

## 2. Handheld lidar mapping

It is recommended to use the virtual machine we provide directly, because it may not be able to run due to environmental differences

### 1. Install dependent libraries, take the ros-melodic version as an example, enter in the terminal,

```
sudo apt install ros-melodic-moveit ros-melodic-moveit-visual-tools ros-melodic-kdl-* ros-melodic-joint-state-publisher-gui ros-melodic-trac-ik liborocos-kdl-dev ros-melodic-teleop-twist-keyboard ros-melodic-moveit-resources ros-melodic-navigation ros-melodic-gmapping ros-melodic-hector-slam ros-melodic-slam-karto ros-melodic-robot-state-publisher ros-melodic-geographic-msgs ros-melodic-libuv-* ros-melodic-rtabmap-ros libavformat-dev libavcodec-dev libswresample-dev libswscale-dev libavutil-dev libSDL1.2-dev ros-melodic-pointcloud-to-laserscan ros-melodic-mbf-msgs ros-melodic-mbf-costmap-core ros-melodic-costmap-converter ros-melodic-bfl ros-melodic-serial ros-melodic-teleop-twist-joy ros-melodic-laser-proc ros-melodic-rosserial-arduino ros-melodic-rosserial-python ros-melodic-rosserial-server ros-melodic-rosserial-client ros-melodic-rosserial-msgs ros-melodic-amcl ros-melodic-map-server ros-melodic-urdf ros-melodic-xacro ros-melodic-interactive-markers ros-melodic-octomap* ros-melodic-joy* ros-melodic-dwa-local-planner ros-melodic-multirobot-map-merge python-catkin-tools python3-dev python3-catkin-pkg-modules python3-numpy python3-yaml build-essential ros-melodic-imu-tools ros-melodic-cartographer*
```

### 2. Start the mapping command

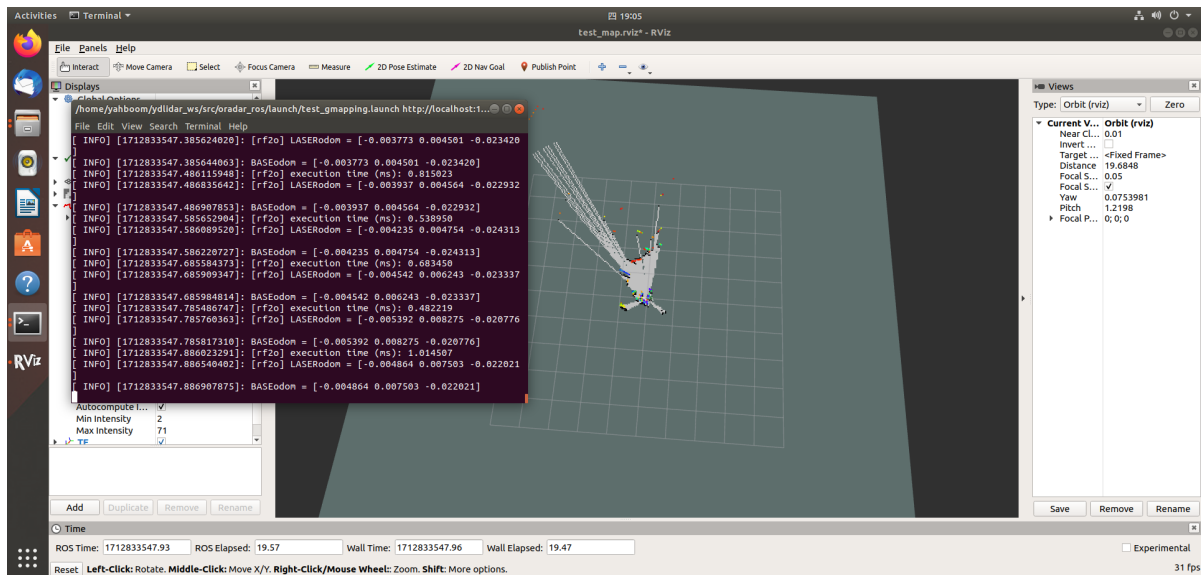
Take gmapping mapping as an example, enter in the terminal,

```
roslaunch oradar_lidar test_gmapping.launch
```

