Thank you for reading this document!

If you find any errors and omissions in the tutorial, or if you have any suggestions and questions, please feel free to contact us:
cokoino@outlook.com

We will do our best to make changes and publish revisions as soon as possible.

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