ROS2 environment entity mechanical dog APP navigation

Quick use

1. Power on the mechanical dog

PI4 version steps:

Press the power switch on the side of the mechanical dog and wait for the mechanical dog to start up. And connect the robot dog's WiFi to the same LAN environment as the computer.

After the mechanical dog is started, the laser radar, imu, and mechanical dog joint status nodes have been automatically started.

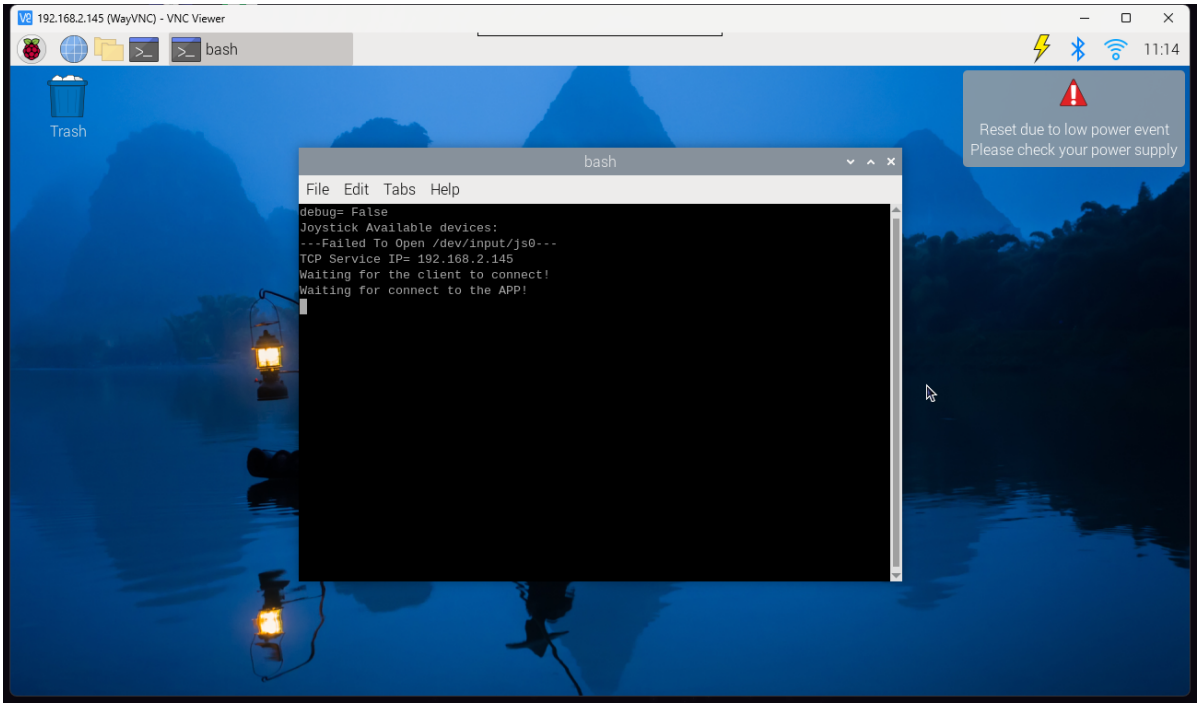
If you find that you cannot obtain lidar and other data, please close the mechanical dog program and restart the chassis program.

To close the large program, restart the chassis and modify the multi-level communication ID, please refer to the tutorial: 14. Radar mapping navigation\6. Obtaining the status of the physical mechanical dog in the ROS2 environment\Acquiring the real joint data of the mechanical dog in the ROS2 environment.pdf

PI5 version steps:

Press the power switch on the side of the mechanical dog and wait for the mechanical dog to start up. And connect the robot dog's WiFi to the same LAN environment as the computer.

After the mechanical dog is started, remotely connect to the mechanical dog through the IP address on the OLED.



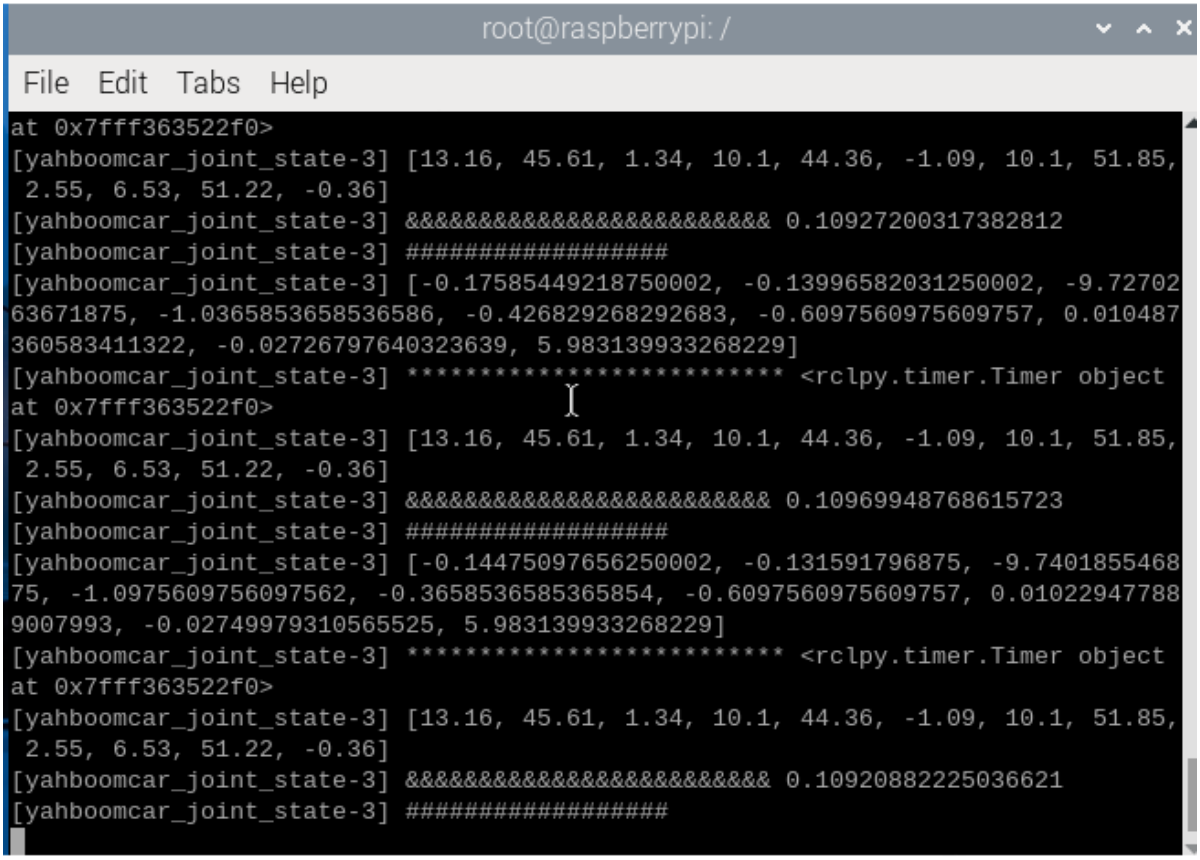
Then ctrl+c closes the large program and enter the following command to enter docker:

```
./run_humble.sh
```

```
TCP Service IP= 192.168.2.145
Waiting for the client to connect!
Waiting for connect to the APP!
^CKeyboardInterrupt
2024-04-28T10:17:27Z
-----program end-----
pi@raspberrypi:~ $ ./run_humble.sh
access control disabled, clients can connect from any host
root@raspberrypi:/#
```

Then enter the following commands in the docker terminal to start the car radar, imu, and mechanical dog joint status nodes.

