Note: This tutorial assumes that you have completed the previous tutorials: RGB-D Hand-Held Mapping With a Kinect (http://wiki.ros.org/rtabmap_ros/Tutorials/HandHeldMapping), Setup RTAB-Map on Your Robot! (http://wiki.ros.org/rtabmap_ros/Tutorials/SetupOnYourRobot).

💡 Please ask about problems and questions regarding this tutorial on answers.ros.org (http://answers.ros.org). Don't forget to include in your question the link to this page, the versions of your OS & ROS, and also add appropriate tags.

Mapping and Navigation with Turtlebot

Description: This tutorial shows how to use RTAB-Map with Turtlebot for mapping and navigation.

Tutorial Level: INTERMEDIATE

Next Tutorial: Stereo Outdoor Mapping (http://wiki.ros.org/rtabmap_ros/Tutorials/StereoOutdoorMapping)

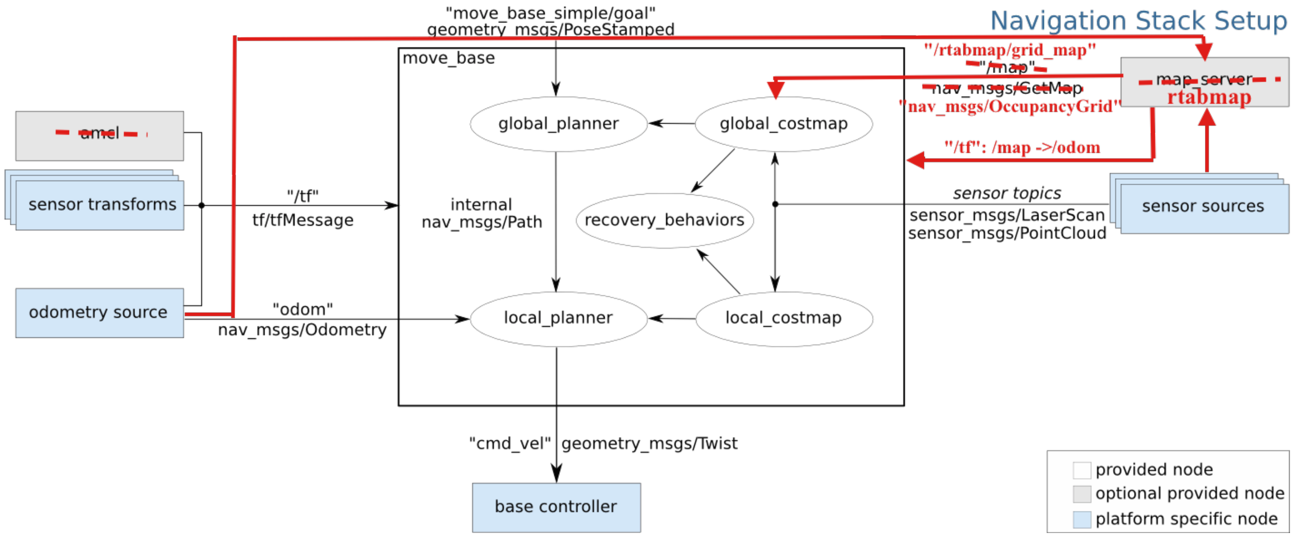
Contents

1. Introduction

(Originally from this post from RTAB-Map's forum (http://official-rtab-map-forum.67519.x6.nabble.com/Demo-RTAB-Map-on-Turtlebot-td439.html))

For **Turtlebot3 on Melodic**, see below (http://wiki.ros.org/rtabmap_ros/Tutorials/MappingAndNavigationOnTurtlebot#Turtlebot3_On_Melodic).

