Robot information release

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

1. Program function description

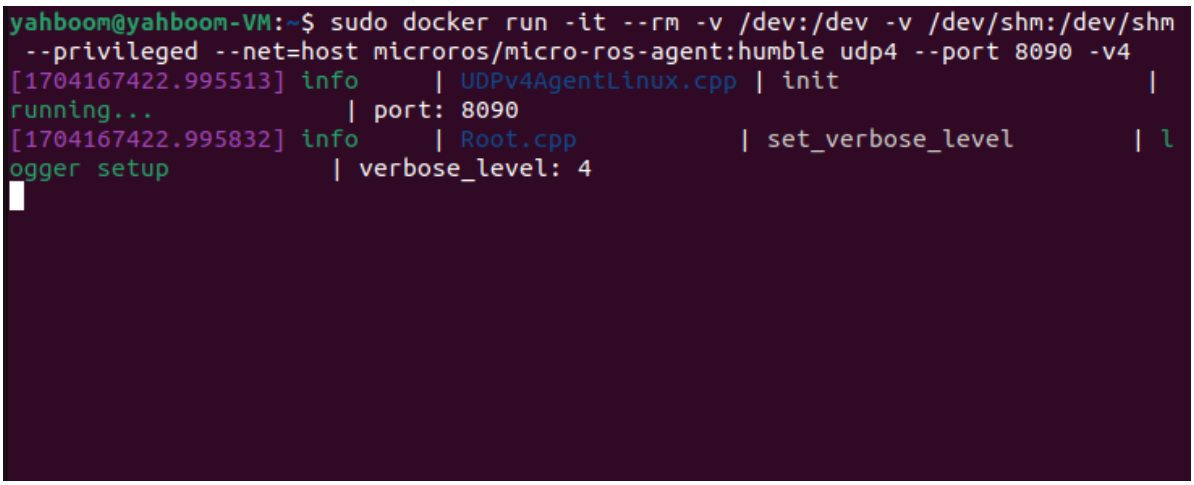
After the car is connected to the agent, it will publish sensor data such as radar and imu. You can run commands in the supporting virtual machine/Raspberry Pi 5 to query this information. You can also publish control data of sensors such as speed and buzzer.

2. Query car information

2.1. Start and connect to the agent

Taking the supporting virtual machine as an example, enter the following command to start the agent:

```
sudo docker run -it --rm -v /dev:/dev -v /dev/shm:/dev/shm --privileged --
net=host microros/micro-ros-agent:humble udp4 --port 8090 -v4
```



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

```
[1702630014.015846] info     | ProxyClient.cpp     | create_participant      | participant created    | client_key: 0x0B62A009, part
icipant_id: 0x000(1)
[1702630014.135363] info     | ProxyClient.cpp     | create_topic            | topic created          | client_key: 0x0B62A009, topi
c_id: 0x000(2), participant_id: 0x000(1)
[1702630014.223689] info     | ProxyClient.cpp     | create_publisher        | publisher created      | client_key: 0x0B62A009, publ
isher_id: 0x000(3), participant_id: 0x000(1)
[1702630014.415510] info     | ProxyClient.cpp     | create_datawriter       | datawriter created     | client_key: 0x0B62A009, data
writer_id: 0x000(5), publisher_id: 0x000(3)
[1702630014.428530] info     | ProxyClient.cpp     | create_topic            | topic created          | client_key: 0x0B62A009, topi
c_id: 0x001(2), participant_id: 0x000(1)
[1702630014.527190] info     | ProxyClient.cpp     | create_publisher        | publisher created      | client_key: 0x0B62A009, publ
isher_id: 0x001(3), participant_id: 0x000(1)
[1702630014.543889] info     | ProxyClient.cpp     | create_datawriter       | datawriter created     | client_key: 0x0B62A009, data
writer_id: 0x001(5), publisher_id: 0x001(3)
[1702630014.554490] info     | ProxyClient.cpp     | create_topic            | topic created          | client_key: 0x0B62A009, topi
c_id: 0x002(2), participant_id: 0x000(1)
[1702630014.737059] info     | ProxyClient.cpp     | create_publisher        | publisher created      | client_key: 0x0B62A009, publ
isher_id: 0x002(3), participant_id: 0x000(1)
[1702630014.755072] info     | ProxyClient.cpp     | create_datawriter       | datawriter created     | client_key: 0x0B62A009, data
writer_id: 0x002(5), publisher_id: 0x002(3)
[1702630014.818985] info     | ProxyClient.cpp     | create_topic            | topic created          | client_key: 0x0B62A009, topi
c_id: 0x003(2), participant_id: 0x000(1)
[1702630014.840001] info     | ProxyClient.cpp     | create_subscriber       | subscriber created     | client_key: 0x0B62A009, subs
criber_id: 0x000(4), participant_id: 0x000(1)
[1702630014.864010] info     | ProxyClient.cpp     | create_datareader       | datareader created     | client_key: 0x0B62A009, data
reader_id: 0x000(6), subscriber_id: 0x000(4)
[1702630014.959908] info     | ProxyClient.cpp     | create_topic            | topic created          | client_key: 0x0B62A009, topi
c_id: 0x004(2), participant_id: 0x000(1)
[1702630015.033537] info     | ProxyClient.cpp     | create_subscriber       | subscriber created     | client_key: 0x0B62A009, subs
criber_id: 0x001(4), participant_id: 0x000(1)
[1702630015.140350] info     | ProxyClient.cpp     | create_datareader       | datareader created     | client_key: 0x0B62A009, data
reader_id: 0x001(6), subscriber_id: 0x001(4)
[1702630015.158510] info     | ProxyClient.cpp     | create_topic            | topic created          | client_key: 0x0B62A009, topi
c_id: 0x005(2), participant_id: 0x000(1)
[1702630015.241039] info     | ProxyClient.cpp     | create_subscriber       | subscriber created     | client_key: 0x0B62A009, subs
criber_id: 0x002(4), participant_id: 0x000(1)
[1702630015.347393] info     | ProxyClient.cpp     | create_datareader       | datareader created     | client_key: 0x0B62A009, data
reader_id: 0x002(6), subscriber_id: 0x002(4)
```

