

# **Neor\_mini Ackerman Mobile Base**

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## **Description:**

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Neor\_mini is a mobile base with an Ackerman steering structure, equipped with ROS operating system, which can realize 2D and 3D mapping and navigation demonstration functions. This document will teach you how to start from the perspective of simulation and real vehicles. Started to build an Ackerman ROS car. The content involved: URDF ROS Ackerman odometer drive, mapping, navigation demonstration, camera patrol, multi-ultrasonic obstacle avoidance, VLP 16-line radar 3D mapping, Examples of camera calibration, Raspberry Pi monocular recognition and range, etc.

Also includes ROS entry and advanced tutorials based on the Neo\_mini physical car. Follow-up will continue to update, welcome to pay attention to our maintenance official account and this warehouse...

(Neor\_mini 是一台阿克曼转向结构的移动底座，搭载了ROS操作系统，可以实现2D与3D建图以及导航的演示功能。本文档将会从仿真和实车的角度教你如何从零开始搭建一台阿克曼ROS小车，涉及的内容有：URDF ROS阿克曼里程计驱动、gmapping建图、navigation导航演示、摄像头巡线、多超声波避障、VLP 16线雷达的三维建图、摄像头校准、树莓派单目识别与测距等示例。另外还包括基于 Neor\_mini 实体车的ROS入门及进阶教程。后续将持续更新，欢迎关注我们的维系公众号以及本仓库...)

## **Contents:**

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### **1.Neor mini Simulation Tutorials (neor\_mini 全套仿真教程)**

Chapter 1: Make a indoor autonomous mobile robot.

Chapter 2: Make a outdoor line-tracking mobile robot.

Chapter 3: Velodyne-16 && Lego\_LOAM 3D Mapping.

Chapter 4: Simulation of Automatic Obstacle Avoidance Based on Three-channel Ultrasonic.

Related folders:

**mini\_sim18\_ws && original\_neor\_mini**

### **2.Raspberry Pi camera calibration (树莓派摄像头校准)**

Related folders:

**calib\_camera**

### 3.Raspberry Pi camera recognition and ranging (树莓派单目摄像头目标检测与测距)

Related folders:

[Object\\_detection && Distence](#)

### 4.Neor\_min\_ROS\_Tutorials (neor\_mini ROS 入门及进阶教程)

Related folders:

[Neor\\_min\\_ROS\\_Tutorials](#)

## Chapter 1: Make a indoor autonomous mobile robot

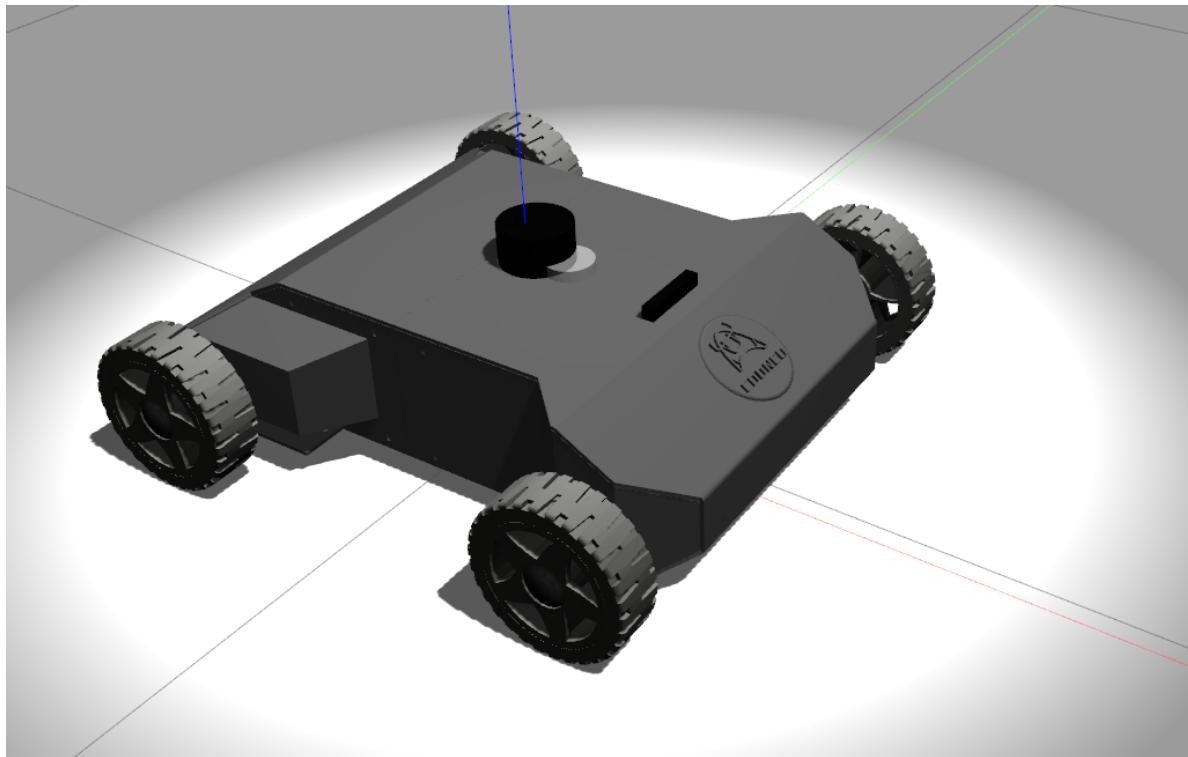
### Corresponding WeChat article

从零开始搭建一台ROS开源迷你无人车

原创 Lee COONEO 3月12日

收录于话题

#人工智能 5 #机器人 8



Developing Environments:

ubuntu 18.04 + ROS Melodic desktop full

Explanation:

```
mini_sim18_ws          # this folder is ROS Workspace, you can run launches and look at every
demo.
original_neor_mini     # this folder is an original neor_mini urdf file, you can construction by
yourself
pictures              # the total process pictures
```

