1. Introduction and use of lidar

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Before driving the liDAR, the oradar lidar equipment needs to be identified at the end of the car. The environment has been set up in the system image. After SSH connects to the car, type in the terminal:

```
ll /dev/oradar
```

The oradar and its corresponding port are displayed, indicating that the lidar equipment is successfully connected. If no result is displayed, try to reinsert the lidar USB.

1.1. Description of program function

After the program runs, start the lidar of oradar MS200, turn on the lidar scanning data, and visualize the liDAR scanning data in the rviz of the virtual machine.

1.2. Program Code Reference path

After SSH is connected to the car, the functional source code location of the activated lidar is located at,

```
/userdata/software/oradar_ws/src/oradar_lidar/launch/ms200_scan.launch.py
```

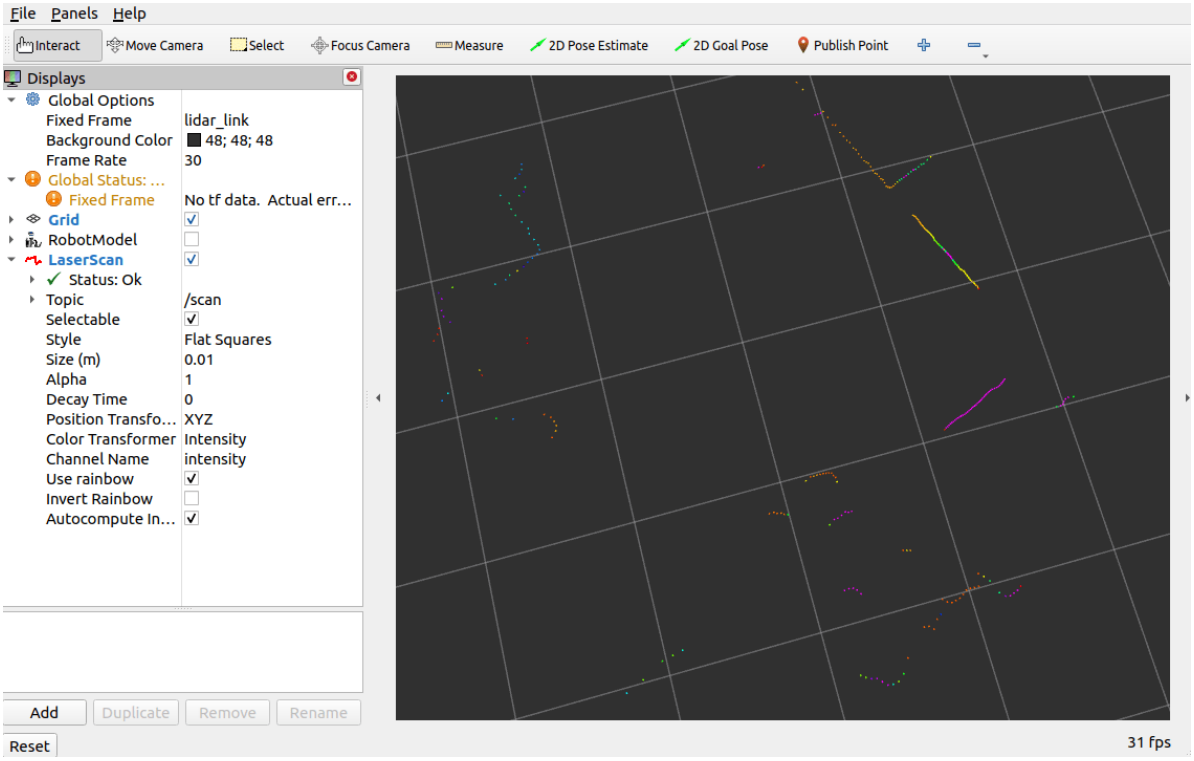
1.3, program start

SSH connects the car, runs at the terminal,

```
ros2 launch oradar_lidar ms200_scan.launch.py
```

Open the virtual machine terminal, run,

```
ros2 launch yahboomcar_rviz yahboomcar_laser_launch.py
```



The data from the lidar scan can be printed with the following command,

```
ros2 topic echo /scan
```

```
header:
  stamp:
    sec: 1684740712
    nanosec: 121202197
  frame_id: lidar_link
angle_min: 0.00959963072091341
angle_max: 6.280392646789551
angle_increment: 0.013997306115925312
time_increment: 0.00022455837461166084
scan_time: 0.1006021499633789
range_min: 0.05000000074505806
range_max: 20.0
ranges:
- 1.559999942779541
- 1.5809999704360962
- 1.590000033378601
- 1.6009999513626099
- 1.6109999418258667
- 1.6239999532699585
- 1.6390000581741333
```

1.4 Introduction to MS200 lidar

1.4.1. Overview

Single-line LiDAR refers to a single-line lidar with triangulation ranging and TOF liDAR, which is mainly used in the field of robotics. It has fast scanning speed, strong resolution and high reliability. Compared with multi-line lidar, single-line lidar responds faster in angular frequency and sensitivity, so it is more accurate in the distance and accuracy of obstacles.

1.4.2. Principle of ranging

The measuring principle of Orida MS200 is TOF ranging method.

TOF LiDAR is based on measuring the time of flight of light to obtain the distance of the target object. Its working principle is mainly manifested in that a modulated laser signal is sent out by the laser transmitter, and the modulated light is received by the laser detector after being reflected by the measured object. The distance of the target can be calculated by measuring the phase difference between the emitted laser and the received laser.

1.4.3 Baud rate

The MS200 lidar uses a baud rate of 230400.

1.4.4. Specifications

Product model	MS200e	Instructions
Ranging range	0.03m~12.0m	90% reflectance
Range of range	Typical value ±10mm [0.2m~ 2.0m) ±20mm [2.0m~12.0m] Maximum value ±40mm [0.2m~12.0m]	In room temperature, under the condition of 90% reflectivity, the radar collected data statistical results for at least 100 times.Average accuracy for the data and the true value, the difference between the accuracy of the data sample standard deviation (1σ)
Accuracy of ranging	Typical value ≤4mm [0.2m~2.0m) ≤15mm [2.0m~12.0m] Maximum value ≤15mm [0.2m~2.0m) ≤30mm [2.0m~12.0m]	
Data information	Distance, Angle, intensity, time stamp	-
Scanning Angle	360°	-
Point frequency	4,500 Dots per second	-
Rotational speed	7~15Hz Default10Hz	Configurable, interval of 1 hz
Angular resolution	0.8°@10Hz	Angular resolution is related to point frequency
Laser exit pitch Angle	0.5°~2°	Based on radar base frame underside
Laser zero exit azimuth	0±2°	-
Laser wavelength	Near infrared	-
Eye safety level	Class 1 IEC60825-1:2014	-
Anti-ambient light performance	30,000Lux	-
Working life	≥10,000 hour	Test according to the speed of 600rpm
Working power supply	DC 5.0±0.5V	-
Voltage ripple	＜100mV	-
Starting current	＜500mA	-
Working current	Typical value 260mA	-
Working temperature	-10℃~50℃	Typical value 25℃
Storage temperature	-30℃~70℃	Typical value 25℃
Class of protection	IP5X	-
Dimensions of products	37.7*37.5*33.0	Length * width * height (unit: mm)
Net weight	about 40g	-
Authentication	RoHS2.0, REACH, CE, FCC	-

Among them, ranging range, measurement accuracy, rotation speed, angular resolution and other parameters are important indicators of lidar performance.