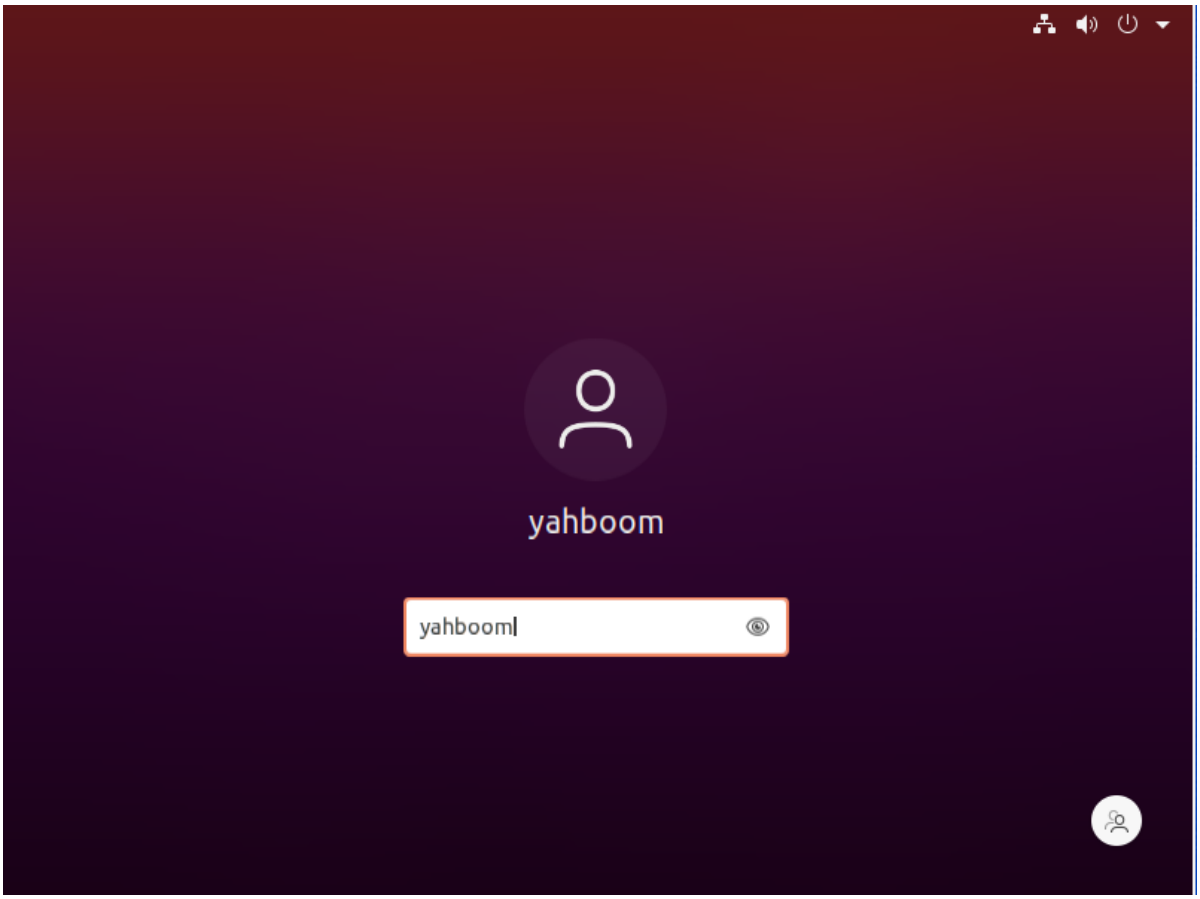
```
ros2 launch bringup Navigation_bringup.launch.py
```



2. Open the virtual machine

Note: The default virtual machine has been installed here.

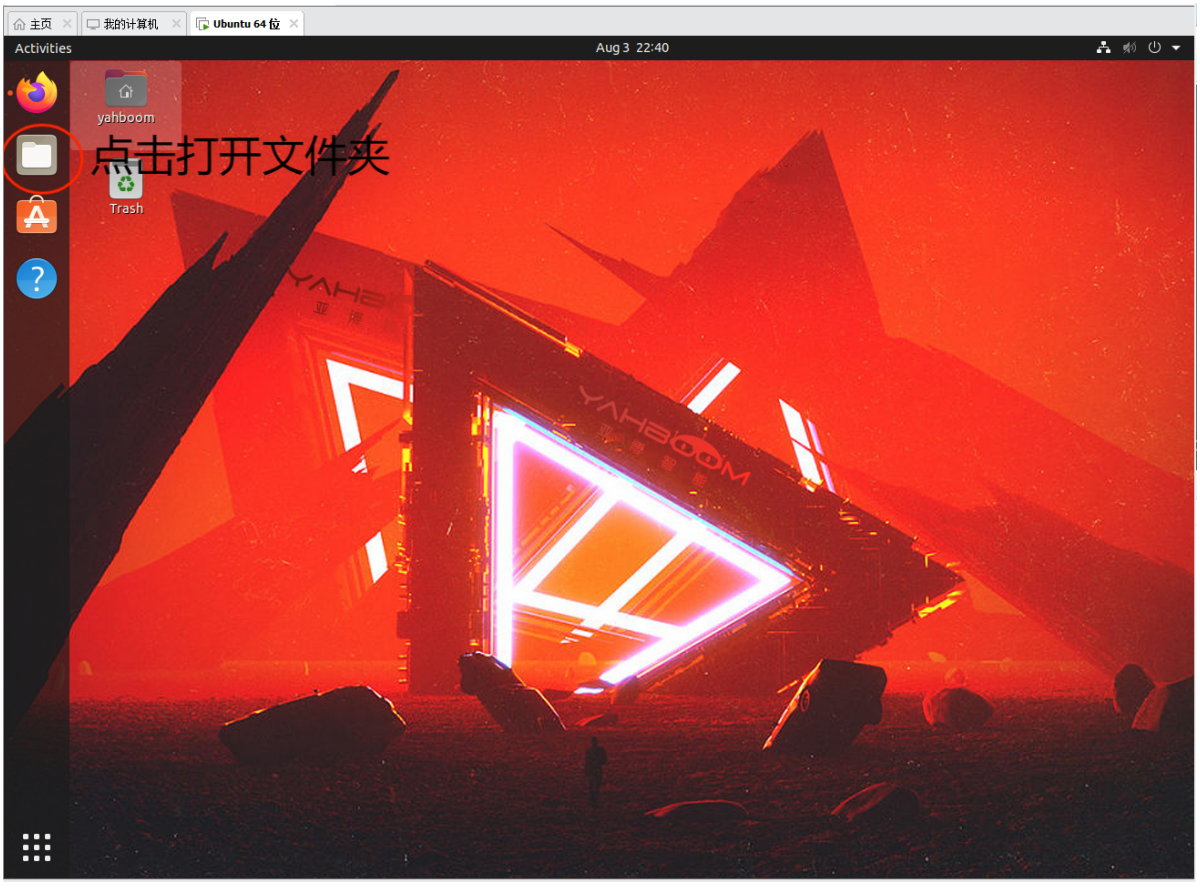
Open the virtual machine, enter the password: yahboom and press the Enter key to enter the system desktop.



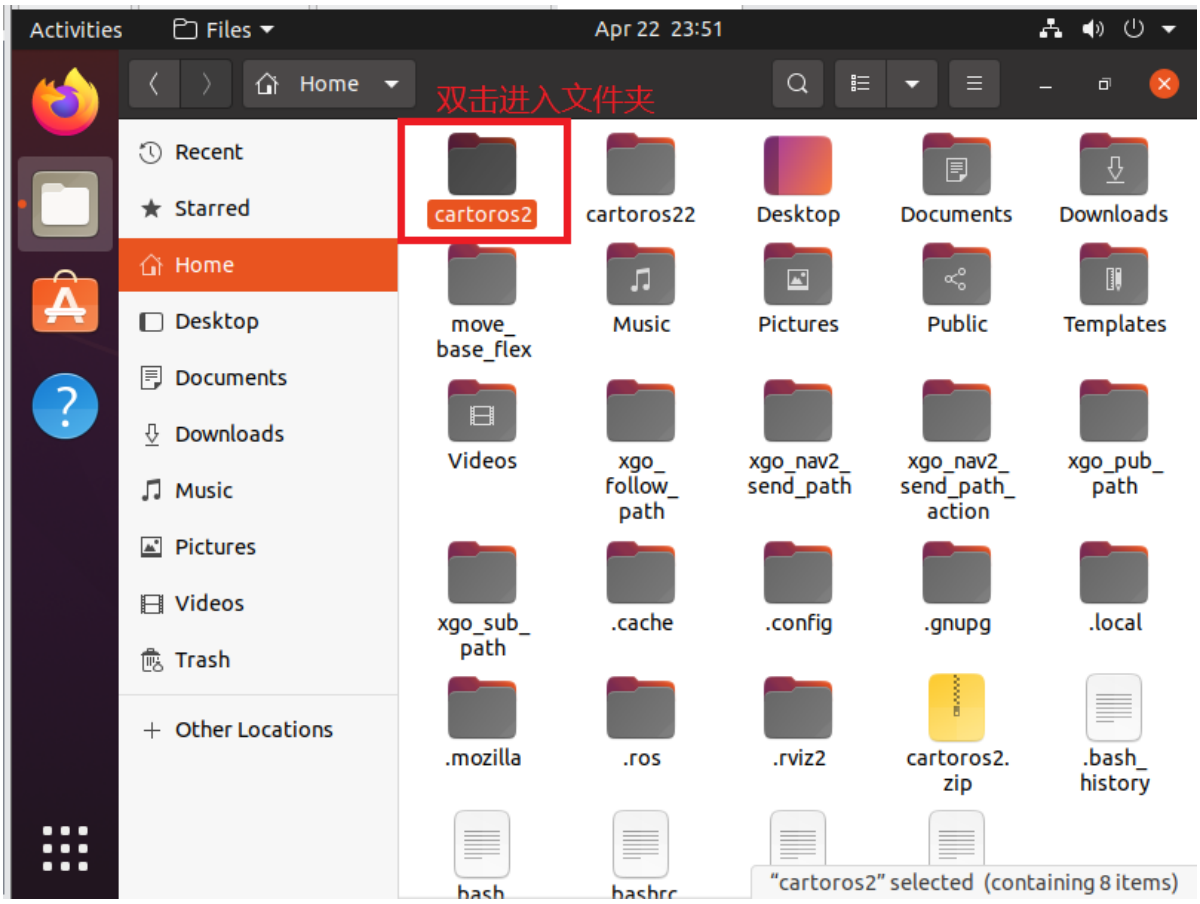
3. Start ROSBridge

The steps are the same for PI4 and PI5 versions:

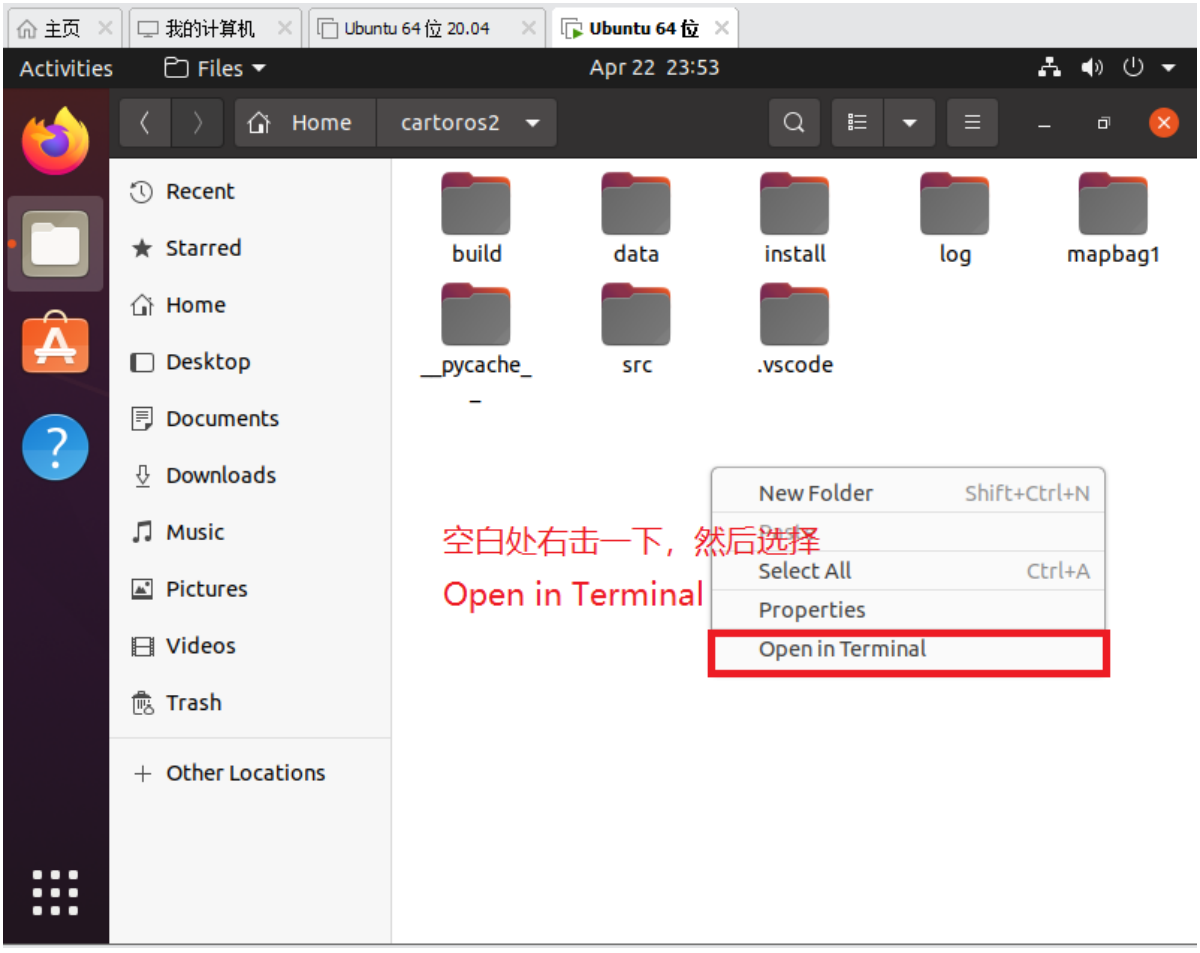
Enter the desktop system and open the folder.



Then double click on the cartoros2 folder



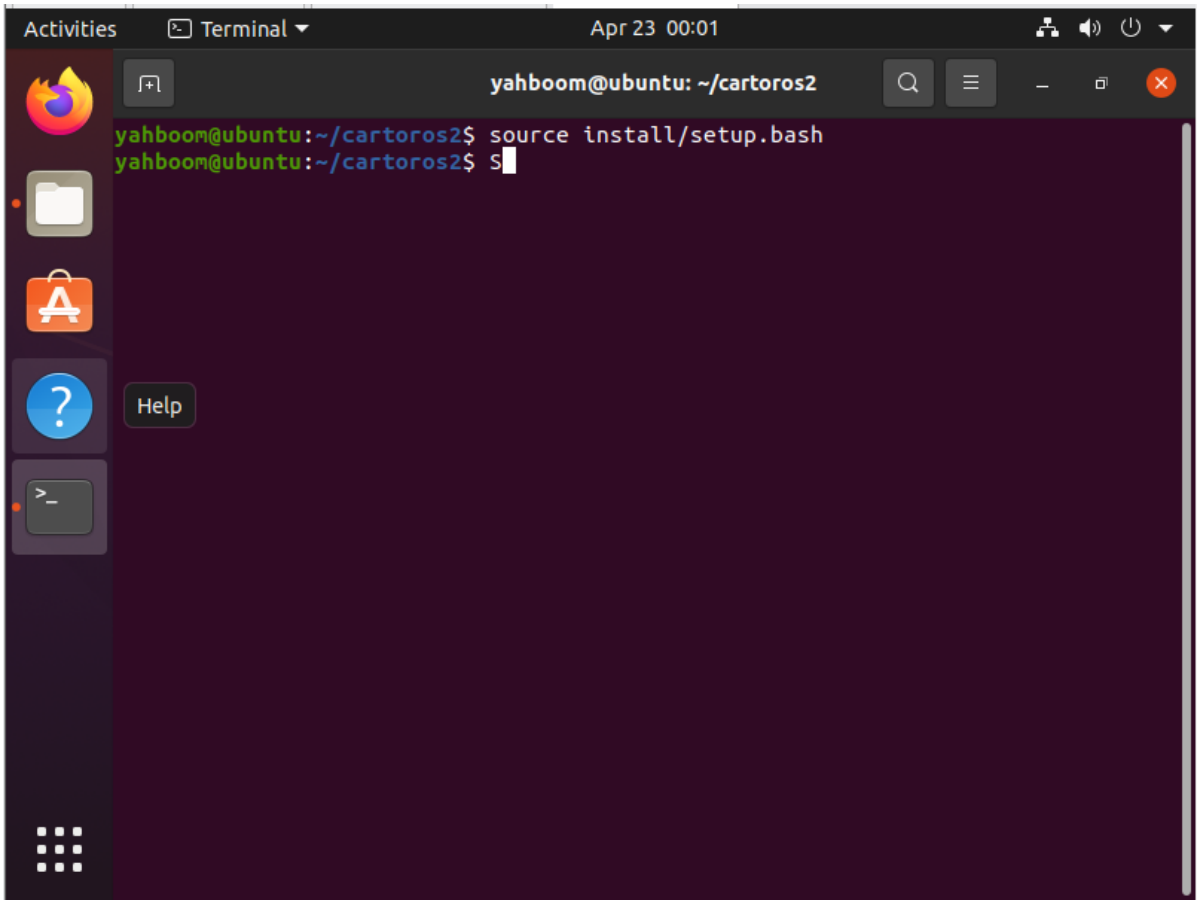
Then right-click in an empty space of the folder and select Open in Terminal