2.2. Query the car node information

Enter the following command in the terminal to query the node,

```
ros2 node list
```

```
yahboom@yahboom-VM:~$ ros2 node list
/YB_Car_Node
```

Then enter the following command to query which topics the node has published/subscribed to,

```
ros2 node info /YB_Car_Node
```

```
yahboom@yahboom-VM:~$ ros2 node info /YB_Car_Node
/YB_Car_Node
  Subscribers:
    /beep: std_msgs/msg/UInt16
    /cmd_vel: geometry_msgs/msg/Twist
    /servo_s1: std_msgs/msg/Int32
    /servo_s2: std_msgs/msg/Int32
  Publishers:
    /imu: sensor_msgs/msg/Imu
    /odom_raw: nav_msgs/msg/Odometry
    /scan: sensor_msgs/msg/LaserScan
  Service Servers:

  Service Clients:

  Action Servers:

  Action Clients:
```

It can be seen that the topics subscribed to include:

/beep：Buzzer control

/cmd_vel：Car speed control

/servo_s1：s1 servo gimbal control

/servo_s2：s1 servo gimbal control

Posted topics include:

/imu：imu module data

/odom：Odometer module data

/scan：Radar module data

We can also query the topic command and enter it in the terminal,

```
ros2 topic list
```

```
yahboom@yahboom-VM:~$ ros2 topic list
/beep
/cmd_vel
/imu
/odom_raw
/parameter_events
/rosout
/scan
/servo_s1
/servo_s2
```

2.3. Query topic data

Query radar data,

```
ros2 topic echo /scan
```

```
header:
  stamp:
    sec: 1100
    nanosec: 349000000
  frame_id: laser_frame
angle_min: -3.1415927410125732
angle_max: 3.1415927410125732
angle_increment: 0.01745329238474369
time_increment: 0.0
scan_time: 0.0
range_min: 0.11999999731779099
range_max: 8.0
ranges:
- 0.1459999978542328
- 0.15600000321865082
- 0.16899999976158142
- 0.0
- 0.0
- 0.8100000023841858
- 0.800000011920929
- 0.8450000286102295
- 0.16099999845027924
- 0.1599999964237213
- 0.1599999964237213
- 0.1599999964237213
- 0.0
- 0.2240000069141388
- 0.2240000069141388
- 0.21799999475479126
- 0.8820000290870667
- 0.8420000076293945
- 0.828000009059906
```

Query imu data,

```
ros2 topic echo /imu
```

```
header:
  stamp:
    sec: 1161
    nanosec: 198000000
  frame_id: imu_frame
orientation:
  x: 0.0
  y: 0.0
  z: 0.0
  w: 1.0
orientation_covariance:
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
angular_velocity:
  x: -0.024501830339431763
  y: 0.015979453921318054
  z: -0.0010652969358488917
angular_velocity_covariance:
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
- 0.0
linear_acceleration:
  x: -0.1363811045885086
  y: -0.2930997610092163
  z: 9.69861125946045
linear_acceleration_covariance:
- 0.0
```


