Handle control

This lesson uses the Raspberry Pi as an example. For Raspberry Pi and Jetson-Nano , you need to open a terminal on the host computer and enter the command to enter the Docker container. Once inside the Docker container, enter the commands mentioned in this lesson in the terminal. For instructions on entering the Docker container from the host computer, refer to **[01. Robot Configuration and Operation Guide] -- [5.Enter Docker (For JETSON Nano and RPi 5)]**. For Orin , simply open the terminal and enter the commands mentioned in this lesson.

1. Program Function Description

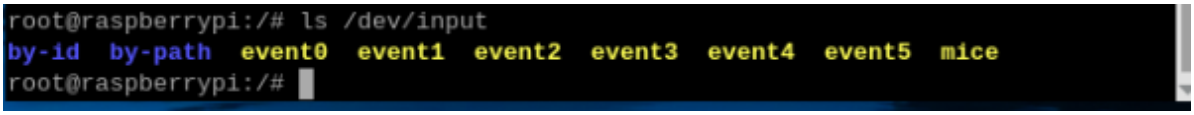
Power on the chassis and run the joystick control program. You can control the car's movements with the joystick. The joystick also controls the buzzer, servos, and other functions.

2. Program Startup

2.1. Device Verification

First, plug the wireless joystick USB receiver into the host computer (Jetson, Raspberry Pi, or PC). Open the terminal and enter the following command. If [js0] is displayed, this indicates the wireless joystick.

```
ls /dev/input
```



2.2 Testing the Controller Input

Open a terminal and enter the following command. As shown in the image, this wireless controller has 8 axis inputs and 15 button inputs. You can test the corresponding numbers by pressing each button.

```
sudo jstest /dev/input/js0
```

The button should normally turn on. If jstest is not installed, run the following command:

```
sudo apt-get install joystick
```

2.3. Startup Commands

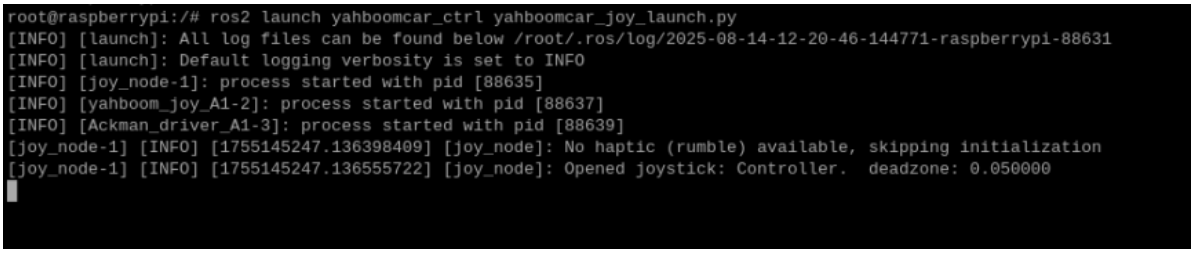
For the Raspberry Pi PI5 controller, you must first enter the Docker container. For the Orin controller, this is not necessary.

Enter the Docker container (for steps, see [Docker Course] --- [4. Docker Startup Script]).

All of the following Docker commands must be executed from the same Docker container.**(For steps, see [Docker Course] --- [3. Docker Submission and Multi-Terminal Access]).**

Start chassis data + controller control, input in the terminal.

```
ros2 launch yahboomcar_ctrl yahboomcar_joy_launch.py
```



After turning on the car, press the "START" button. When you hear the buzzer, you can start remote control. **If the remote control is left on for a while and not used, it will enter sleep mode. You need to press the "START" button to end it.** To **control the car**, you need to **press the R2 button** to **release the motion control lock** before you can use the joystick to control the car.

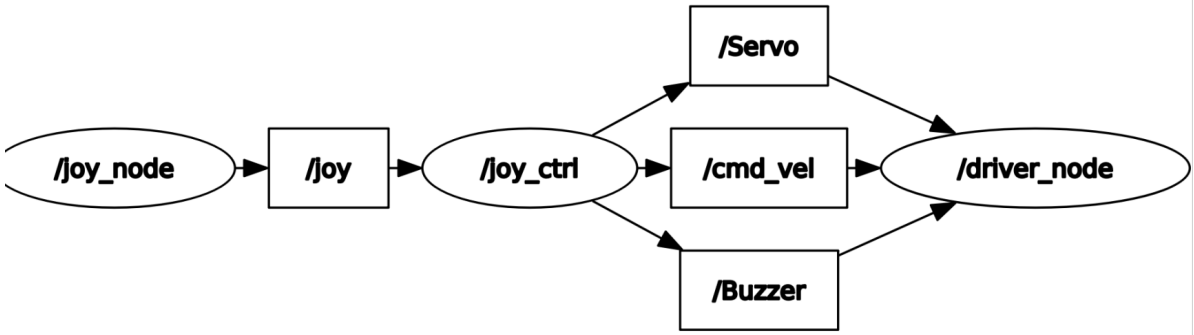
Remote Control Effect Description:

Handle	Effect
Left Stick Up/Down	Forward/Backward
Left Stick Pressed	Decelerate
Right Stick Left/Right	Turn Left/Right
Right Stick Pressed	Accelerate
"START" Button	Control Buzzer/End Sleep
Left Arrow Key Left/Right	Control S1 Servo Left/Right
Left Arrow Key Up/Down	Control S2 Servo Up/Down
R1 Button	Servo Reset/Center
R2 Button	Handle Motion Control Switch

3. Node Communication Diagram

Terminal Input:

```
ros2 run rqt_graph rqt_graph
```



If it doesn't display initially, select [Nodes/Topics (all)] and click the refresh button in the upper left corner.