Then enter the following command in the terminal to activate the environment

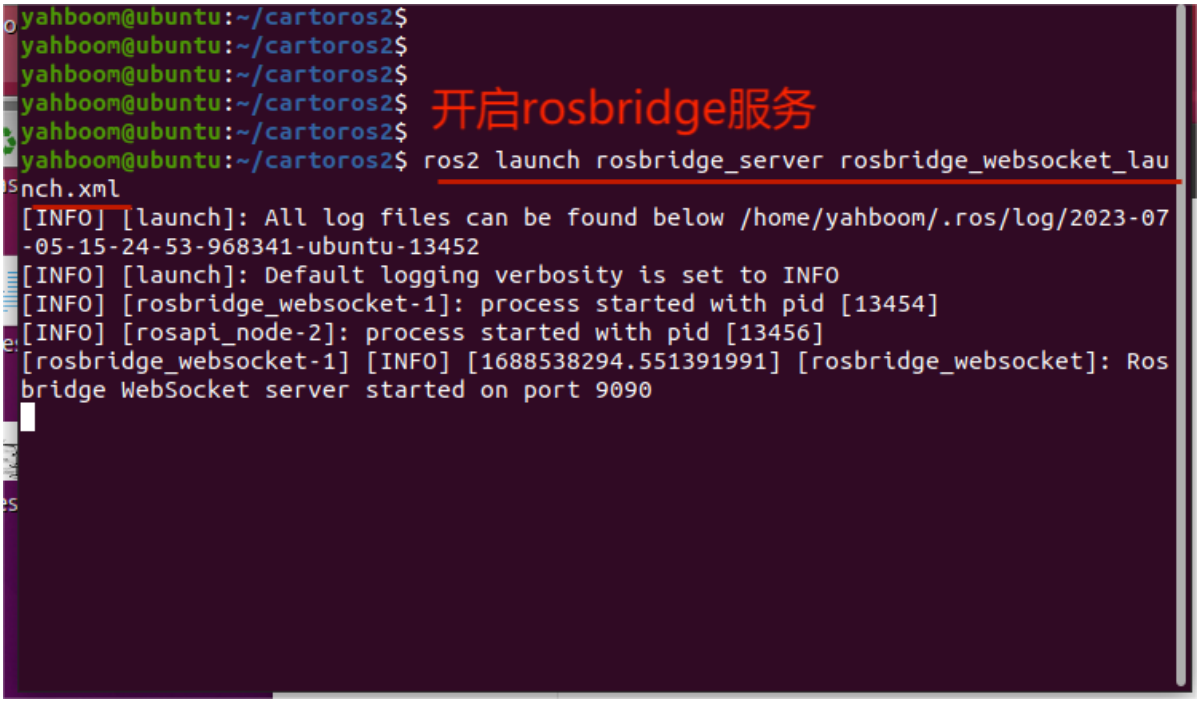
```
source install/setup.bash
```

After completing the input, press the Enter key.



Then enter the following command and press Enter to start rosbridge

```
ros2 launch rosbridge_server rosbridge_websocket_launch.xml
```



4. Start navigation

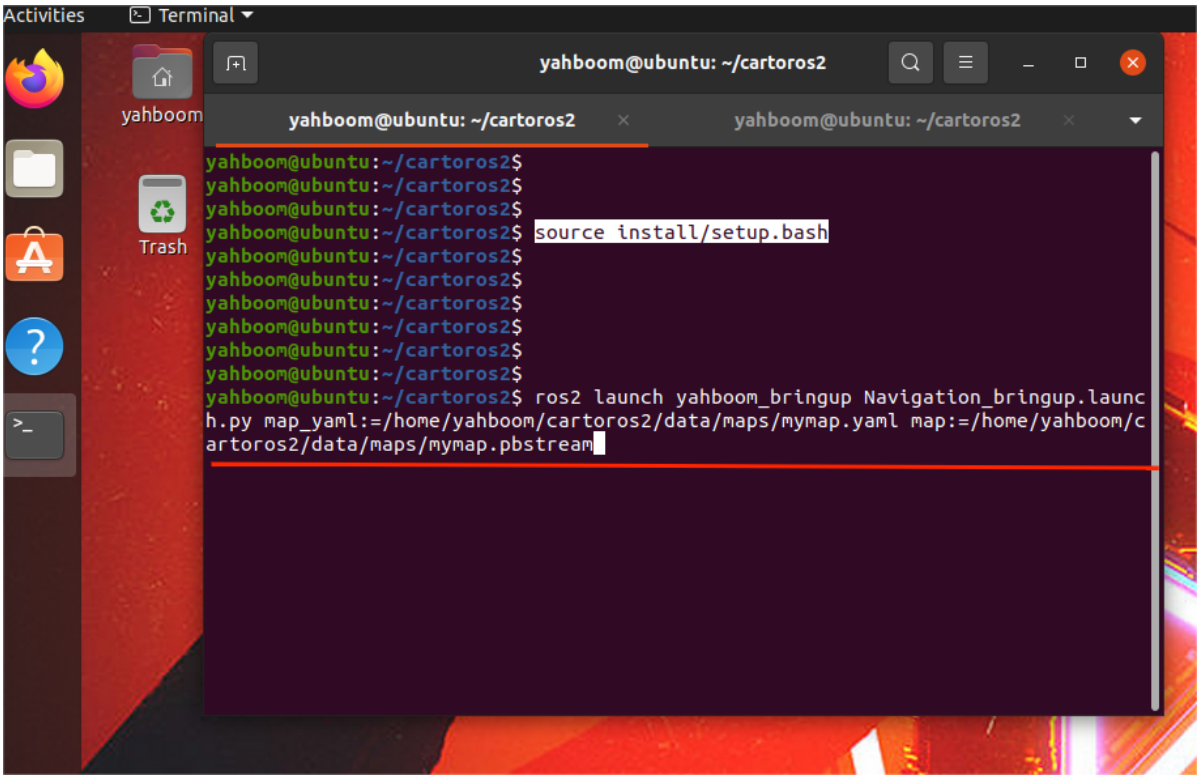
PI4 version steps:

Then press the shortcut key: ctrl + shift + t

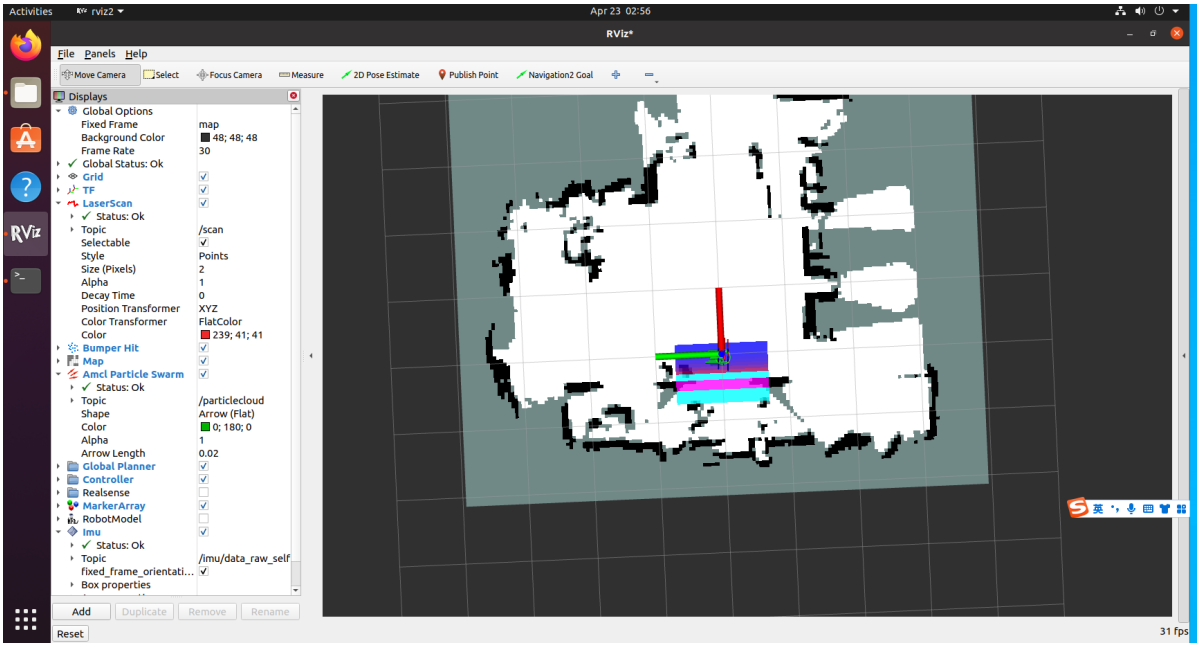
Enter the command in the newly opened terminal

```
source install/setup.bash

ros2 launch yahboom_bringup Navigation_bringup.launch.py
map_yaml:=/home/yahboom/cartoros2/data/maps/mymap.yaml
map:=/home/yahboom/cartoros2/data/maps/mymap.pbstream
```



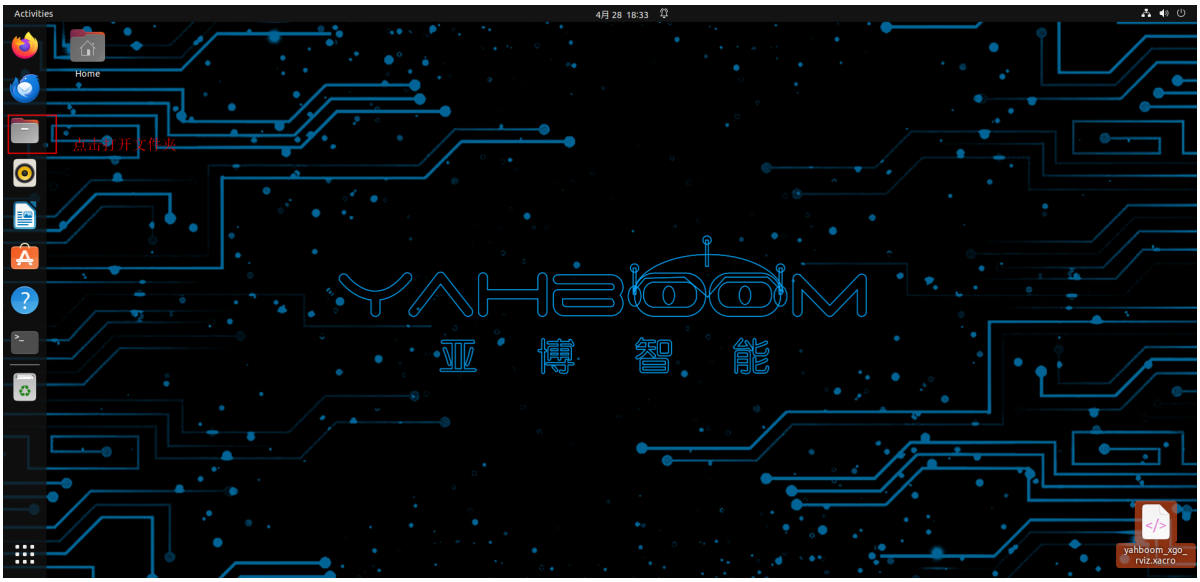
Then press the Enter key to navigate.



