

1、 Hand-held lidar mapping

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1.1、 Mapping

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1.1.2、 hector

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

hector_slam: http://wiki.ros.org/hector_slam

hector_slam/Tutorials: http://wiki.ros.org/hector_slam/Tutorials/SettingUpYourRobot

hector_mapping: http://wiki.ros.org/hector_mapping

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/>

rrt_exploration: http://wiki.ros.org/rrt_exploration

rrt_exploration/Tutorials: http://wiki.ros.org/rrt_exploration/Tutorials

map_server: https://wiki.ros.org/map_server

1.1、 Mapping

Install dependent libraries

```
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 libstd1.2-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*
```

If it is a new environment, you need to copy the lua file and launch file of cartographer to the corresponding location

```
cd ~/rplidar_ws/src/transbot_nav/scripts/  
sudo bash create.sh
```

Build map start command

```
roslaunch transbot_nav laser_map.launch map_type:=gmapping robot_model:=astra
```

- map_type parameter: mapping algorithm [gmapping, hector, karto, cartographer], the default is [gmapping].
- robot_model parameters: simulation model [astra, camera].

When creating a map in rviz, if [LaserScan] reports an error and fails to load the lidar data; select it, click [Remove] to remove it, and click [Add] to add it again. Just select the corresponding topic.

1.1.1、 gmapping

1.1.2、 hector

1.1.3、 karto

1.1.4、 cartographer

1.2、 Save map

Several mapping algorithms save maps in different ways.

- cartographer: execute the following commands

```
bash ~/rplidar_ws/src/transbot_nav/maps/carto_map.sh
```

- gmapping,hector,karto: Execute the following command to save.

```
roslaunch map_server map_saver -f ~/rplidar_ws/src/transbot_nav/maps/my_map #  
Method 1  
bash ~/rplidar_ws/src/transbot_nav/maps/map.sh #  
Method 2
```

The map will be saved this path: ~/rplidar_ws/src/transbot_nav/maps/

one pgm picture, one yaml file.

map.yaml

```
image: map.pgm  
resolution: 0.05  
origin: [-15.4,-12.2,0.0]  
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: The resolution of the map, m/pixel
- origin: The 2D pose (x,y,yaw) in the lower left corner of the map, where yaw is rotated counterclockwise (yaw=0 means no rotation). 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 occupation probability greater than this threshold will be considered as fully occupied.
- free_thresh: Pixels whose occupancy probability is less than this threshold will be considered completely free.

1.3、 View related information

View tf tree

```
roslaunch rqt_tf_tree rqt_tf_tree
```

View node

```
rqt_graph
```