

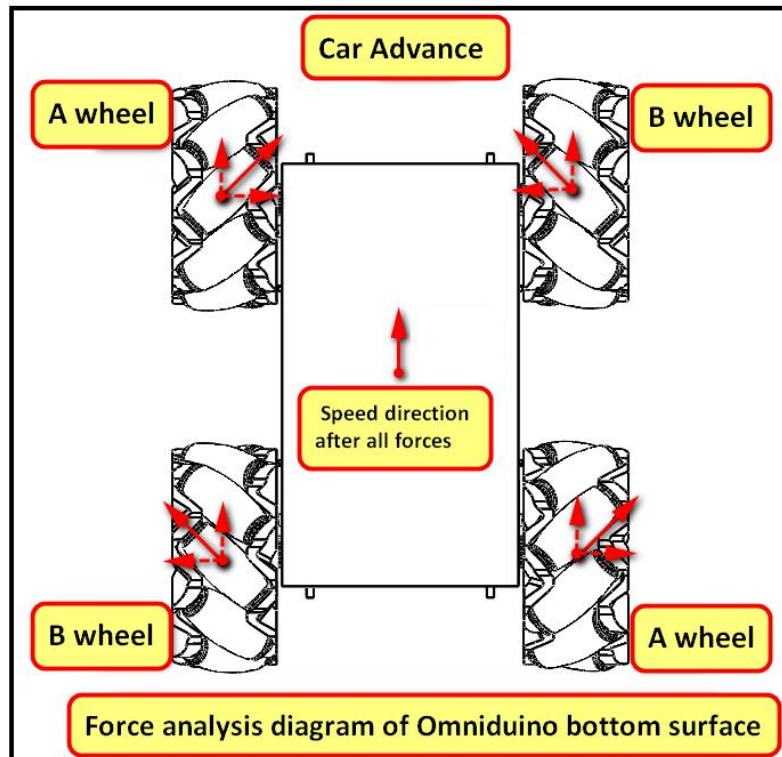
## Car advance

### 1. Learning goal

In this lesson, we will learn how to control car advance and stop.

### 2. Force Analysis

2.1 According to the characteristics of the Mecanum wheel, if the omniduino car advances, the four wheels must rotate forward. The force analysis diagram is shown below.



2.2 According to the physics, the forces of equal magnitude and opposite directions can cancel each other out. If the A and B wheels forward at the same speed, the A wheel decomposes the right force and the B wheel decomposes the left force will cancel each other out.

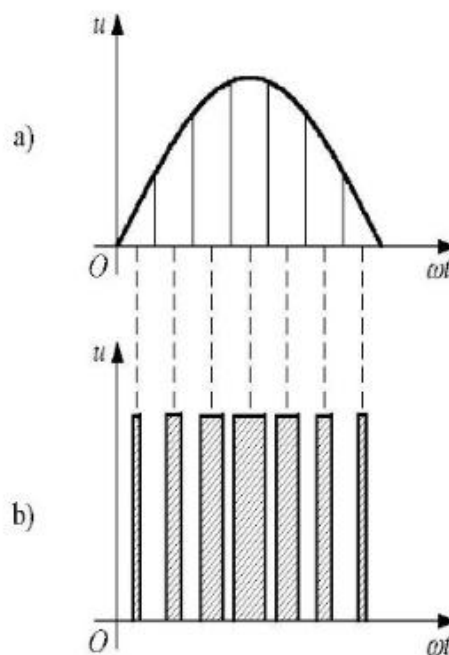
According to " $F=ma$ ", we can know that the acceleration direction is forward, and the final speed direction is also forward.

2.3 According to the hardware manual, we can know that PCA9685 controls one wheel by two pins, one pin controls forward rotation and another pin controls reverse rotation.

For example, the pin12 of the PCA9685 chip control M1 reserve and the pin13 control M1 forward. If the 12th output is 0, the 13th normally outputs the PWM pulse, then the M1 motor rotates forward; if the 12th output is output PWM pulse, the output of No. 13 is 0, then the M1 motor is reversed.

PCA9685PWM controlled component pins		
Pins	Function	Remarks
0~6	no connect	
7	servo angle	0~180
8	M4 motor forward	Right rear motor
9	M4 motor Reserve	
10	M3 motor forward	Right front motor
11	M3 motor Reserve	
12	M1 motor Reserve	Left front motor
13	M1 motor forward	
14	M2 motor Reserve	Left rear motor
15	M2 motor forward	

2.3 PWM refers to pulse width modulation. In the PWM drive control adjustment system, the output is high and low at a fixed frequency, and the length of the "high level 1" and "low level 0" time in one cycle is changed as needed. . In this way, the "duty cycle" is changed to change the average voltage (effective voltage), and then the motor drives the amplified signal to control the motor speed.