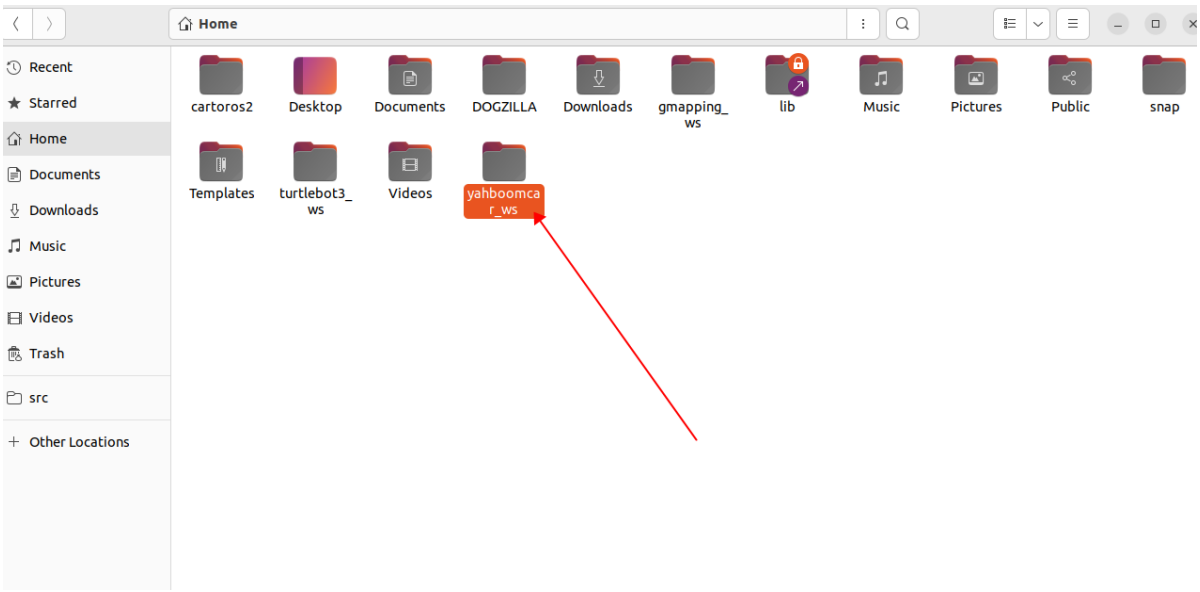
Press the Enter key, and the urdf of the mechanical dog is started.

PI5 version steps:

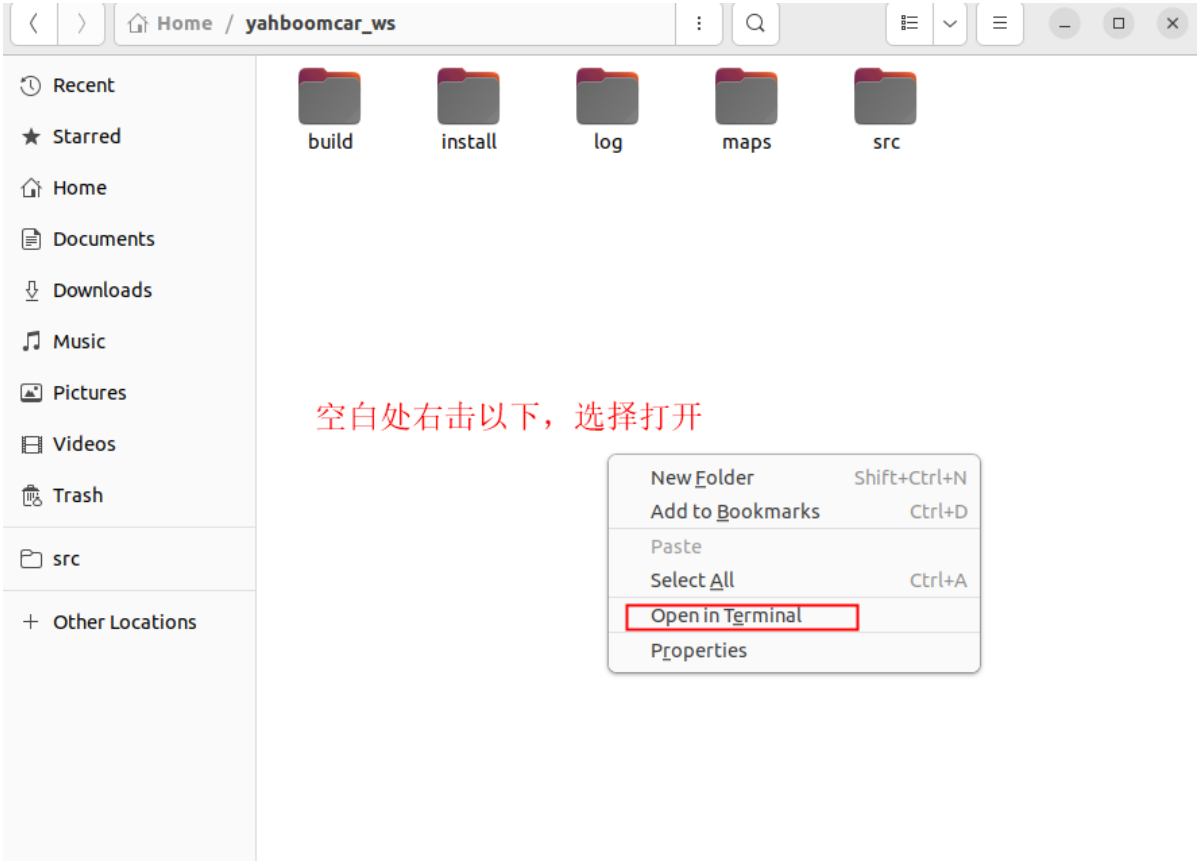
Enter the desktop system and open the folder.



Double-click to open the yahboomcar_ws folder



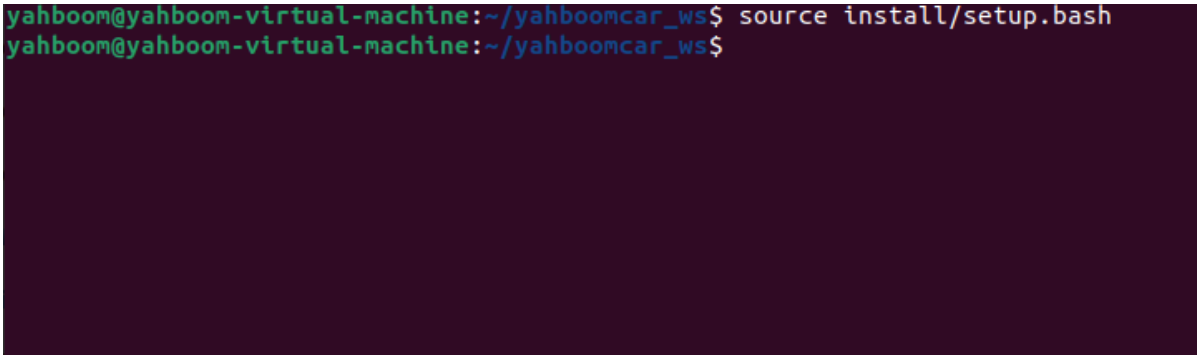
Then right-click in an empty space of the folder and select Open in Terminal