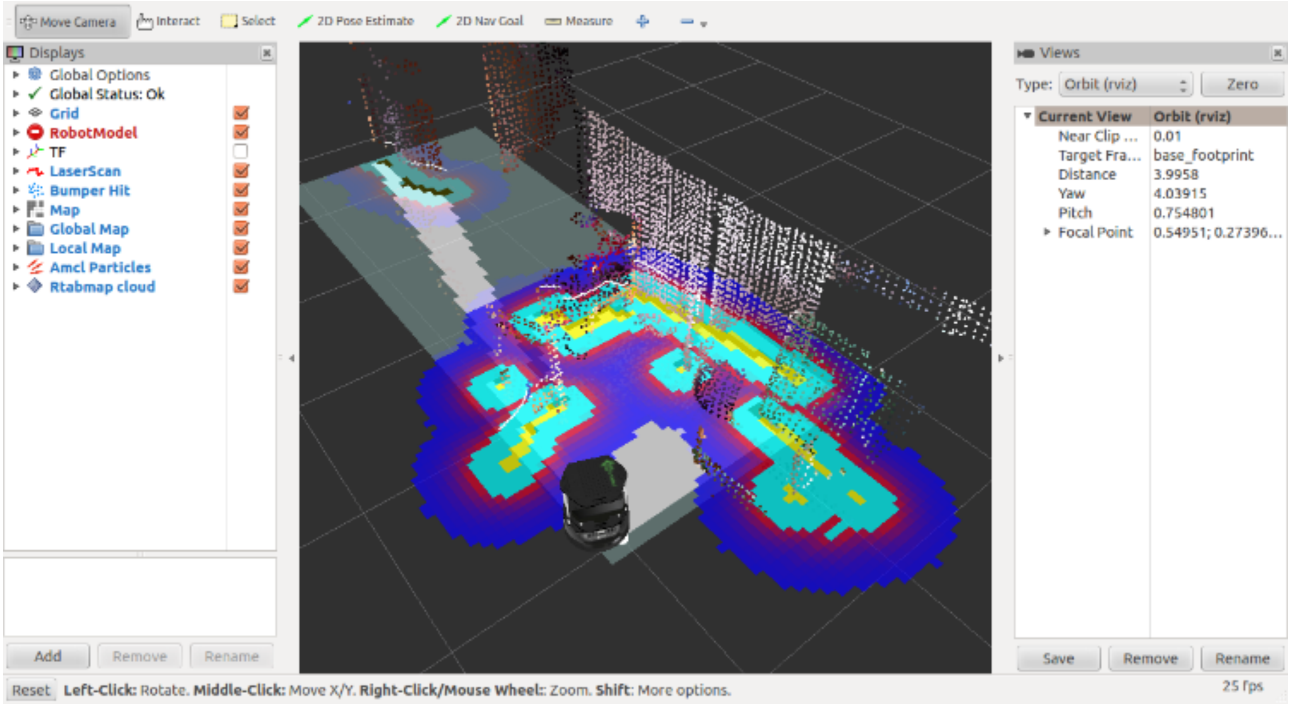
This page will show how to use rtabmap on a Turtlebot. I don't own a Turtlebot, so I've made a launch file from what I can test without the actual robot. The launch file demo_turtlebot_mapping.launch (https://github.com/introlab/rtabmap_ros/blob/master/launch/demo/demo_turtlebot_mapping.launch) is a one to one replacement of the gmapping_demo.launch (https://github.com/turtlebot/turtlebot_apps/blob/indigo/turtlebot_navigation/launch/gmapping_demo.launch) of the official SLAM Map Building with TurtleBot (http://wiki.ros.org/turtlebot_navigation/Tutorials/Build%20a%20map%20with%20SLAM) tutorial.



Requirements:

```
Kinetic
$ sudo apt-get install ros-kinetic-turtlebot-bringup ros-kinetic-turtlebot-navigation ros-kinetic-rtabmap-ros

Indigo
$ sudo apt-get install ros-indigo-turtlebot-bringup ros-indigo-turtlebot-navigation ros-indigo-rtabmap-ros
```



Type: Orbit (rviz)

Current View	Orbit (rviz)
Near Clip ...	0.01
Target Fra...	base_footprint
Distance	3.9958
Yaw	4.03915
Pitch	0.754801
Focal Point	0.54951; 0.27396...

Left-Click: Rotate. **Middle-Click:** Move X/Y. **Right-Click/Mouse Wheel:**: Zoom. **Shift**: More options.

Usage:

```
$ roslaunch turtlebot_bringup minimal.launch
$ roslaunch rtabmap_ros demo_turtlebot_mapping.launch
```

Visualization (turtlebot_navigation.rviz (https://github.com/introlab/rtabmap_ros/blob/master/launch/config/turtlebot_navigation.rviz)):

```
 $ roslaunch rtabmap_ros demo_turtlebot_rviz.launch
or
 $ rosrun rviz rviz -d turtlebot_navigation.rviz
```

You should see a 2D map and a 3D map. For the navigation stuff, see below. By default, rtabmap re-uses always the same database after each mapping session. To delete the old one and start fresh, delete the database saved here `~/.ros/rtabmap.db` or use argument `args:="--delete_db_on_start"` when launching the demo_turtlebot_mapping.launch:

```
 $ roslaunch rtabmap_ros demo_turtlebot_mapping.launch args:="--delete_db_on_s
tart"
```

2. Localization mode

After a mapping session as above, a database is saved here `~/.ros/rtabmap.db`. Now restart the `demo_turtlebot_mapping.launch` with argument `localization:=true`:

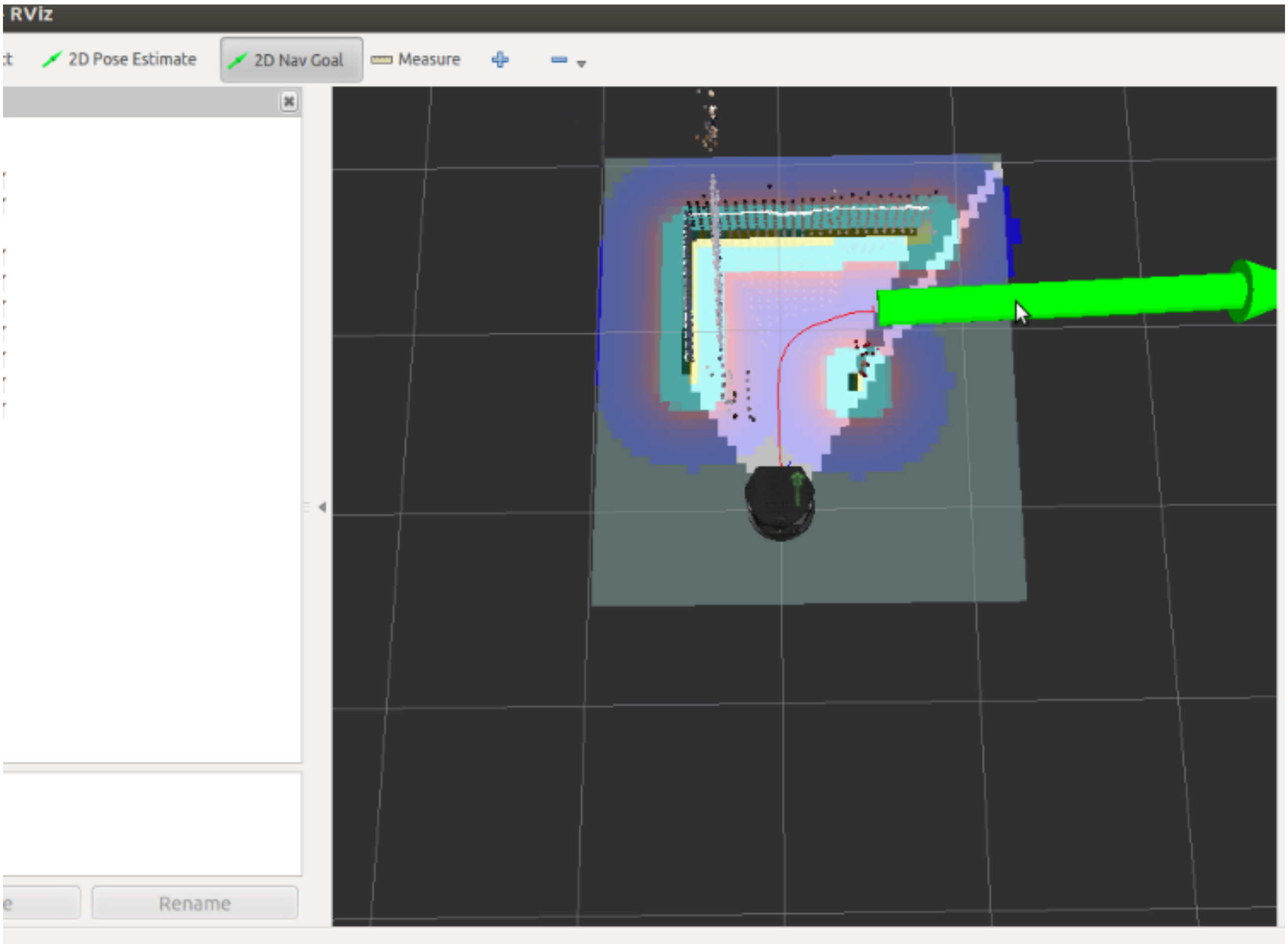
```
 $ roslaunch rtabmap_ros demo_turtlebot_mapping.launch localization:=true
```

Move the robot around until it can relocalize in the previous map, then the 2D map would re-appear again when a loop closure is found.

3. Autonomous Navigation

When a map is created (in mapping mode or localization mode), you can then follow the same steps from 2.3.2 of the Autonomous Navigation of a Known Map with TurtleBot (http://wiki.ros.org/turtlebot_navigation/Tutorials/Autonomously%20navigate%20in%20a%20known%20map#Teleoperation) tutorial to navigate in the map.