It is normal for this error to appear at the beginning of running the program, because the tf conversion was not converted at the beginning, but was converted later.

```
process[1712]: send to peer [551]
[ERROR] [1712833527.282690671]: "base_link" passed to lookupTransform argument t
arget frame does not exist.
[YDLIDAR] Lidar successfully connected [/dev/ydlidar:230400]
[YDLIDAR] Lidar running correctly! The health status: good
[YDLIDAR] Baseplate device info
Firmware version: 1.3
Hardware version: 1
Model: Tmini Plus
Serial: 2024000000020063
[ INFO] [1712833528.283775292]: Listening laser scan from topic: /scan
[YDLIDAR] Current scan frequency: 10.00Hz
[YDLIDAR] Lidar init success, Elapsed time 1077 ms
```

The following screen appears, indicating successful operation.



### 3. Save the map

Taking gmapping as an example, the map saving command is,

```
roslaunch map_server map_saver -f ~/ydlidar_ws/src/oradar_ros/maps/map
```

```
yahboom@yahboom-virtual-machine:~$ roslaunch map_server map_saver -f ~/ydlidar_ws/src/oradar_ros/maps/map
[ INFO] [1712833851.545073385]: Waiting for the map
[ INFO] [1712833851.755499456]: Received a 384 X 384 map @ 0.050 m/pix
[ INFO] [1712833851.755588538]: Writing map occupancy data to /home/yahboom/ydlidar_ws/src/oradar_ros/maps/map.pgm
[ INFO] [1712833851.758525604]: Writing map occupancy data to /home/yahboom/ydlidar_ws/src/oradar_ros/maps/map.yaml
[ INFO] [1712833851.758897530]: Done
```

The map will be saved to the ~/ydlidar\_ws/src/oradar\_ros/maps/ folder, a pgm image and a yaml file.

map.yaml

```
image: /home/yahboom/ydlidar_ws/src/oradar_ros/maps/map.pgm
resolution: 0.050000
origin: [-10.000000, -10.000000, 0.000000]
Negate: 0
occupied_thresh: 0.65
free_thresh: 0.196
```

Parameter analysis:

- image: The path of the map file, which can be an absolute path or a relative path.
- resolution: resolution of the map, meters/pixel
- Origin: 2D pose (x, y, yaw) in the lower left corner of the map. The yaw here is rotated counterclockwise (yaw=0 means no rotation change). Many parts of the current system ignore the yaw value.
- negate: whether to reverse the meaning of white/black and free/occupied (the interpretation of the threshold is not affected)

- `occupied_thresh`: Pixels with an occupation probability greater than this threshold will be considered fully occupied.
- `free_thresh`: Pixels with occupancy probability less than this threshold will be considered completely free.

## 4. View relevant information

View tf tree

```
roslaunch rqt_tf_tree rqt_tf_tree
```

Node communication view

```
roslaunch rqt_graph rqt_graph
```

## 5. Algorithm information reference website

### 5.1. Graphing algorithm

Gmapping: <http://wiki.ros.org/gmapping/>

hector\_slam: [http://wiki.ros.org/hector\\_slam](http://wiki.ros.org/hector_slam)

hector\_slam/Tutorials: [http://wiki.ros.org/hector\\_slam/Tutorials/SettingUpForYourRobot](http://wiki.ros.org/hector_slam/Tutorials/SettingUpForYourRobot)

hector\_mapping: [http://wiki.ros.org/hector\\_mapping](http://wiki.ros.org/hector_mapping)

karto: [http://wiki.ros.org/slam\\_karto](http://wiki.ros.org/slam_karto)

Cartographer: <https://google-cartographer.readthedocs.io/en/latest/>

Cartographer ROS: <https://google-cartographer-ros.readthedocs.io/en/latest/>

### 5.2. Independent map navigation

rrt\_exploration: [http://wiki.ros.org/rrt\\_exploration](http://wiki.ros.org/rrt_exploration)

rrt\_exploration/Tutorials: [http://wiki.ros.org/rrt\\_exploration/Tutorials](http://wiki.ros.org/rrt_exploration/Tutorials)

### 5.3. Save the map

map\_server: [https://wiki.ros.org/map\\_server](https://wiki.ros.org/map_server)