Then enter the following command in the terminal to activate the environment

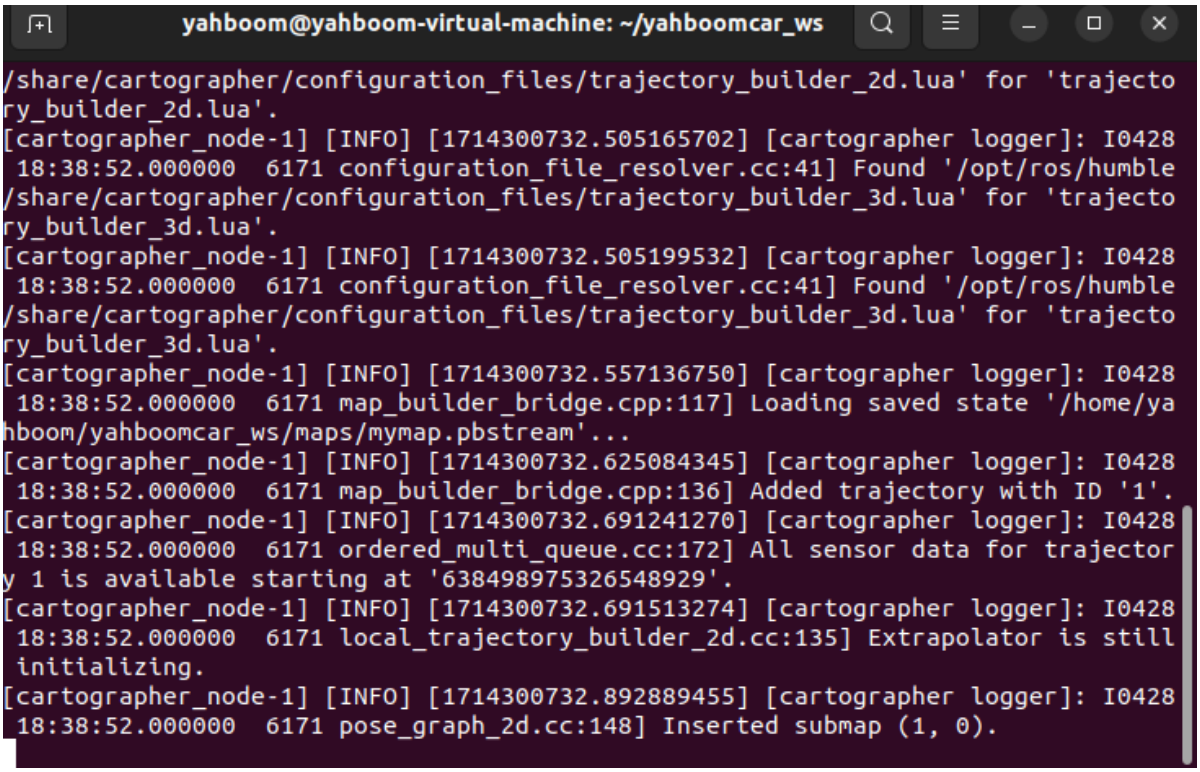
```
source install/setup.bash
```

After completing the input, press Enter.



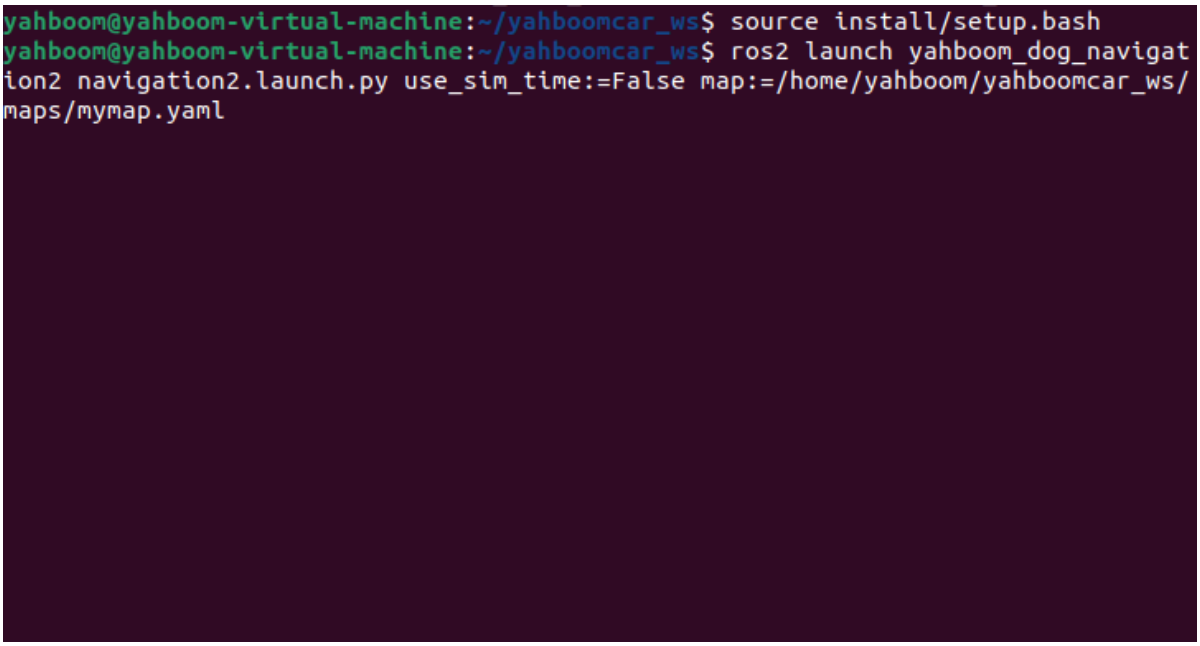
Then enter the command to start the relocation function

```
ros2 launch yahboom_dog_cartographer localization_imu_odom.launch.py
load_state_filename:=/home/yahboom/yahboomcar_ws/maps/mymap.pbstream
```

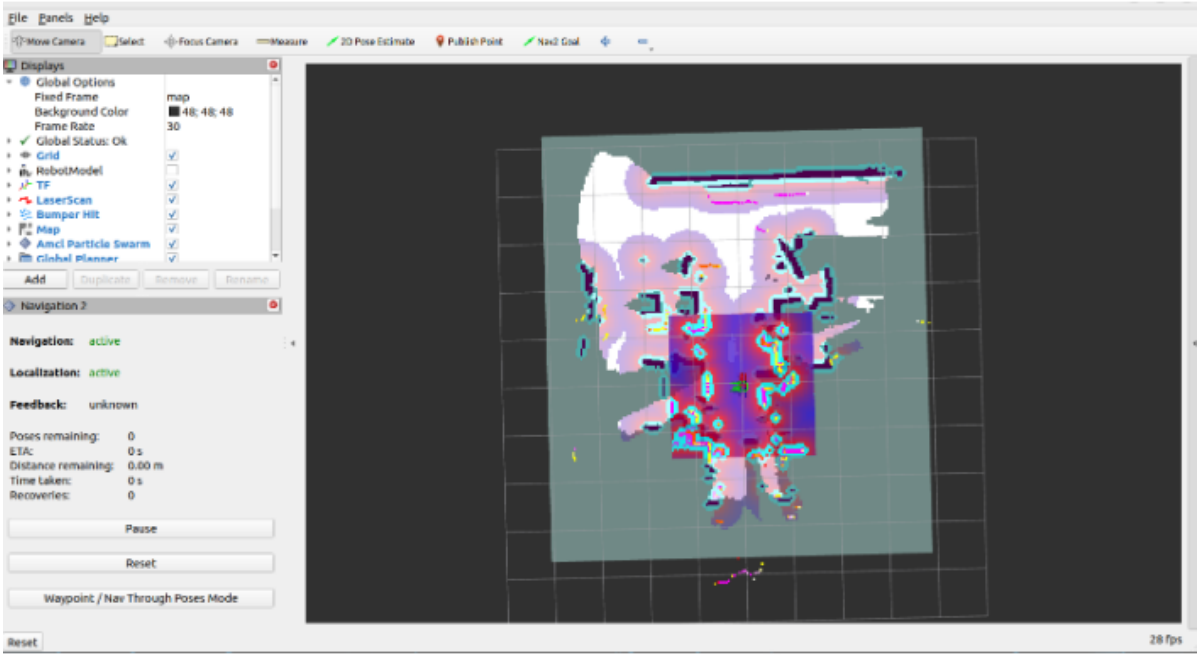


Repeat the above steps to open the terminal, reopen a terminal and enter navigation commands.

```
ros2 launch yahboom_dog_navigation2 navigation2.launch.py use_sim_time:=False
map:=/home/yahboom/yahboomcar_ws/maps/mymap.yaml
```



Then press the Enter key to navigate. **(Because the mechanical dog itself does not provide odom, we need to position the mechanical dog at the coordinate origin when constructing the map)**



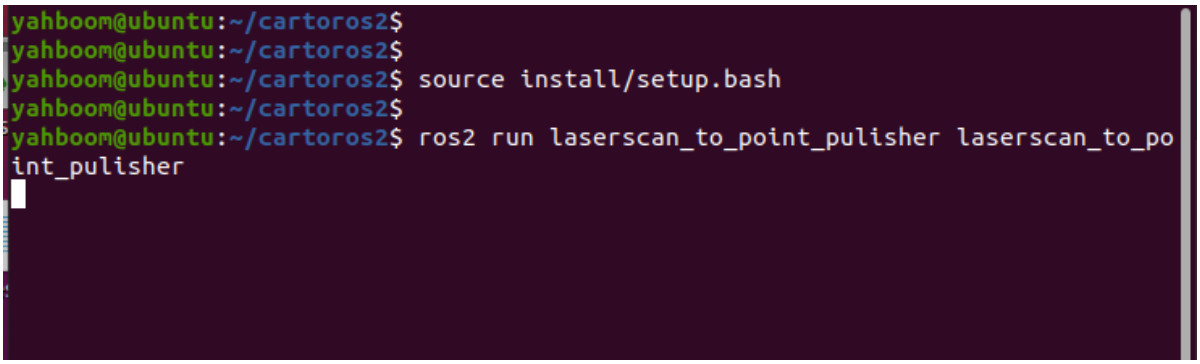
5. APP controls the mechanical dog to walk and navigate