Normally, you only have to "drop" a navigation goal on the map with RVIZ to see the robot moving autonomously to it. Click on "2D Nav Goal" button in RVIZ to set a goal. You should see a planned path (red line) like this to the goal set (green arrow):



The commands sent by move_base (/move_base):

```
$ rostopic echo /mobile_base/commands/velocity
```

4. Freenect/OpenNI2 on Indigo

By default, OpenNI2 is used from the included 3dsensor.launch (https://github.com/turtlebot/turtlebot/blob/indigo/turtlebot_bringup/launch/3dsensor.launch) (`TURTLEBOT_3D_SENSOR=asus_xtion_pro`). If you want to use Freenect driver, set this before launching `demo_turtlebot_mapping.launch`:

```
$ export TURTLEBOT_3D_SENSOR=kinect
```

5. If you don't have the robot

If you don't have the robot and you just want to see what it could look like if you have one, you can still generate an odometry like this (with `rgbd_odometry:=true`):

```
$ roslaunch turtlebot_bringup minimal.launch
$ roslaunch rtabmap_ros demo_turtlebot_mapping.launch args:="--delete_db_on_st
art" rgbd_odometry:=true
$ roslaunch rtabmap_ros demo_turtlebot_rviz.launch
```

6. Simulation (Gazebo)

Note This example has been added on August 2017, make sure you have the demo_turtlebot_mapping.launch (https://github.com/introlab/rtabmap_ros/blob/master/launch/demo/demo_turtlebot_mapping.launch) with `simulation` argument depending on the `rtabmap_ros` version installed.

```
$ roslaunch turtlebot_gazebo turtlebot_world.launch
$ roslaunch rtabmap_ros demo_turtlebot_mapping.launch simulation:=true
$ roslaunch rtabmap_ros demo_turtlebot_rviz.launch
```

- Verify that `/scan` topic is published after launching `turtlebot_world.launch`. If not, edit turtlebot_world.launch (https://github.com/turtlebot/turtlebot_simulator/blob/indigo/turtlebot_gazebo/launch/turtlebot_world.launch) and use `depthimage_to_laserscan` node instead of the nodelet:

```
$ sudo gedit /opt/ros/indigo/share/turtlebot_gazebo/launch/turtlebot_world.launch

<!-- Fake laser -->
<node pkg="depthimage_to_laserscan" type="depthimage_to_laserscan" name="depthimage_to_laserscan">
    <param name="scan_height" value="10"/>
    <param name="output_frame_id" value="/camera_depth_frame"/>
    <param name="range_min" value="0.45"/>
    <remap from="image" to="/camera/depth/image_raw"/>
    <remap from="scan" to="/scan"/>
</node>
```

- If when sending goals, Turtlebot is always turning (overshooting rotation), set max_vel_x (https://github.com/turtlebot/turtlebot_apps/blob/48bfc9c1270606d37f61eeb45156a55e12cf3333/turtlebot_navigation/param/dwa_local_planner_params.yaml#L4) to 0.3 and sim_time (https://github.com/turtlebot/turtlebot_apps/blob/48bfc9c1270606d37f61eeb45156a55e12cf3333/turtlebot_navigation/param/dwa_local_planner_params.yaml#L32) to 1.3. You can also set allow_unknown (https://github.com/turtlebot/turtlebot_apps/blob/48bfc9c1270606d37f61eeb45156a55e12cf3333/turtlebot_navigation/param/navfn_global_planner_params.yaml#L4) to be able to send goals in unknown areas of the map.

6.1 Turtlebot3 On Melodic

Note This example has been added on September 2019, the following file may not be installed with binaries, download it here: demo_turtlebot3_navigation.launch (https://github.com/introlab/rtabmap_ros/blob/master/launch/demo/demo_turtlebot3_navigation.launch)

```
$ export TURTLEBOT3_MODEL=waffle
$ roslaunch turtlebot3_gazebo turtlebot3_world.launch

$ export TURTLEBOT3_MODEL=waffle
$ roslaunch rtabmap_ros demo_turtlebot3_navigation.launch
```

To avoid TF warning about leading '/' in frame name (`map`, `odom`, `base_footprint`), remove it in those files:

- `/opt/ros/melodic/share/turtlebot3_navigation/param/global_costmap_params.yaml`
- `/opt/ros/melodic/share/turtlebot3_navigation/param/local_costmap_params.yaml`

7. Issues

- On autonomous navigation, if teleop node is also sending commands on the same topic as `move_base` at the same time, the robot may not move.
- If there are many TF warnings, you can try to increase `robot_state_publisher`'s publishing frequency in `turtlebot_bringup/launch/includes/robot.launch.xml` from 5 to 10 Hz. You can also increase `wait_for_transform argument` of demo_turtlebot_mapping.launch (https://github.com/introlab/rtabmap_ros/blob/master/launch/demo/demo_turtlebot_mapping.launch) to `0.2`.
- If sometimes the robot is planning a straight path through an obstacle, it may be related to this issue (https://github.com/ros-planning/navigation/issues/320). This can be fixed by using `rtabmap_ros::StaticLayer` instead of `costmap_2d::StaticLayer` here (https://github.com/turtlebot/turtlebot_apps/blob/indigo/turtlebot_navigation/param/global_costmap_params.yaml#L9).

Wiki: rtabmap_ros/Tutorials/MappingAndNavigationOnTurtlebot (last edited 2020-01-09 15:29:45 by MathieuLabbe (/MathieuLabbe))