Neor mini Simulation in Gazebo with ROS, Follow below steps:

Step 1:

```
# open your Terminal
git clone https://github.com/COONEO/neor_mini.git
cd neor_mini/mini_sim18_ws
rosdep install --from-paths src --ignore-src -r -y   # you need wait a moment
catkin_make
```

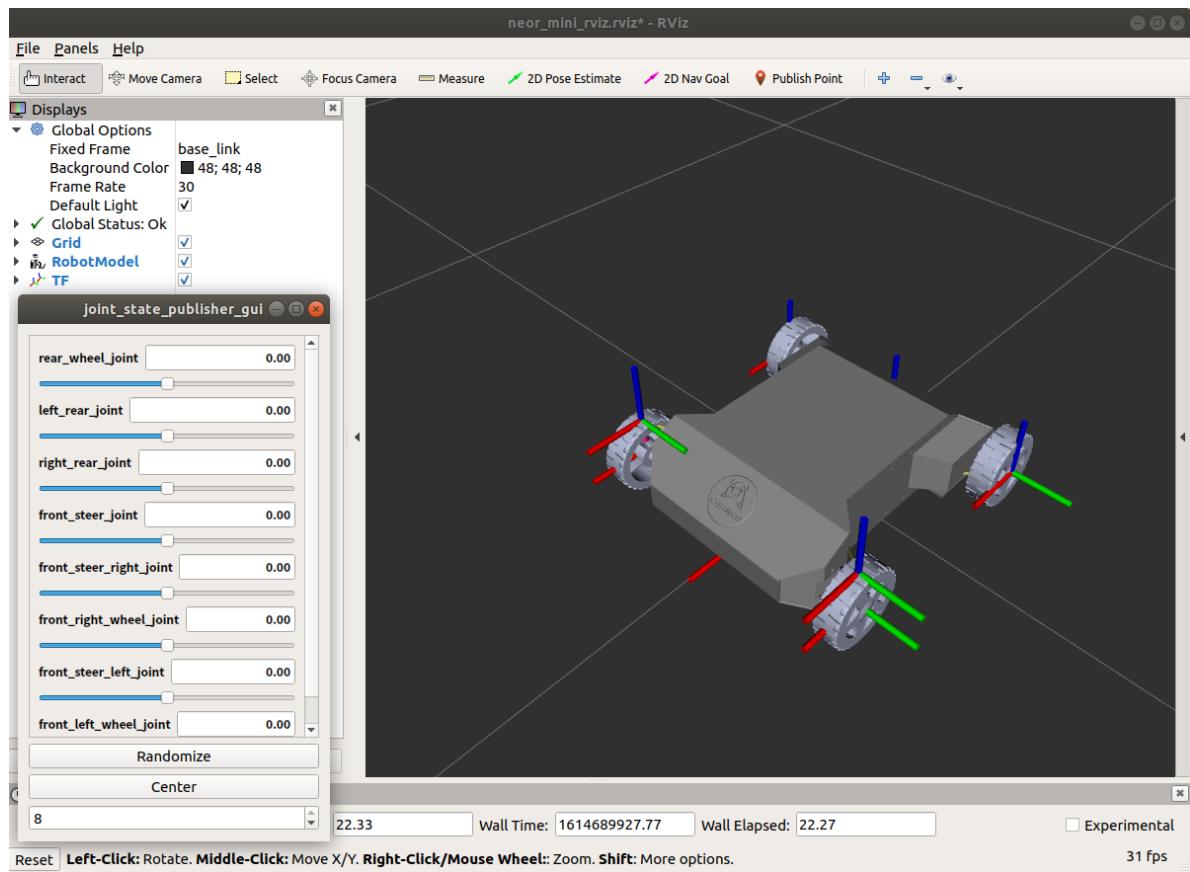
**if "catkin\_make" error,please install the dependency of  
lego\_loam(See chapter 3). or remove LeGO-LOAM folder.**

You can see 5 ROS packages in mini\_sim18\_ws/src folder,lists:

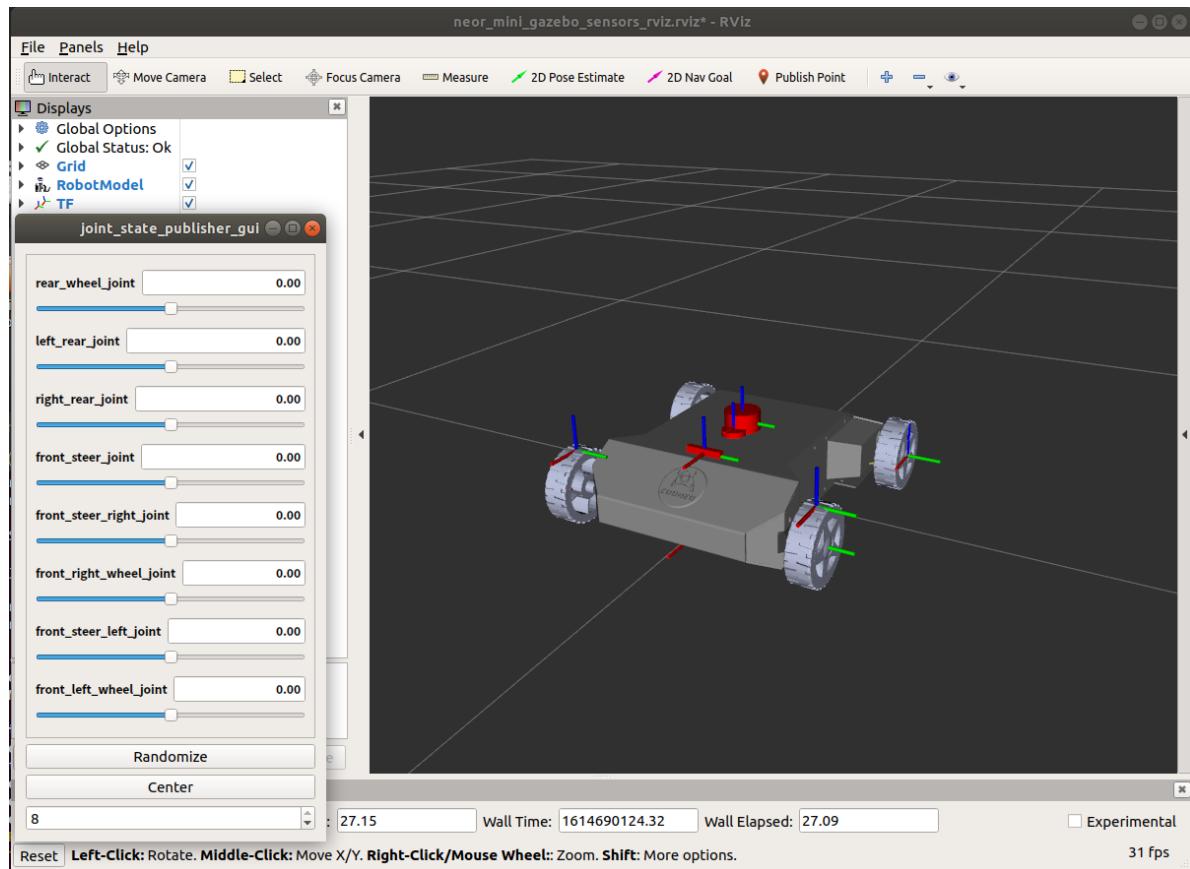
```
neor_mini           # Storing the description of neor mini's appearance with urdf file
steer_drive_ros    # Ackermann kinematics ROS plugins
steer_mini_gazebo  # Storing the launch files of neor mini model visual in Gazebo
mini_gmapping      # Storing the launch files and gmapping params files
mini_navigation    # Storing the launch file and navigation params files
```

Step 2: launch neor\_mini's launch file, visualize the urdf in Rviz.

```
# show the neor_mini.urdf in Rviz
cd ~/neor_mini/mini_sim18_ws
source devel/setup.bash
roslaunch neor_mini display.launch
```

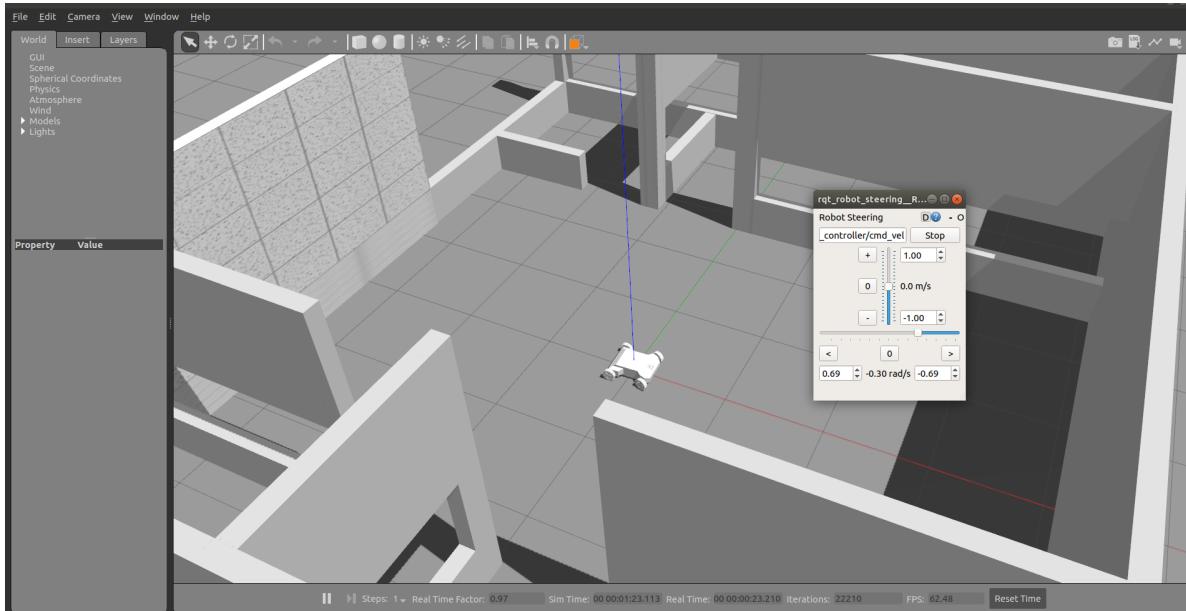


```
#show the neor_mini_gazebo_sensors.urdf in Rviz
cd ~/neor_mini/mini_sim18_ws
source devel/setup.bash
roslaunch neor_mini display_gazebo_sensors.launch
```

