ROS Robot App Map Building

Note: The virtual machine needs to be in the same LAN as the car, and the ROS_DOMAIN_ID needs to be the same. You can check [Must Read Before Use] to set the IP and ROS_DOMAIN_ID on the board.

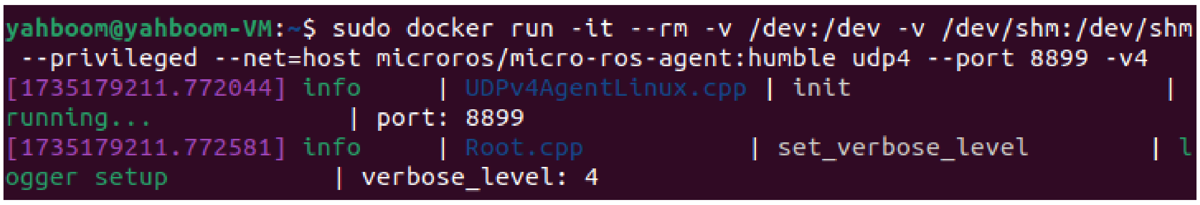
1. Program Function Description

The car connects to the proxy, runs the program, opens the [ROS Robot] app downloaded on the phone, enters the IP address of the car, selects ROS2, clicks Connect, and the car can be connected. You can control the car by sliding the wheel on the interface, slowly control the car to walk through the map building area, and finally click Save Map, the car will save the current built map.

2. Start and connect the agent

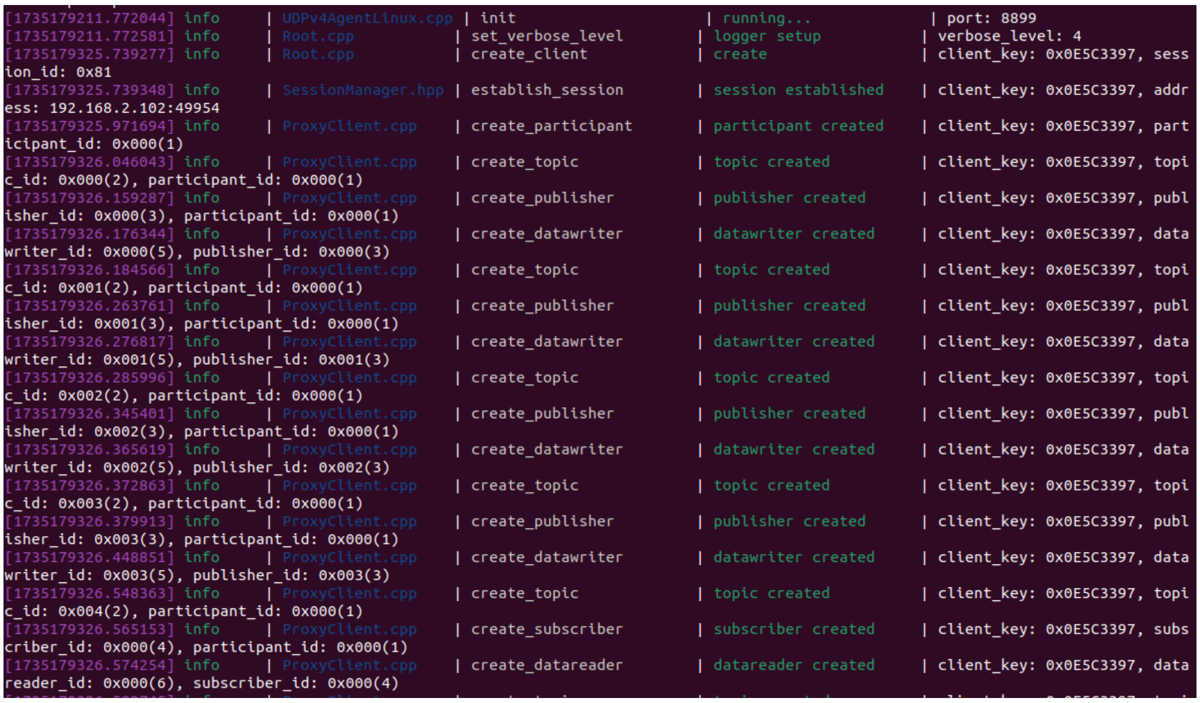
Take the supporting virtual machine as an example, enter the following command to start the agent (the agent can be started once without shutting down, no need to restart),

```
#Car agent
sudo docker run -it --rm -v /dev:/dev -v /dev/shm:/dev/shm --privileged --net=host microros/micro-ros-agent:humble udp4 --port 8899 -v4
#Camera agent (start the agent first and then turn on the car switch)
docker run -it --rm -v /dev:/dev -v /dev/shm:/dev/shm --privileged --net=host microros/micro-ros-agent:humble udp4 --port 9999 -v4
```