Query odom data,

```
ros2 topic echo /odom_raw
```


```
header:
  stamp:
    sec: 1266
    nanosec: 683000000
  frame_id: odom_frame
child_frame_id: base_footprint
pose:
  pose:
    position:
      x: 0.0
      y: 0.0
      z: 0.0
    orientation:
      x: 0.0
      y: 0.0
      z: 0.0
      w: 1.0
  covariance:
  - 0.001
  - 0.0
  - 0.0
  - 0.0
  - 0.0
```


3. Publish car control information

3.1. Control the buzzer

First, query the relevant information about the following buzzer topics, enter it in the terminal,

```
ros2 topic info /beep
```

```
yahboom@yahboom-VM:~$ ros2 topic info /beep
Type: std_msgs/msg/UInt16
Publisher count: 0
Subscription count: 1
```

Learn that the data type is std_msgs/msg/UInt16. Then enter the following command to turn on the buzzer and enter in the terminal,

```
ros2 topic pub /beep std_msgs/msg/UInt16 "data: 1"
```

```
yahboom@yahboom-VM:~$ ros2 topic pub /beep std_msgs/msg/UInt16 "data: 1"
publisher: beginning loop
publishing #1: std_msgs.msg.UInt16(data=1)

publishing #2: std_msgs.msg.UInt16(data=1)

publishing #3: std_msgs.msg.UInt16(data=1)

publishing #4: std_msgs.msg.UInt16(data=1)

publishing #5: std_msgs.msg.UInt16(data=1)

publishing #6: std_msgs.msg.UInt16(data=1)
```

Enter the following command to turn off the buzzer, terminal input,

```
ros2 topic pub /beep std_msgs/msg/UInt16 "data: 0"
```

```
yahboom@yahboom-VM:~$ ros2 topic pub /beep std_msgs/msg/UInt16 "data: 0"
publisher: beginning loop
publishing #1: std_msgs.msg.UInt16(data=0)

publishing #2: std_msgs.msg.UInt16(data=0)

publishing #3: std_msgs.msg.UInt16(data=0)
```

3.2. Release speed control information

We assume that the released car moves at a linear speed of 0.5 and an angular speed of 0.2, and the terminal input is,

```
ros2 topic pub /cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.5, y: 0.0, z:
0.0}, angular: {x: 0.0, y: 0.0, z: 0.2}}"
```

```
yahboom@yahboom-VM:~$ ros2 topic pub /cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.5, y: 0.0, z: 0.0}, angular: {x: 0.0, y: 0.0, z: 0.2}}"
publisher: beginning loop
publishing #1: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

publishing #2: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

publishing #3: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))

publishing #4: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.5, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.2))
```

If parking, enter

```
ros2 topic pub /cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.0, y: 0.0, z:
0.0}, angular: {x: 0.0, y: 0.0, z: 0.0}}"
```

```
yahboom@yahboom-VM:~$ ros2 topic pub /cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.0, y: 0.0, z: 0.0}, angular: {x: 0.0, y: 0.0, z: 0.0}}"
publisher: beginning loop
publishing #1: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0))

publishing #2: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0))

publishing #3: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0))

publishing #4: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0))

publishing #5: geometry_msgs.msg.Twist(linear=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0), angular=geometry_msgs.msg.Vector3(x=0.0, y=0.0, z=0.0))
```

3.3. Control the gimbal servo

What needs to be noted here is that the range of s1 servo is [-90,90], and the range of s2 servo is [-90,20]. If the value exceeds the range, the servo will not rotate.

We assume that the s1 servo is controlled to rotate 30 degrees, and the terminal input is,

```
ros2 topic pub /servo_s1 std_msgs/msg/Int32 "data: 30"
```

```
yahboom@yahboom-VM:~$ ros2 topic pub /servo_s1 std_msgs/msg/Int32 "data: 30"
publisher: beginning loop
publishing #1: std_msgs.msg.Int32(data=30)

publishing #2: std_msgs.msg.Int32(data=30)

publishing #3: std_msgs.msg.Int32(data=30)

publishing #4: std_msgs.msg.Int32(data=30)
```

In the same way, if the s2 servo is controlled to rotate -30 degrees, the terminal input will be

```
ros2 topic pub /servo_s2 std_msgs/msg/Int32 "data: -30"
```

```
yahboom@yahboom-VM:~$ ros2 topic pub /servo_s2 std_msgs/msg/Int32 "data: -30"
publisher: beginning loop
publishing #1: std_msgs.msg.Int32(data=-30)

publishing #2: std_msgs.msg.Int32(data=-30)

publishing #3: std_msgs.msg.Int32(data=-30)

publishing #4: std_msgs.msg.Int32(data=-30)
```