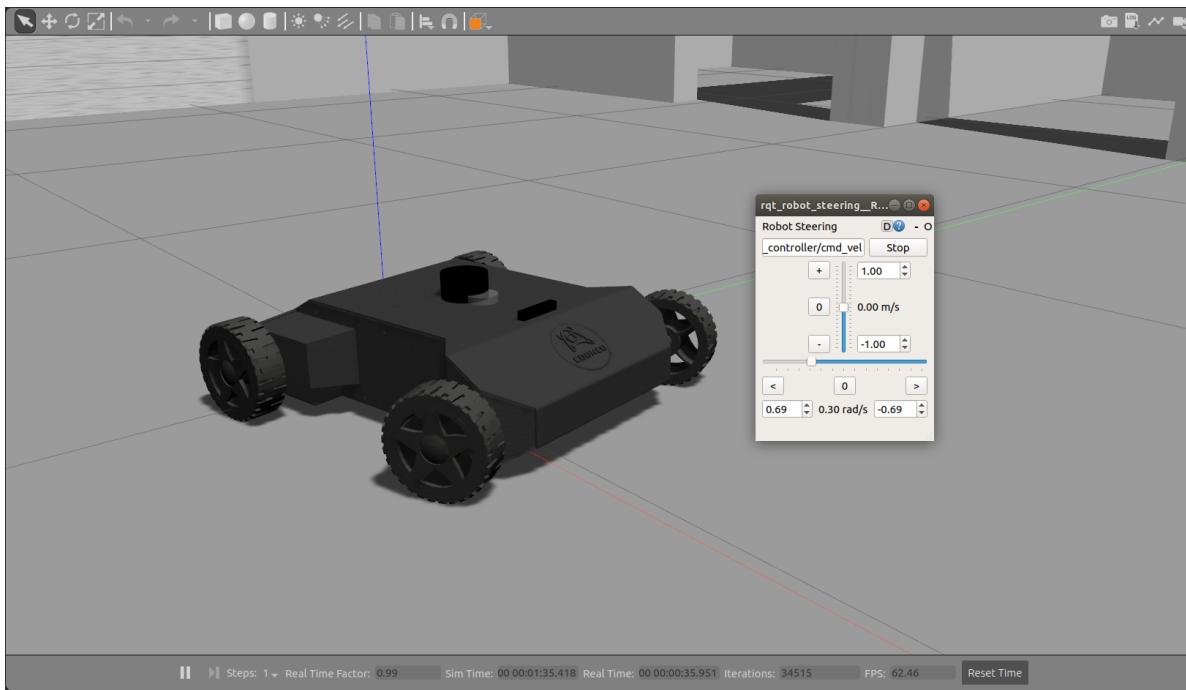


Step 3: launch steer\_mini\_gazebo's launch file. visualize the urdf in Gazebo and try to control neor\_mini .

```
#show the neor_mini_gazebo.urdf in Gazebo
cd ~/neor_mini/mini_sim18_ws
source devel/setup.bash
roslaunch steer_mini_gazebo steer_mini_sim.launch
```

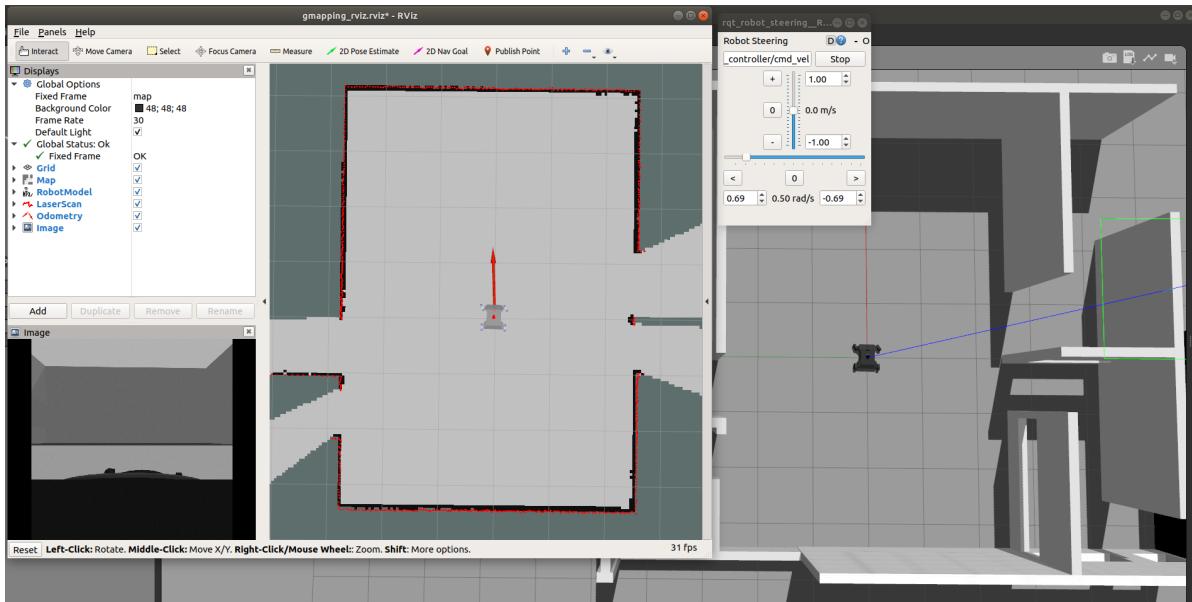


```
#show the neor_mini_gazebo_sensors.urdf in Gazebo
cd ~/neor_mini/mini_sim18_ws
source devel/setup.bash
roslaunch steer_mini_gazebo steer_mini_sim_sensors.launch
```