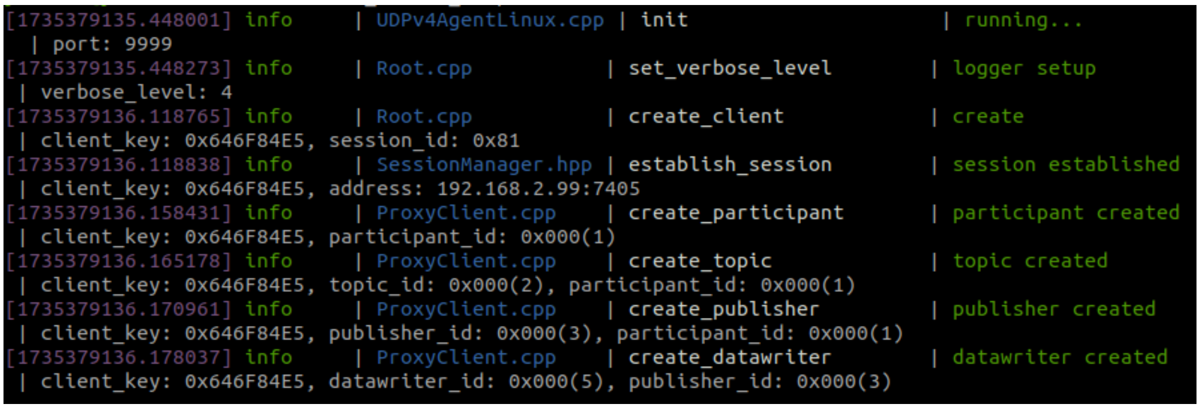
```
yahboom@yahboom-VM:~$ sudo docker run -it --rm -v /dev:/dev -v /dev/shm:/dev/shm
 --privileged --net=host microros/micro-ros-agent:humble udp4 --port 8899 -v4
[1735179211.772044] info     | UDPv4AgentLinux.cpp | init                     |
running...               | port: 8899
[1735179211.772581] info     | Root.cpp            | set_verbose_level        | l
ogger setup              | verbose_level: 4
```