### 3. Looking for building blocks

3.1 The content in the Omniduino setup block will only run once when the Omniduino is turned on or the reset button is pressed.

We can write into the initialization and other content in this block.

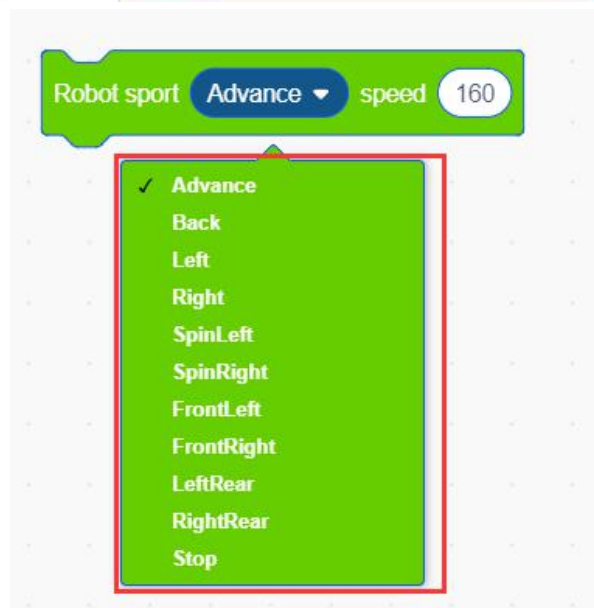
The content in the loop is the main loop function of the Omniduino car, most of the data processing and logic processing are completed in this function.



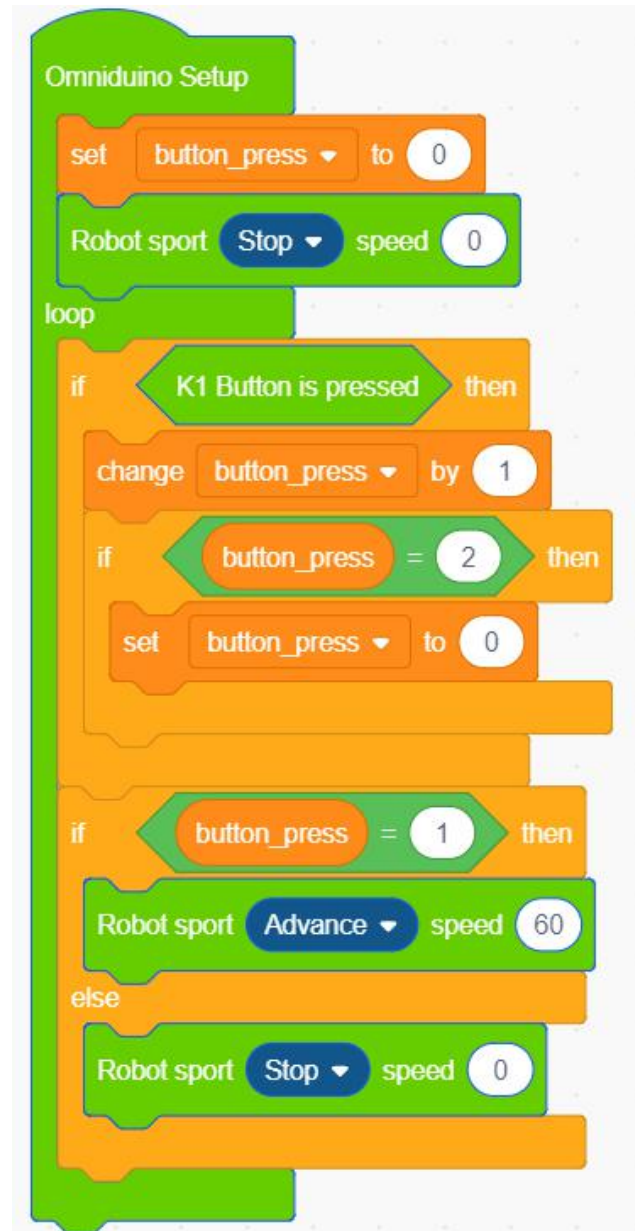
3.2 K1 Button is pressed block.