Step 4 : Gmapping with neor\_mini urdf

```
# launch gmapping_steer_mini_sim.launch file and construction map
cd ~/neor_mini/mini_sim18_ws
source devel/setup.bash
roslaunch mini_gmapping gmapping_steer_mini_sensors.launch
```

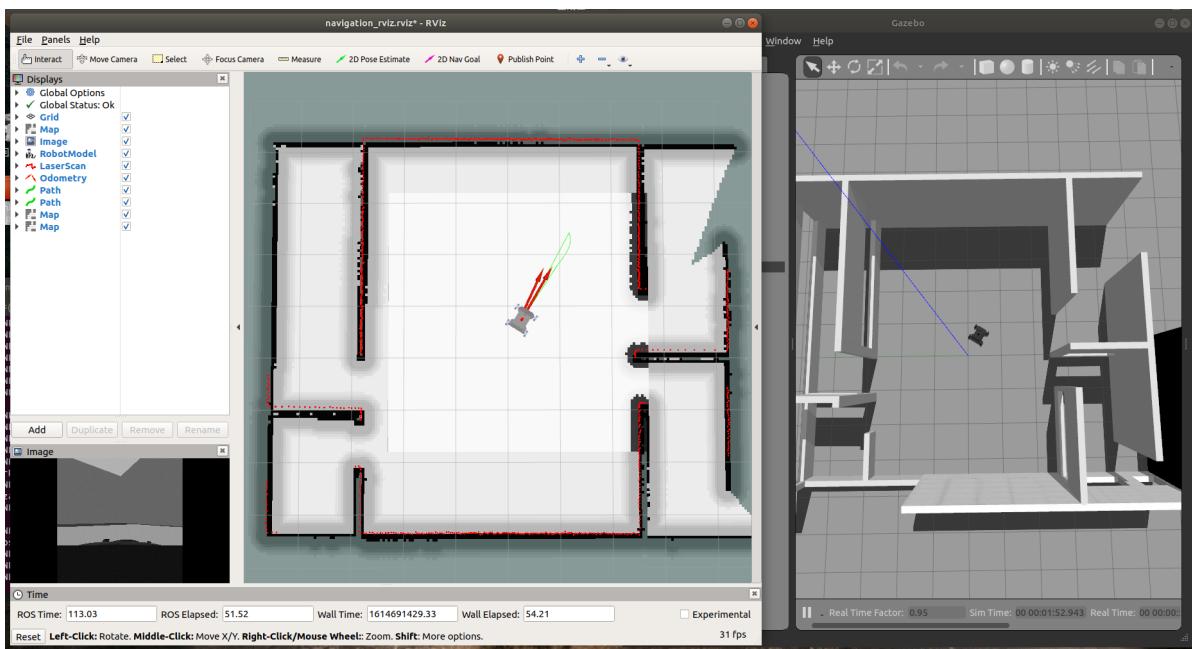


When you think the construction map is finished, Open a new terminal, you can run the below command to save the map.

```
cd ~/neor_mini/mini_sim18_ws/
source devel/setup.bash
cd src/mini_gmapping/map
rosrun map_server map_saver -f cooneo_office_map # You can saved as another name
```

Step 5 : Using cooneo\_office\_map to make a navigation demo.

```
cd ~/neor_mini/mini_sim18_ws/
source devel/setup.bash
roslaunch mini_navigation navigation_steer_mini_sensors.launch # start a navigation demo
```