Then, turn on the car switch and wait for the car to connect to the proxy. The connection is successful as shown in the figure below.



```
[1735179211.772044] info     | UDPv4AgentLinux.cpp | init                   | running...             | port: 8899
[1735179211.772581] info     | Root.cpp            | set_verbose_level      | logger setup           | verbose_level: 4
[1735179325.739277] info     | Root.cpp            | create_client          | create                 | client_key: 0x0E5C3397, sess
ion_id: 0x81
[1735179325.739348] info     | SessionManager.hpp  | establish_session      | session established    | client_key: 0x0E5C3397, addr
ess: 192.168.2.102:49954
[1735179325.971694] info     | ProxyClient.cpp     | create_participant     | participant created    | client_key: 0x0E5C3397, part
icipant_id: 0x000(1)
[1735179326.046043] info     | ProxyClient.cpp     | create_topic           | topic created          | client_key: 0x0E5C3397, topi
c_id: 0x000(2), participant_id: 0x000(1)
[1735179326.159287] info     | ProxyClient.cpp     | create_publisher       | publisher created      | client_key: 0x0E5C3397, publ
isher_id: 0x000(3), participant_id: 0x000(1)
[1735179326.176344] info     | ProxyClient.cpp     | create_datawriter      | datawriter created     | client_key: 0x0E5C3397, data
writer_id: 0x000(5), publisher_id: 0x000(3)
[1735179326.184566] info     | ProxyClient.cpp     | create_topic           | topic created          | client_key: 0x0E5C3397, topi
c_id: 0x001(2), participant_id: 0x000(1)
[1735179326.263761] info     | ProxyClient.cpp     | create_publisher       | publisher created      | client_key: 0x0E5C3397, publ
isher_id: 0x001(3), participant_id: 0x000(1)
[1735179326.276817] info     | ProxyClient.cpp     | create_datawriter      | datawriter created     | client_key: 0x0E5C3397, data
writer_id: 0x001(5), publisher_id: 0x001(3)
[1735179326.285996] info     | ProxyClient.cpp     | create_topic           | topic created          | client_key: 0x0E5C3397, topi
c_id: 0x002(2), participant_id: 0x000(1)
[1735179326.345401] info     | ProxyClient.cpp     | create_publisher       | publisher created      | client_key: 0x0E5C3397, publ
isher_id: 0x002(3), participant_id: 0x000(1)
[1735179326.365619] info     | ProxyClient.cpp     | create_datawriter      | datawriter created     | client_key: 0x0E5C3397, data
writer_id: 0x002(5), publisher_id: 0x002(3)
[1735179326.372863] info     | ProxyClient.cpp     | create_topic           | topic created          | client_key: 0x0E5C3397, topi
c_id: 0x003(2), participant_id: 0x000(1)
[1735179326.379913] info     | ProxyClient.cpp     | create_publisher       | publisher created      | client_key: 0x0E5C3397, publ
isher_id: 0x003(3), participant_id: 0x000(1)
[1735179326.448851] info     | ProxyClient.cpp     | create_datawriter      | datawriter created     | client_key: 0x0E5C3397, data
writer_id: 0x003(5), publisher_id: 0x003(3)
[1735179326.548363] info     | ProxyClient.cpp     | create_topic           | topic created          | client_key: 0x0E5C3397, topi
c_id: 0x004(2), participant_id: 0x000(1)
[1735179326.565153] info     | ProxyClient.cpp     | create_subscriber      | subscriber created     | client_key: 0x0E5C3397, subs
criber_id: 0x000(4), participant_id: 0x000(1)
[1735179326.574254] info     | ProxyClient.cpp     | create_datareader      | datareader created     | client_key: 0x0E5C3397, data
reader_id: 0x000(6), subscriber_id: 0x000(4)
```

Camera proxy, the connection is successful as shown in the figure below.



