8. Control robot movement

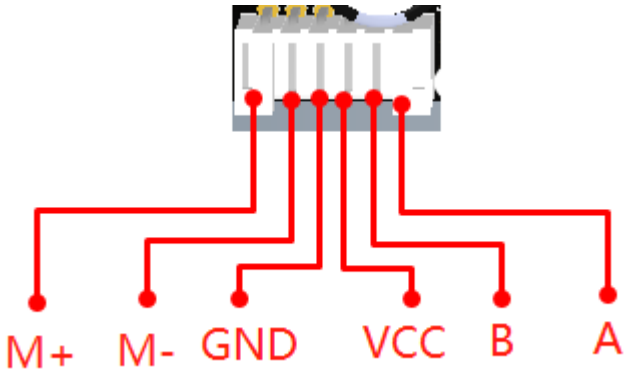
8.1. Experimental objectives

Control the forward and backward on the Rosmaster, left and right, and set the relevant parameters of the car.

8.2. Experiment preparation

The motor interface has an anti-reverse connection function, which can be connected to the motor using Rosmaster's motor cable.

The interface line sequence corresponding to the motor is shown in the following figure:



Rosmaster_Lib library functions required to control the Rosmaster motor:

```
set_car_motion ( v_x ,  v_y ,  v_z )
```

Parameter explanation: trolley motion control, this function will read the pulse data of the encoder to calculate the speed of the trolley motion. There may be differences according to different trolleys. Here is an example of a Mecanum wheel trolley: v_x represents the longitudinal speed of the trolley, in m/s, positive forward, negative backward; v_y control represents the lateral speed of the trolley, in m/s , positive numbers are left, negative numbers are right; v_z represents the rotation speed of the car, the unit is rad/s, positive numbers are left rotation, negative numbers are right rotation.

v_x=[-1.0, 1.0], v_y=[-1.0, 1.0], v_z=[-5.0, 5.0]

Return value: None.

```
set_pid_param ( kp ,  ki ,  kd ,  forever = False )
```

Parameter explanation: PID parameter control will affect the change of the movement speed of the car controlled by the set_car_motion function. By default it can be left unadjusted.

kp ki kd = [0, 10.00], decimals can be entered.

forever=True save forever, =False temporary effect.

Permanent storage is to write the data into the Flash of the MCU chip, the data will not be lost after restarting, and the writing time is long, so the delay time is added to avoid the problem of packet loss caused by the MCU. Temporary action has fast response and is effective once, and the data is no longer maintained after restarting the single chip.

Return value: None.

```
set_auto_report_state ( enable ,  forever = False )
```

Parameter explanation: The MCU automatically returns the data status bit, which is enabled by default. If it is set to be disabled, it will affect the function of reading data.

enable=True, the underlying expansion board will send data every 40 milliseconds. enable=False, do not send.

forever=True save forever, =False temporary effect.

Return value: None.

```
clear_auto_report_data ()
```

Parameter explanation: Clear the cached data automatically sent by the microcontroller.

Return value: None.

```
reset_flash_value ()
```

Parameter explanation: reset the data saved in the car's flash and restore the factory default value. This function can also be achieved by long pressing the K2 key on the expansion board for about 10 seconds.

Return value: None.

The following functions all return data, which can only be read when create_receive_threading() is started normally:

```
get_accelerometer_data ()
```

Parameter Explanation: Get the three-axis data of the accelerometer

Return statement: a_x, a_y, a_z

```
get_gyroscope_data ()
```

Parameter explanation: Get the three-axis data of the gyroscope

Return value: g_x, g_y, g_z

```
get_motion_data ()
```

Parameter explanation: Get the speed of the car, return val_vx, val_vy, val_vz

Return value: val_vx, val_vy, val_vz

```
get_motion_pid ()
```

Parameter explanation: Get the motion PID parameters of the car, and return [-1, -1, -1] if the error is read.

Return value: kp, ki, kd

8.3. Experimental effect

Refer to 4.3.1 and 4.3.2 Checking ROS expansion board and entering Docker container, then run the program. double-click on the jupyter lab interface to enter /root/yahboomcar_ros2_ws/Rosmaster/Sample.

Double-click and select 8.car_motion.ipynb, and click the button in 4.3.3 to operate the program step by step.

8.4. Program source code

Go to docker, Reference code path:

/root/yahboomcar_ros2_ws/Rosmaster/Sample/8.car_motion.ipynb