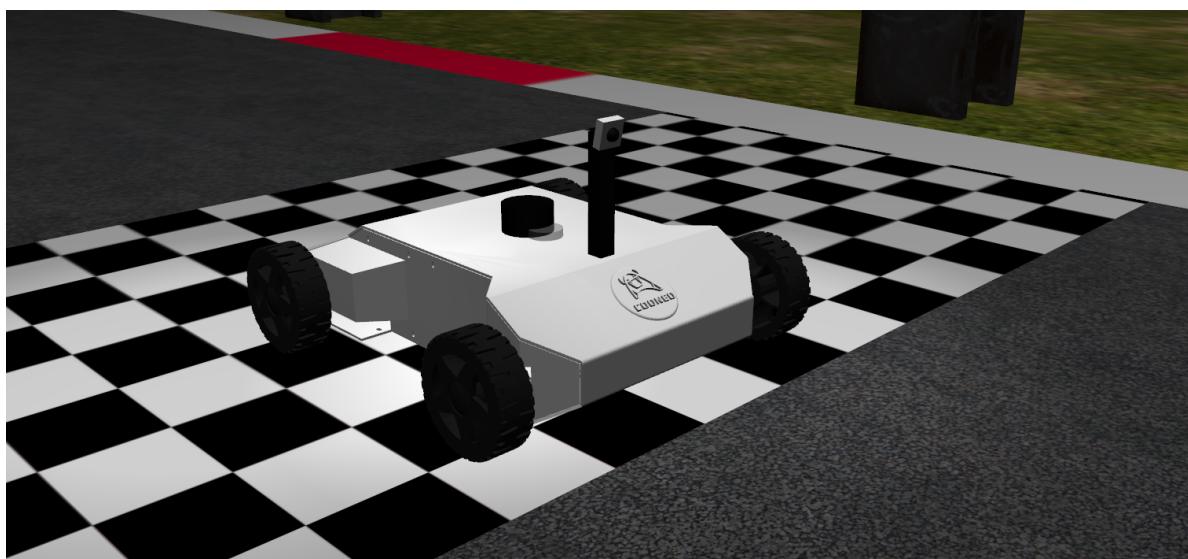
When you run up the list launch file, your monitor will show two windows, one is Rviz, another is Gazebo. looking at the rviz window up toolbar, you need to click "2D Nav Goal", and select a navigation goal on the map, soon the neor\_mini model car will plan a route, and arrived.

## Chapter 2: Make a outdoor line-tracking mobile robot

### Corresponding WeChat article

#### NEOR mini在赛道上独自狂奔

原创 Lee COONEO 4月30日



step 1 : Copy Gazebo-world from neor\_mini\_linetrack/models folder

```
# open a Terminal  
cp -r ~/neor_mini/mini_sim18_ws/src/neor_mini_linetrack/models/* ~/.gazebo/models/
```

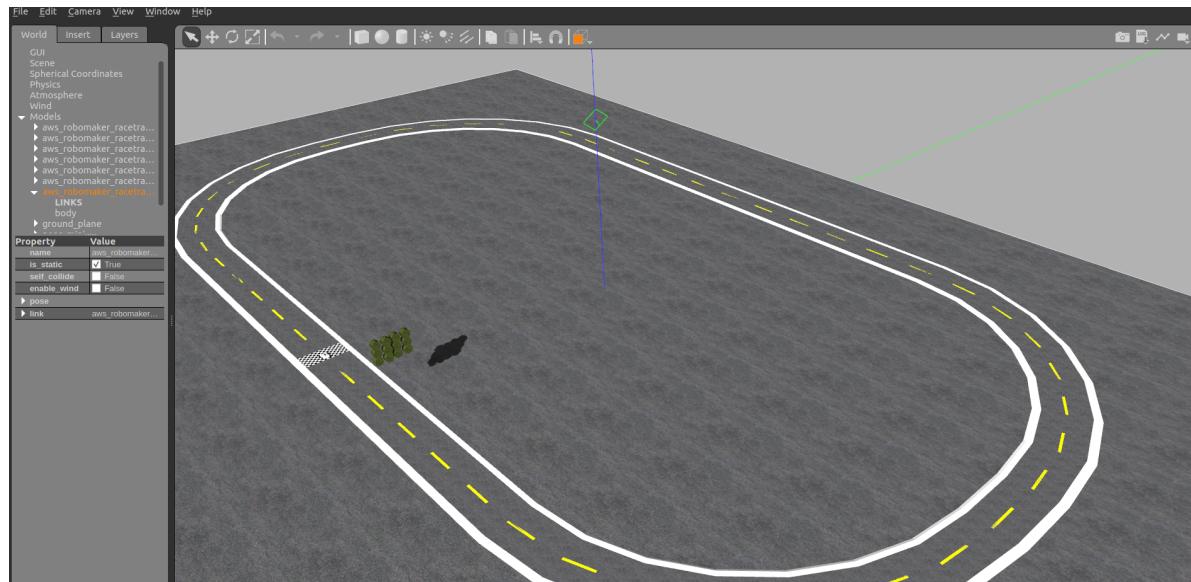
and you will see four new folder in your ./gazebo/models folder as follows:



Step 2 : launch neor\_mini\_linetrack package launch file

```
# open a Terminal
cd ~/neor_mini/mini_sim18_ws/
catkin_make                               # compile you all ros node in you workspace
source devel/setup.bash
roslaunch neor_mini_linetrack neor_mini_linetrack_day.launch
```