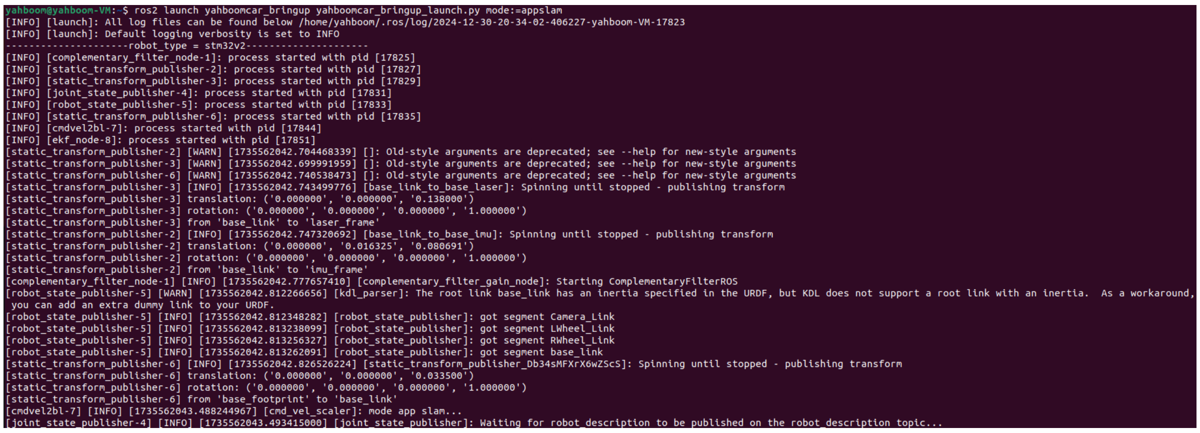
```
[1735379135.448001] info     | UDPv4AgentLinux.cpp | init                   | running...
  | port: 9999
[1735379135.448273] info     | Root.cpp            | set_verbose_level      | logger setup
  | verbose_level: 4
[1735379136.118765] info     | Root.cpp            | create_client          | create
  | client_key: 0x646F84E5, session_id: 0x81
[1735379136.118838] info     | SessionManager.hpp | establish_session       | session established
  | client_key: 0x646F84E5, address: 192.168.2.99:7405
[1735379136.158431] info     | ProxyClient.cpp     | create_participant     | participant created
  | client_key: 0x646F84E5, participant_id: 0x000(1)
[1735379136.165178] info     | ProxyClient.cpp     | create_topic           | topic created
  | client_key: 0x646F84E5, topic_id: 0x000(2), participant_id: 0x000(1)
[1735379136.170961] info     | ProxyClient.cpp     | create_publisher       | publisher created
  | client_key: 0x646F84E5, publisher_id: 0x000(3), participant_id: 0x000(1)
[1735379136.178037] info     | ProxyClient.cpp     | create_datawriter      | datawriter created
  | client_key: 0x646F84E5, datawriter_id: 0x000(5), publisher_id: 0x000(3)
```

3. Start the program

First, start the car to process the underlying data program, and enter the terminal.

```
ros2 launch yahboomcar_bringup yahboomcar_bringup_launch.py mode:=appslam
```

```
#Parameter description, adjust the speed of the car, the mode is app mapping mode
mode:=appslam
```