The steps are the same for PI4 and PI5 versions:

Click on the terminal and press the shortcut key: ctrl + shift + t

Enter the command in the terminal to start the point cloud publishing node:

```
source install/setup.bash
ros2 run laserscan_to_point_pulisher laserscan_to_point_pulisher
```



Click on the terminal and press the shortcut key: ctrl + shift + t

Enter the command in the terminal to start the positioning publishing node:

```
source install/setup.bash
ros2 launch robot_pose_publisher_ros2 robot_pose_publisher_launch.py
```

6. Camera display

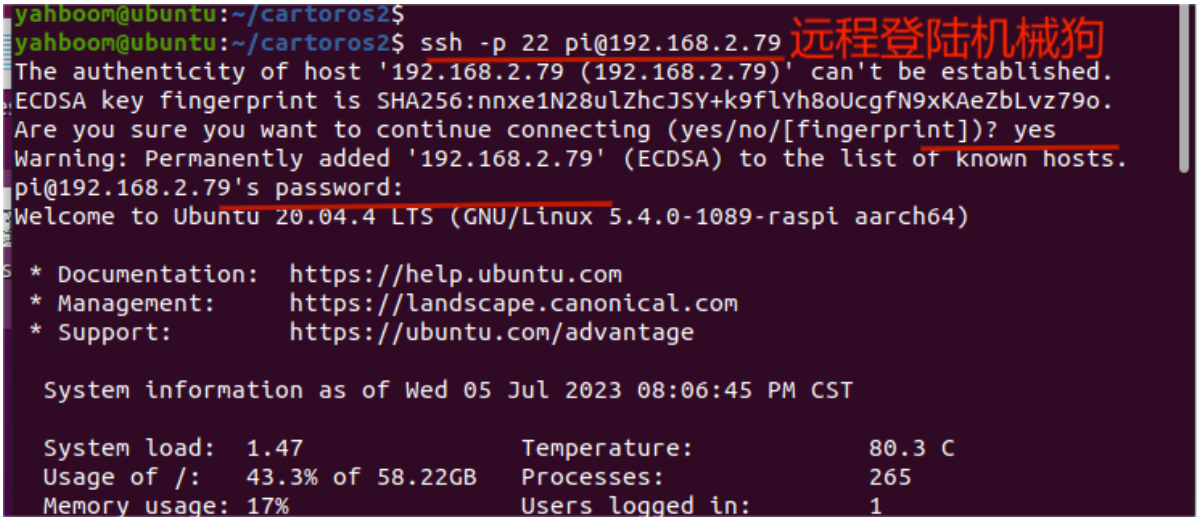
PI4 version steps:

Click on the terminal and press the shortcut key: ctrl + shift + t

Enter the command in the terminal to remotely connect to the robot dog. Currently, the robot dog and the virtual machine are in the same LAN. The IP of the robot dog is: 192.168.2.79. In actual operation, it depends on the specific IP address of your own robot dog.

```
ssh -p 22pi@192.168.2.79
```

Press Enter and enter yes, then enter the login password of the mechanical dog: yahboom



Then enter the command to start the camera in the terminal:

```
ros2 launch usb_cam demo_launch.py
```

```
pi@yahboom:~$
pi@yahboom:~$ ros2 launch usb_cam demo_launch.py
[INFO] [launch]: All log files can be found below /home/pi/.ros/log/2023-07-05-2
0-13-03-911670-yahboom-89445
[INFO] [launch]: Default logging verbosity is set to INFO
'opt/ros/foxy/share/usb_cam/config/params.yaml
 INFO] [usb_cam_node_exe-1]: process started with pid [89529]
[usb_cam_node_exe-1] [INFO] [1688559184.442941567] [usb_cam]: camera_name value:
 test_camera
[usb_cam_node_exe-1] [WARN] [1688559184.443275107] [usb_cam]: framerate: 30.0000
00
[usb_cam_node_exe-1] [INFO] [1688559184.461739301] [usb_cam]: camera calibration
 URL: package://usb_cam/config/camera_info.yaml
[usb_cam_node_exe-1] [INFO] [1688559184.464124605] [usb_cam]: Starting 'test_cam
era' (/dev/video0) at 640x480 via mmap (mjpeg2rgb) at 30 FPS
[usb_cam_node_exe-1] [swscaler @ 0xaaaaf30867f0] No accelerated colorspace conve
rsion found from yuv422p to rgb24.
[usb_cam_node_exe-1] [INFO] [1688559184.545634240] [usb_cam]: This devices suppr
```

启动相机节点

PI5 version steps:

Open a terminal in the virtual machine, enter the IP on the mechanical dog, and log in remotely. The example IP here is 192.168.2.145.

```
ssh -p 22pi@192.168.2.145
```

Press Enter and enter yes, then enter the login password of the mechanical dog: yahboom

```
yahboom@yahboom-virtual-machine:~$ ssh -p 22 pi@192.168.2.145
pi@192.168.2.145's password:
Linux raspberrypi 6.6.20+rpt-rpi-2712 #1 SMP PREEMPT Debian 1:6.6.20-1+rpt1 (202
4-03-07) aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Sun Apr 28 08:36:44 2024
pi@raspberrypi:~ $
```

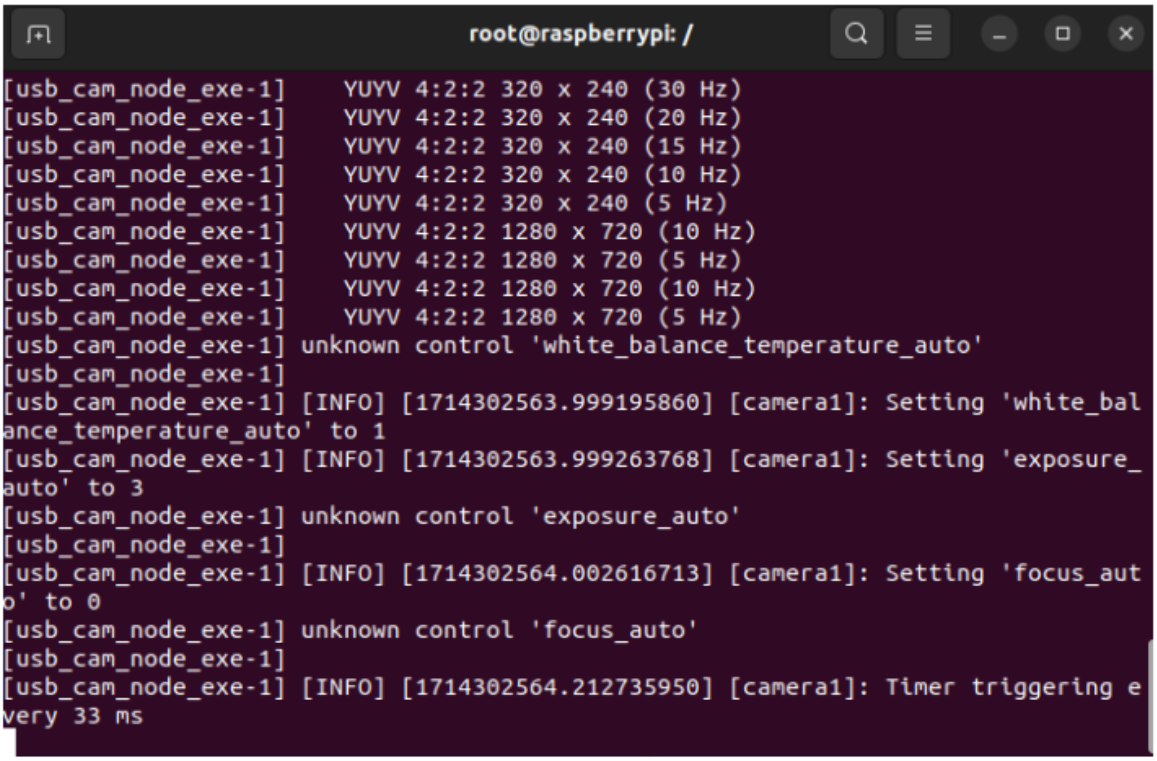
Then enter docker ps to view the current ID, and then enter the command to enter the same docker

```
docker ps
docker exec -it (id)/bin/bash
```

```
pi@raspberrypi:~ $ docker ps
CONTAINER ID   IMAGE                                COMMAND       CREATED
 STATUS          PORTS     NAMES
5029cf9a6f99   yahboomtechnology/ros-humble:3.0   "/bin/bash"   50 minutes ago
 Up 50 minutes             loving_black
pi@raspberrypi:~ $ docker exec -it 5029 /bin/bash
root@raspberrypi:/#
```

Then enter the command to start the camera in the terminal:

```
ros2 launch usb_cam camera.launch.py
```