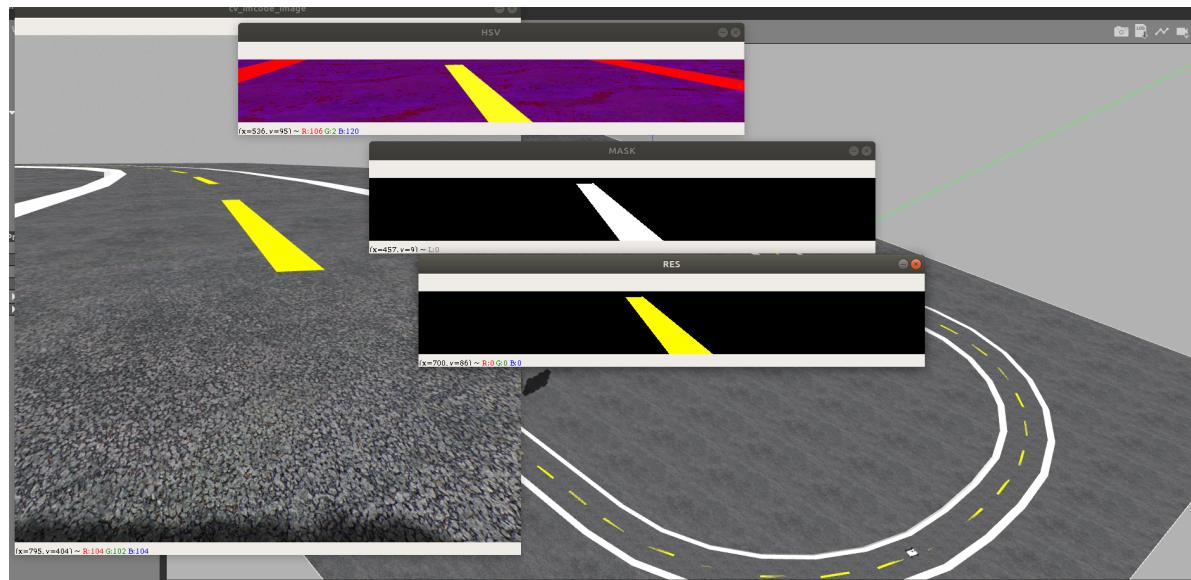
and you will see:



Step 3: rosrun line-tracking python node

```
# open a Terminal
cd ~/neor_mini/mini_sim18_ws/
source devel/setup.bash
rosrun neor_mini_linetrack line_follower_object.py
```

and you will see four new windows ,it's like this:



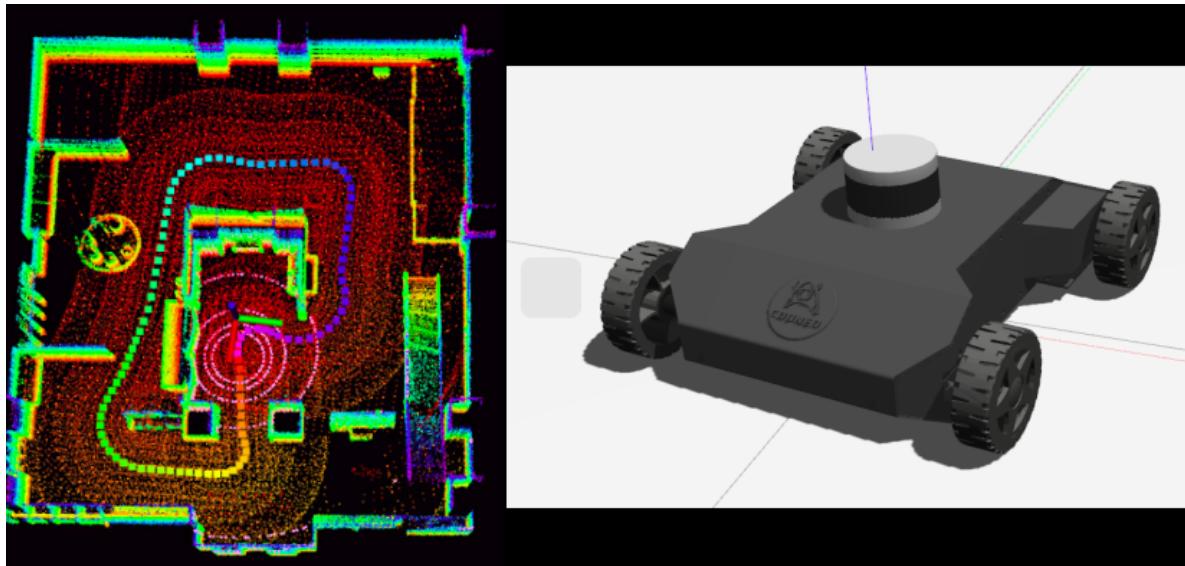
Congratulations!!! you will see the neor\_mini urdf model running automatically using the data from the camera.

# Chapter 3: Velodyne-16 && Lego\_LOAM 3D Mapping

## Corresponding WeChat article

手把手教你Velodyne Lidar仿真+3D建图

原创 Lee COONEO 7月30日



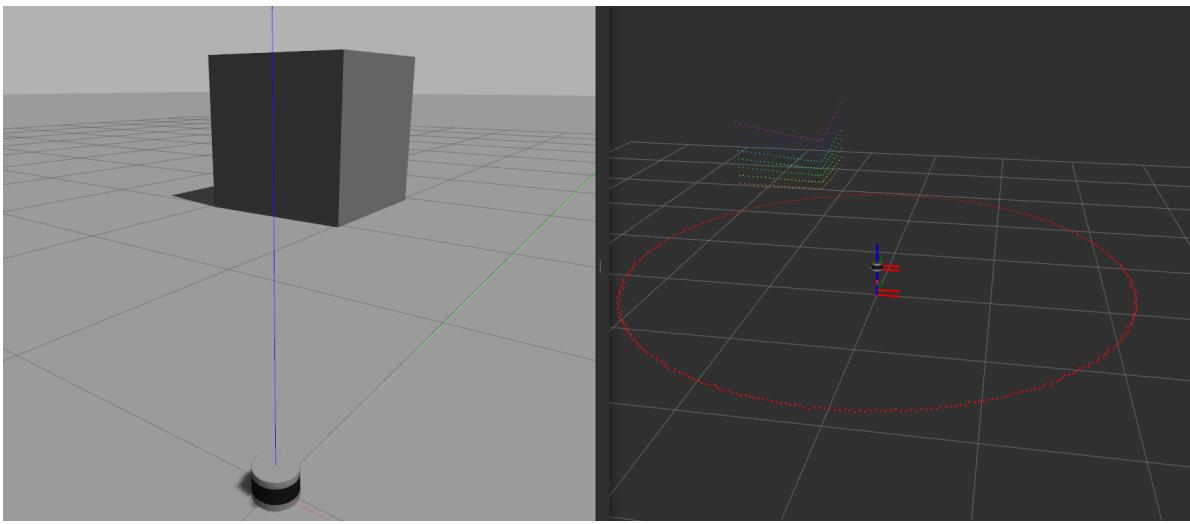
**Lego\_loam url:** <https://github.com/RobustFieldAutonomyLab/LeGO-LOAM>