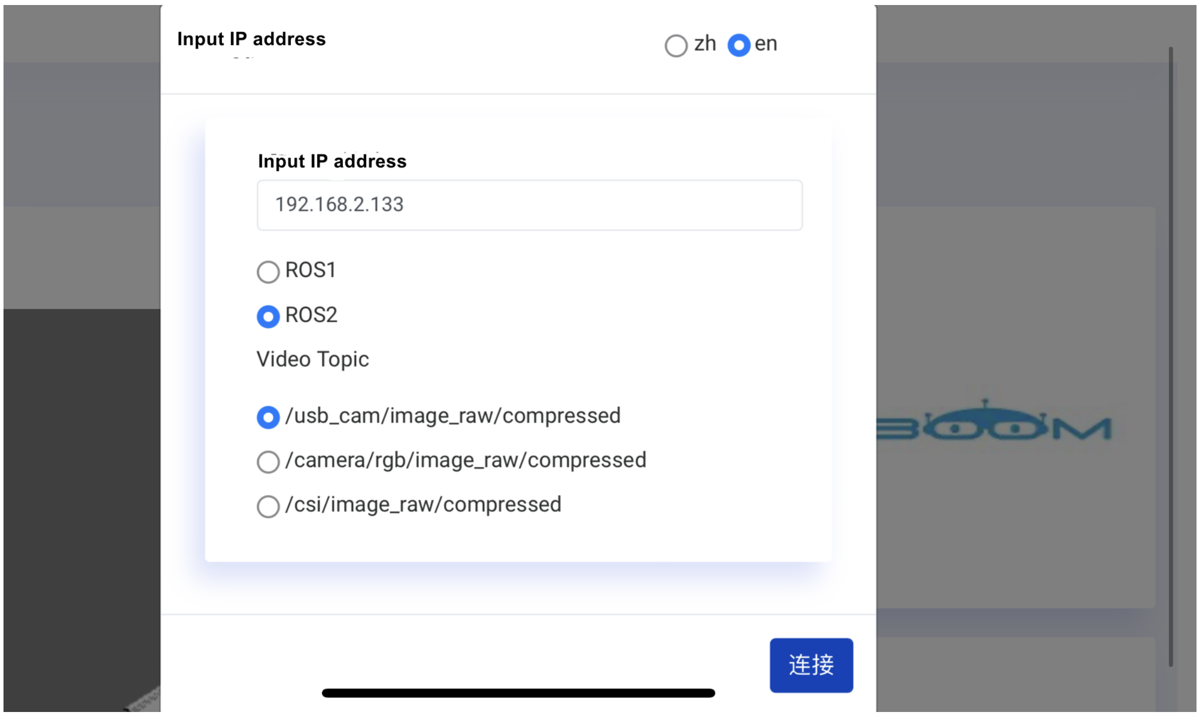


```
yahboom@yahboom-VM:~$ ros2 launch yahboomcar_bringup yahboomcar_bringup_launch.py mode:=appslam
[INFO] [launch]: All log files can be found below /home/yahboom/.ros/log/2024-12-30-20-34-02-406227-yahboom-VM-17823
[INFO] [launch]: Default logging verbosity is set to INFO
---------------------robot_type = stm32v2---------------------
[INFO] [complementary_filter_node-1]: process started with pid [17825]
[INFO] [static_transform_publisher-2]: process started with pid [17827]
[INFO] [static_transform_publisher-3]: process started with pid [17829]
[INFO] [joint_state_publisher-4]: process started with pid [17831]
[INFO] [robot_state_publisher-5]: process started with pid [17833]
[INFO] [static_transform_publisher-6]: process started with pid [17835]
[INFO] [cmdvel2bl-7]: process started with pid [17844]
[INFO] [ekf_node-8]: process started with pid [17851]
[static_transform_publisher-2] [WARN] [1735562042.704468339] []: Old-style arguments are deprecated; see --help for new-style arguments
[static_transform_publisher-3] [WARN] [1735562042.699991959] []: Old-style arguments are deprecated; see --help for new-style arguments
[static_transform_publisher-6] [WARN] [1735562042.740538473] []: Old-style arguments are deprecated; see --help for new-style arguments
[static_transform_publisher-3] [INFO] [1735562042.743499776] [base_link_to_base_laser]: Spinning until stopped - publishing transform
[static_transform_publisher-3] translation: ('0.000000', '0.000000', '0.138000')
[static_transform_publisher-3] rotation: ('0.000000', '0.000000', '0.000000', '1.000000')
[static_transform_publisher-3] from 'base_link' to 'laser_frame'
[static_transform_publisher-2] [INFO] [1735562042.747320692] [base_link_to_base_imu]: Spinning until stopped - publishing transform
[static_transform_publisher-2] translation: ('0.000000', '0.016325', '0.080691')
[static_transform_publisher-2] rotation: ('0.000000', '0.000000', '0.000000', '1.000000')
[static_transform_publisher-2] from 'base_link' to 'imu_frame'
[complementary_filter_node-1] [INFO] [1735562042.777657410] [complementary_filter_gain_node]: Starting ComplementaryFilterROS
[robot_state_publisher-5] [WARN] [1735562042.812266656] [kdl_parser]: The root link base_link has an inertia specified in the URDF, but KDL does not support a root link with an inertia.  As a workaround,
 you can add an extra dummy link to your URDF.
[robot_state_publisher-5] [INFO] [1735562042.812348282] [robot_state_publisher]: got segment Camera_Link
[robot_state_publisher-5] [INFO] [1735562042.813238099] [robot_state_publisher]: got segment LWheel_Link
[robot_state_publisher-5] [INFO] [1735562042.813256327] [robot_state_publisher]: got segment RWheel_Link
[robot_state_publisher-5] [INFO] [1735562042.813262091] [robot_state_publisher]: got segment base_link
[static_transform_publisher-6] [INFO] [1735562042.826526224] [static_transform_publisher_Db34sMFXrX6wZScS]: Spinning until stopped - publishing transform
[static_transform_publisher-6] translation: ('0.000000', '0.000000', '0.033500')
[static_transform_publisher-6] rotation: ('0.000000', '0.000000', '0.000000', '1.000000')
[static_transform_publisher-6] from 'base_footprint' to 'base_link'
[cmdvel2bl-7] [INFO] [1735562043.488244967] [cmd_vel_scaler]: mode app slam...
[joint_state_publisher-4] [INFO] [1735562043.493415000] [joint_state_publisher]: Waiting for robot_description to be published on the robot_description topic...
```