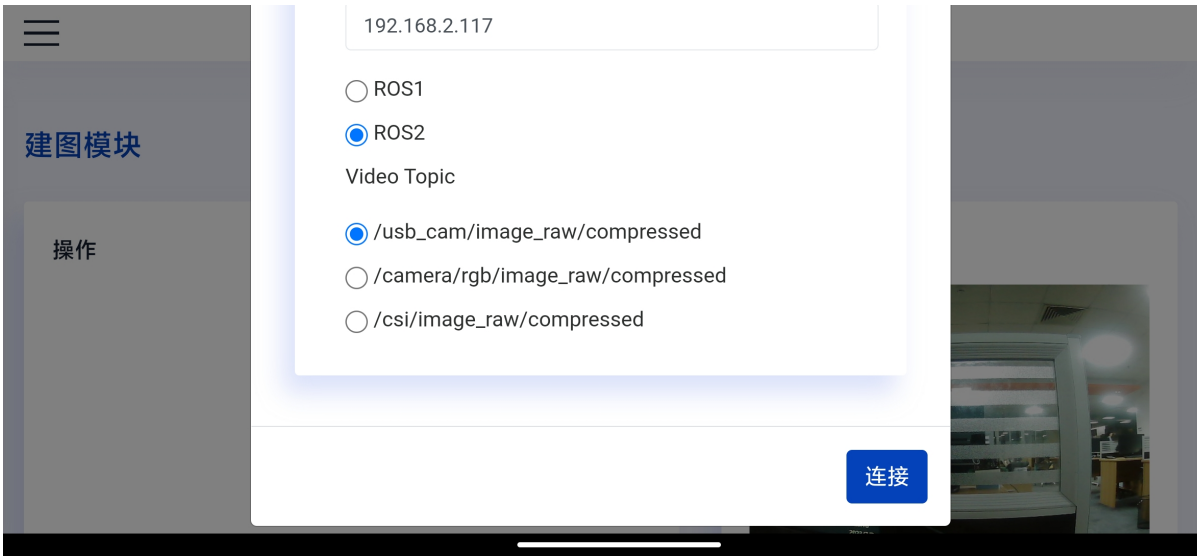


7. APP display

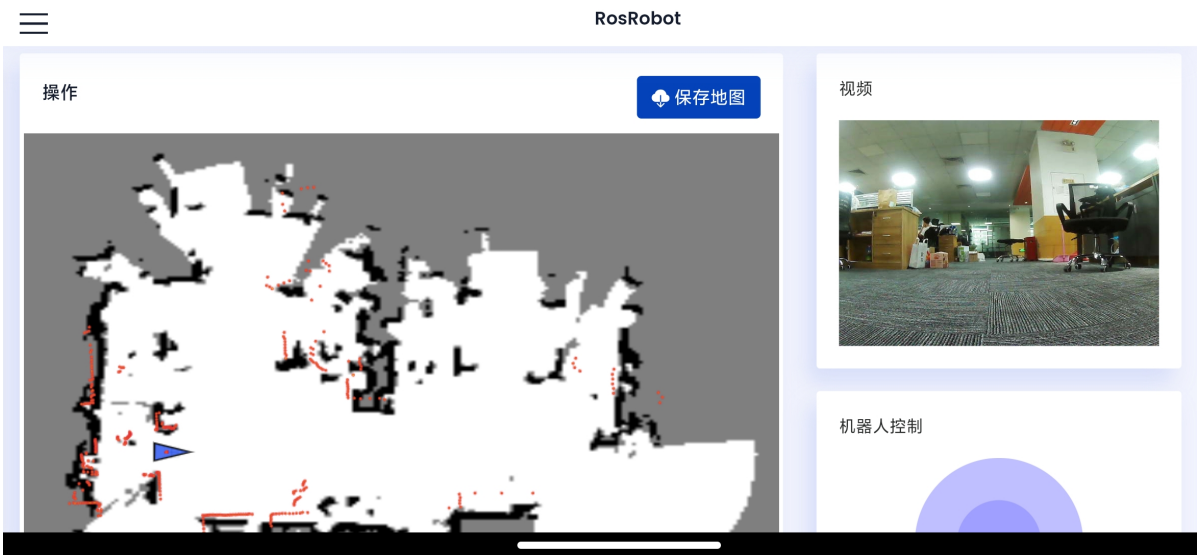
Open the mobile APP ROS Robot

Enter the IP address of the virtual machine. Take the current virtual machine IP as 192.168.2.117 as an example. At the same time, select the camera topic of the mechanical dog as /usb_cam/imge_raw/compress and select ros2.

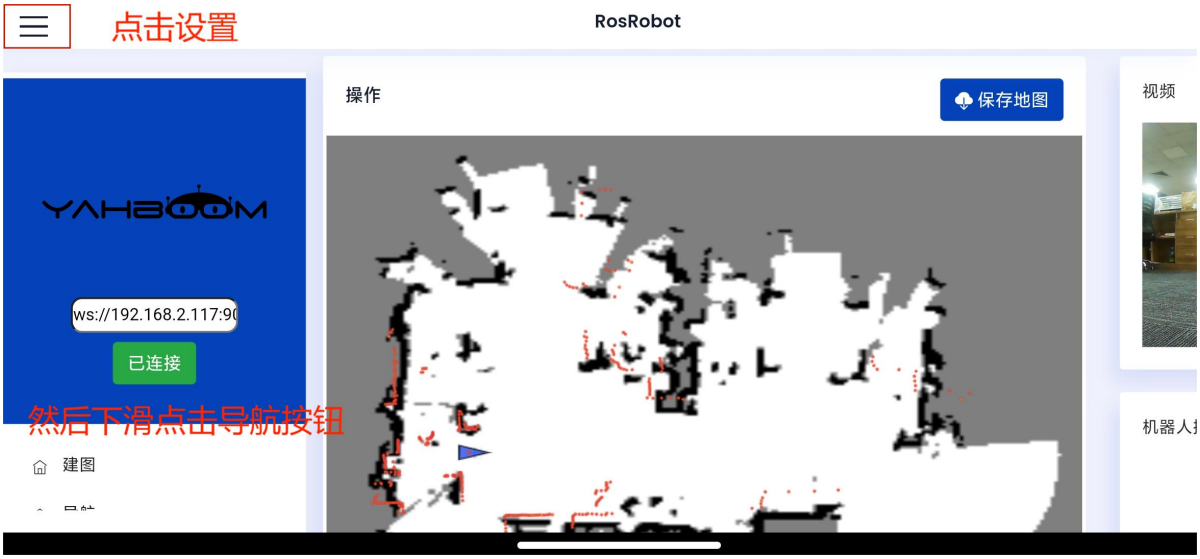
Then swipe down and click Connect.



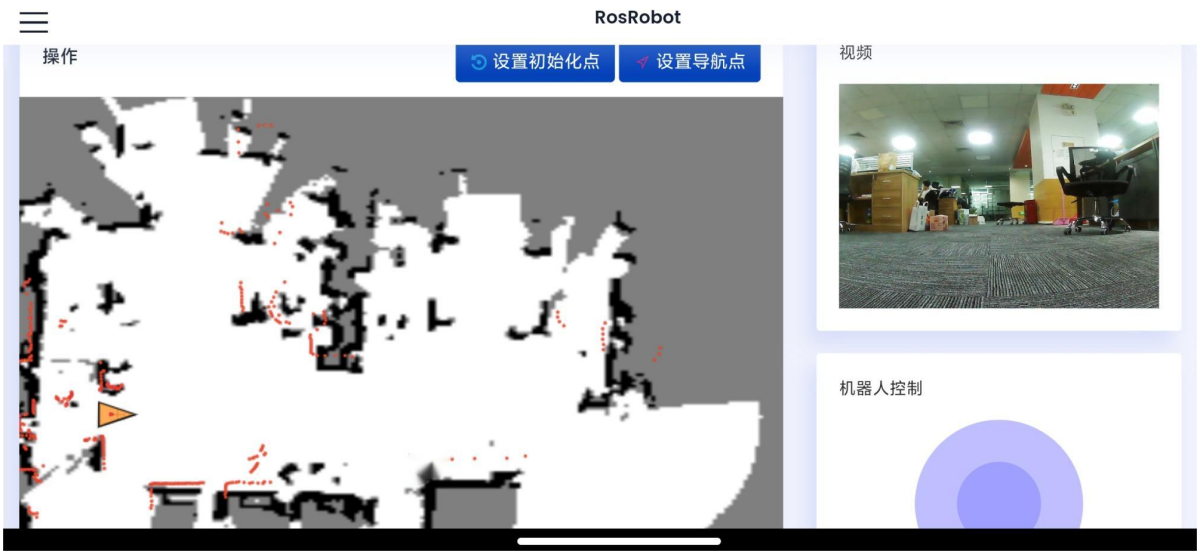
After entering the map interface, you can see the map scanned by the radar and the camera image.



Click the Settings button and slide down the pop-up interface to click the Navigation button.



The picture below shows the screen of entering navigation mode.



Then click on a target point on the subway, and the mechanical dog can navigate normally. The yellow line is the navigation path.