4. Code Analysis

Source code reference path,

```
~/yahboomcar_ros2_ws/yahboomcar_ws/src/yahboomcar_ctrl/launch/yahboomcar_joy_launch.py
```

yahboomcar_joy_launch.py

```
from launch import LaunchDescription
from launch_ros.actions import Node

import os
def generate_launch_description():
    node1 = Node(
        package='joy',
        executable='joy_node',
    )
    joy_node = Node(
        package='yahboomcar_ctrl',
        executable='yahboom_joy_A1',
    )
    bringup_node = Node(
        package='yahboomcar_bringup',
        executable='Ackman_driver_A1',
    )
    launch_description = LaunchDescription([node1,joy_node,bringup_node])
    return launch_description
```

Three nodes are running: the chassis data node, the yahboom_ctrl controller control node, and the joy_node controller key value reading node.

Key controller control node source code path,

```
~/yahboomcar_ros2_ws/yahboomcar_ws/src/yahboomcar_ctrl/yahboomcar_ctrl/yahboom_joy_A1.py
```

```
#Create a subscriber to subscribe to the /joy topic data
self.sub_Joy = self.create_subscription(Joy,'joy', self.buttonCallback,10)
```

```
#Processing key function user_jetson
def user_jetson(self, joy_data):
    # cancel nav
    if joy_data.buttons[9] == 1: self.cancel_nav()

     #Buzzer Buzzer Control
    if joy_data.buttons[11] == 1:
        Buzzer_ctrl = Bool()
        self.Buzzer_active=not self.Buzzer_active
        Buzzer_ctrl.data =self.Buzzer_active
        self.pub_Buzzer.publish(Buzzer_ctrl)

    #Gear adjustment, press the joystick to adjust the gear
    if joy_data.buttons[13] == 1:
        if self.linear_Gear == 1.0: self.linear_Gear = 1.0 / 5
        elif self.linear_Gear == 1.0 / 3: self.linear_Gear = 2.0 / 4
        elif self.linear_Gear == 2.0 / 3: self.linear_Gear = 1
    # angular Gear control
    if joy_data.buttons[14] == 1:
        if self.linear_Gear == 1.0: self.linear_Gear = 1.0
        elif self.linear_Gear == 1.0 / 5: self.linear_Gear = 1.0
    # Servo
    self.servos1 = int(max(0, min(180, self.servos1 + joy_data.axes[6] * 3)))
    self.servos2 = int(max(0, min(100, self.servos2 + joy_data.axes[7] * 3)))
    self.servo_angle.s1 = self.servos1
    self.servo_angle.s2 = self.servos2
    if not 30 <= self.servo_angle.s1 <= 150:
        self.servo_angle.s2 = max(10, self.servo_angle.s2)

    xlinear_speed = self.filter_data(joy_data.axes[1]) * self.xspeed_limit *
self.linear_Gear
    ylinear_speed = self.filter_data(joy_data.axes[2]) * self.yspeed_limit *
self.linear_Gear
    angular_speed = self.filter_data(joy_data.axes[2]) *
self.angular_speed_limit * self.angular_Gear
    # print(self.linear_Gear)
    if xlinear_speed > self.xspeed_limit: xlinear_speed = self.xspeed_limit
    elif xlinear_speed < -self.xspeed_limit: xlinear_speed = -self.xspeed_limit
    if ylinear_speed > self.yspeed_limit: ylinear_speed = self.yspeed_limit
    elif ylinear_speed < -self.yspeed_limit: ylinear_speed = -self.yspeed_limit
    if angular_speed > self.angular_speed_limit: angular_speed =
self.angular_speed_limit
    elif angular_speed < -self.angular_speed_limit: angular_speed = -
self.angular_speed_limit
    twist = Twist()
    twist.linear.x = xlinear_speed
    twist.linear.y = ylinear_speed
    twist.angular.z = angular_speed
    if self.Joy_active == True:
        for i in range(3):
            self.pub_cmdVel.publish(twist)
            self.pub_Servo.publish(self.servo_angle)
```

Variables corresponding to remote control key values

Based on the default mode [Controller], the key values corresponding to the remote control are as follows:

Remote control event	Corresponding variable
Left joystick up	axes[1]=1
Left joystick down	axes[1]=-1
Right joystick left	axes[2]=1
Right joystick right	axes[2]=-1
Button X pressed	button[3]=1
Button B pressed	button[1]=1
Button Y pressed	button[4]=1
Button R1 pressed	button[7]=1
Start button pressed	button[11]=1
Left joystick pressed	button[13]=1
Right joystick pressed	button[14]=1

Combining the source code above makes it easier to understand. When these values change, it means the remote control is pressed, and the corresponding program will be executed. To view other button presses, you can subscribe to the /joy topic and enter in the terminal.

```
ros2 topic echo /joy
```