Start the APP mapping command, enter in the terminal,

```
#Choose one of the following mapping
ros2 launch yahboomcar_nav map_gmapping_app_launch.xml
ros2 launch yahboomcar_nav map_cartographer_app_launch.xml
#Start ESP32 camera
ros2 run yahboom_esp32_camera sub_img
```

The mobile phone APP displays the following figure, enter the IP address of the car, [zh] means Chinese, [en] means English; select ROS2, the video below Tpoic selects /usb_cam/image_raw/compressed, and finally clicks [Connect]


Input IP address

zh [✓ en]

Input IP address

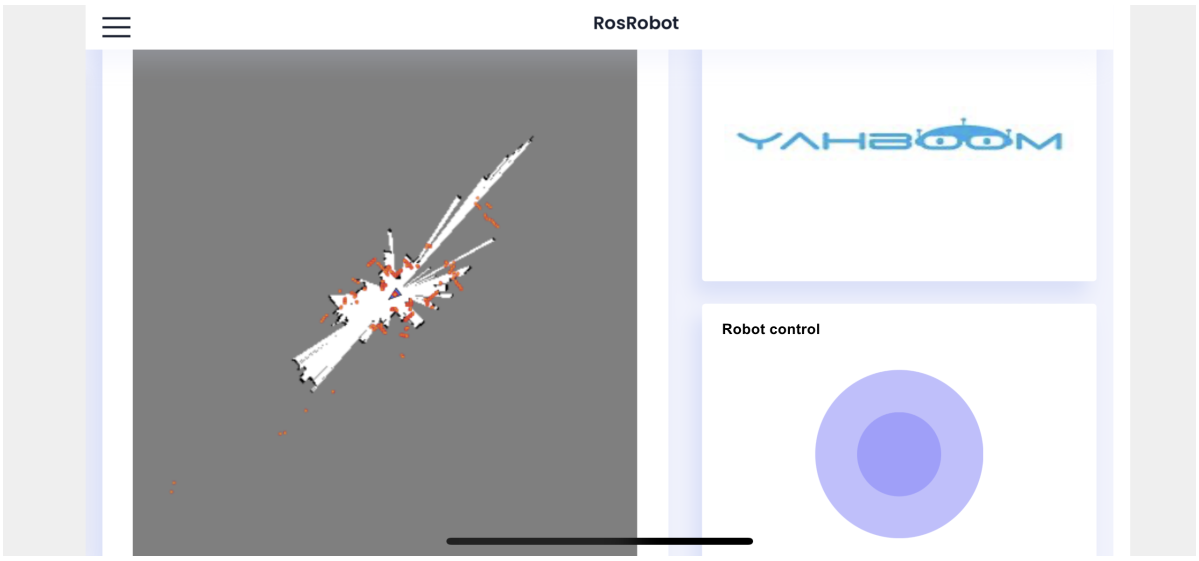
192.168.2.133

ROS1 [✓ ROS2]