3.3 Robot sport building block, we can choose movement status, the speed is adjustable between 0-160.



**Combine blocks**



#### 4. Compiling and uploading the program

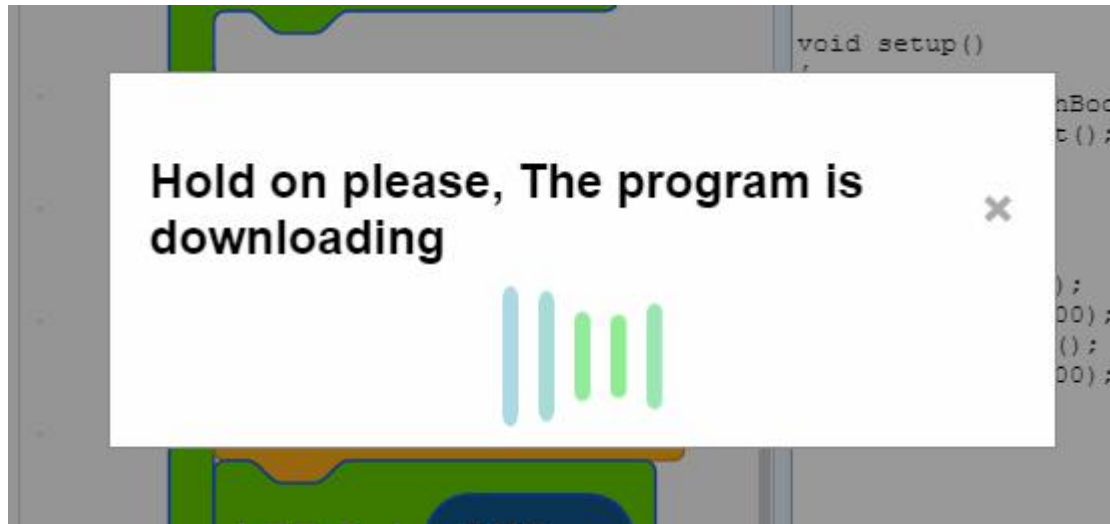
4.1 After building the blocks, click the **[code mode]** in the upper right corner of the Helloblock programming interface. We can see the corresponding Arduino code.



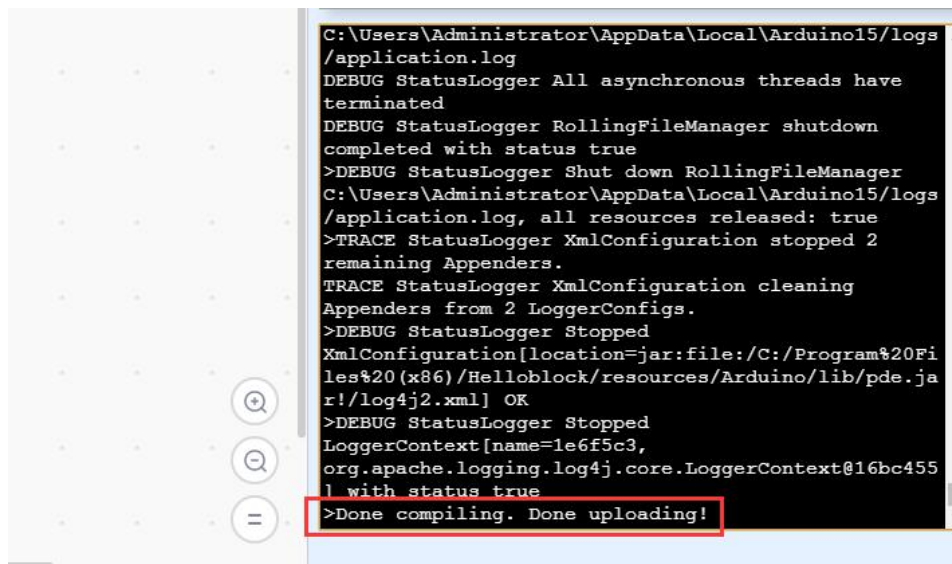
4.2 Then, you need to connect Omniduino car to your computer. Select the CH340 port number identified in the previous step in the upper right corner. Then, click the up arrow to start compiling and uploading the program.







4.3 When the words "**Done compiling Done uploading**" appear in the lower right corner of the programming interface, which means the program has been uploaded.



## 5. Experimental phenomenon

After the program is downloaded. When we press K1 button, car will forward. When we press the button again, car will stop.