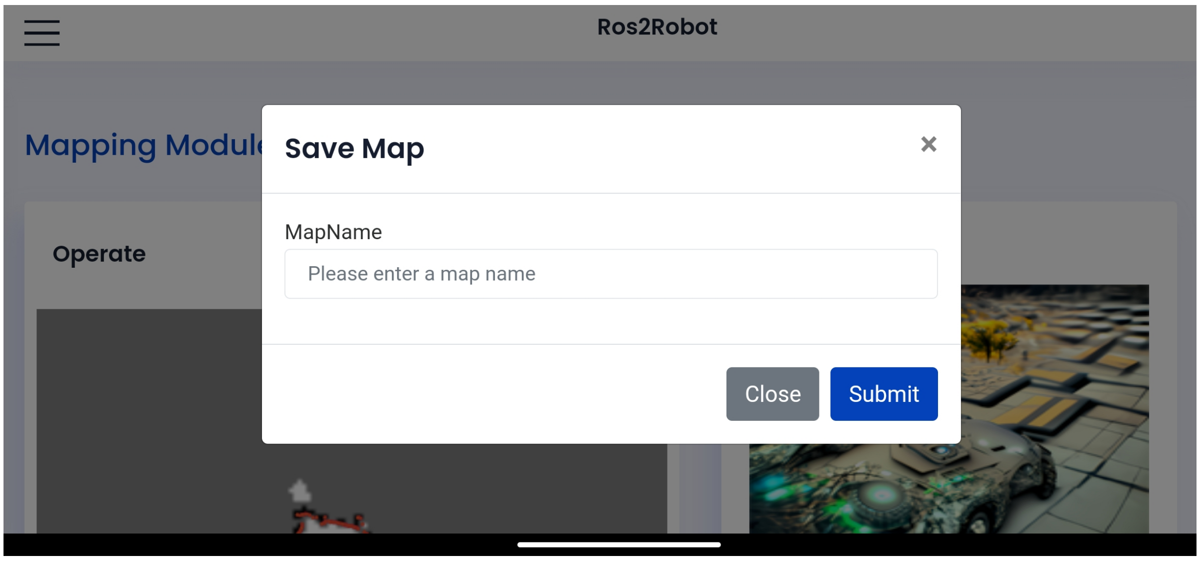
Video Topic

[✓ /usb_cam/image_raw/compressed]
/camera/rgb/image_raw/compressed
/csi/image_raw/compressed

After successfully connecting, the display is as follows,

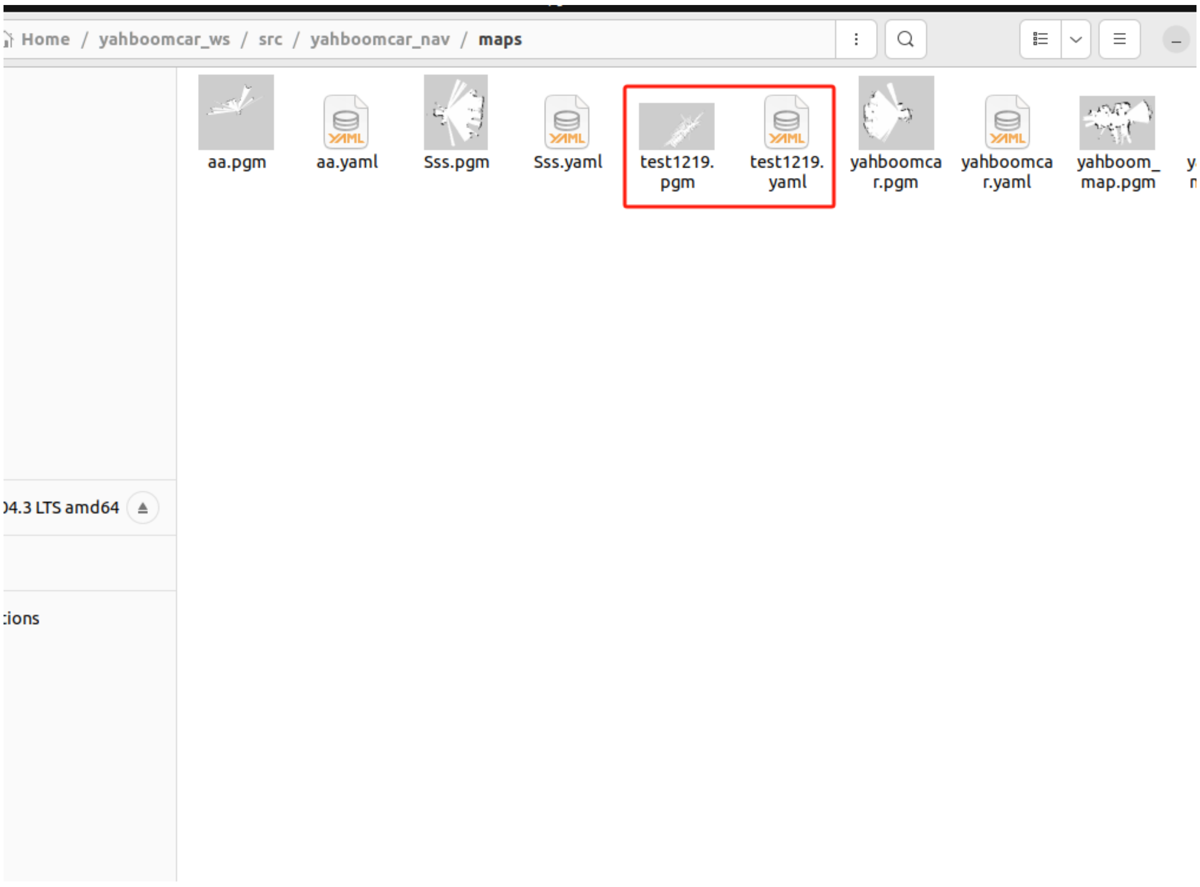


Use the sliding wheel to control the car to slowly move through the area where the map needs to be built, then click Save Map, enter the map name and click Submit to save the map



The location where the map is saved is,

```
/home/yahboom/yahboomcar_ws/src/yahboomcar_nav/maps
```



4. Code analysis

Here is the launch file for opening the APP map, taking gmapping map as an example,

map_gmapping_app_launch.xml

```
<launch>
    <arg name="use_rviz" default="false" />
    <include file="$(find-pkg-share
rosbridge_server)/launch/rosbridge_websocket_launch.xml"/>
    <node name="laserscan_to_point_publisher" pkg="laserscan_to_point_publisher"
exec="laserscan_to_point_publisher"/>
    <include file="$(find-pkg-share
yahboomcar_nav)/launch/map_gmapping_launch.py">
        <arg name="use_rviz" value="$(var use_rviz)"/>
    </include>
    <include file="$(find-pkg-share
robot_pose_publisher_ros2)/launch/robot_pose_publisher_launch.py"/>
    <include file="$(find-pkg-share
yahboom_app_save_map)/yahboom_app_save_map.launch.py"/>
</launch>
```

Here are several launch files and nodes:

- rosbridge_websocket_launch.xml: Open rosbridge service related nodes. After startup, you can connect to ROS through the network
- laserscan_to_point_publisher: Publish the point cloud conversion of the radar to the APP for visualization
- map_gmapping_launch.py: gmapping mapping program
- robot_pose_publisher_launch.py: Car pose publishing program, car pose is visualized in the APP
- yahboom_app_save_map.launch.py: Program for saving maps