**install gtsam(Georgia Tech Smoothing and Mapping library, 4.0.0-alpha2)**

```
#open a Terminal.  
wget -O ~/Downloads/gtsam.zip https://github.com/borglab/gtsam/archive/4.0.0-alpha2.zip  
cd ~/Downloads/ && unzip gtsam.zip -d ~/Downloads/  
cd ~/Downloads/gtsam-4.0.0-alpha2/  
mkdir build && cd build  
cmake ..  
sudo make install
```

Step 1: launch velodyne\_simulator ROS package, and you will see:

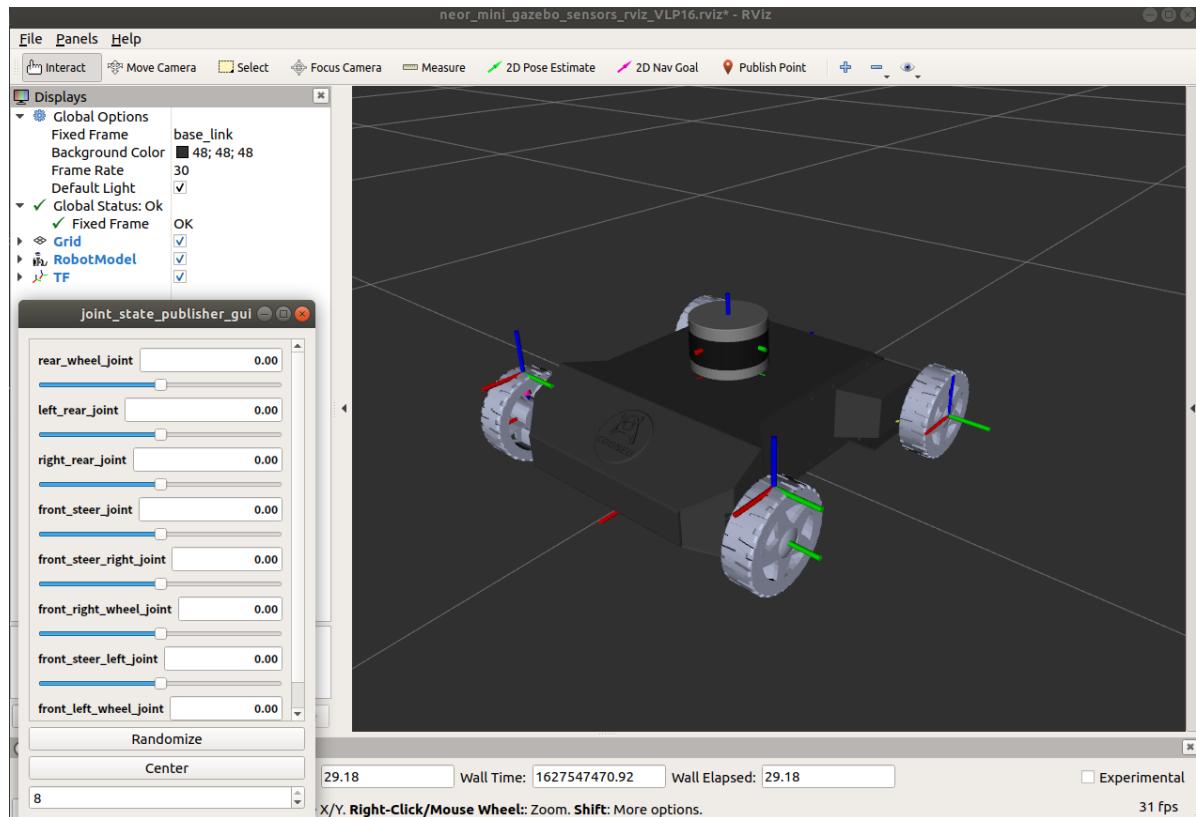
```
# open a Terminal  
cd ~/neor_mini/minisim18_ws/  
source devel/setup.bash  
  
# launch VLP-16  
roslaunch velodyne_description velodyne_16.launch
```



### Step 2: Install the Velodyne-16 on the neor\_mini

```
# open a Terminal
cd ~/neor_mini/minisim18_ws/
source devel/setup.bash

# start launch file and see neor_mini + vlp-16 in Rviz
roslaunch neor_mini display_gazebo_sensors_VLP16.launch
```

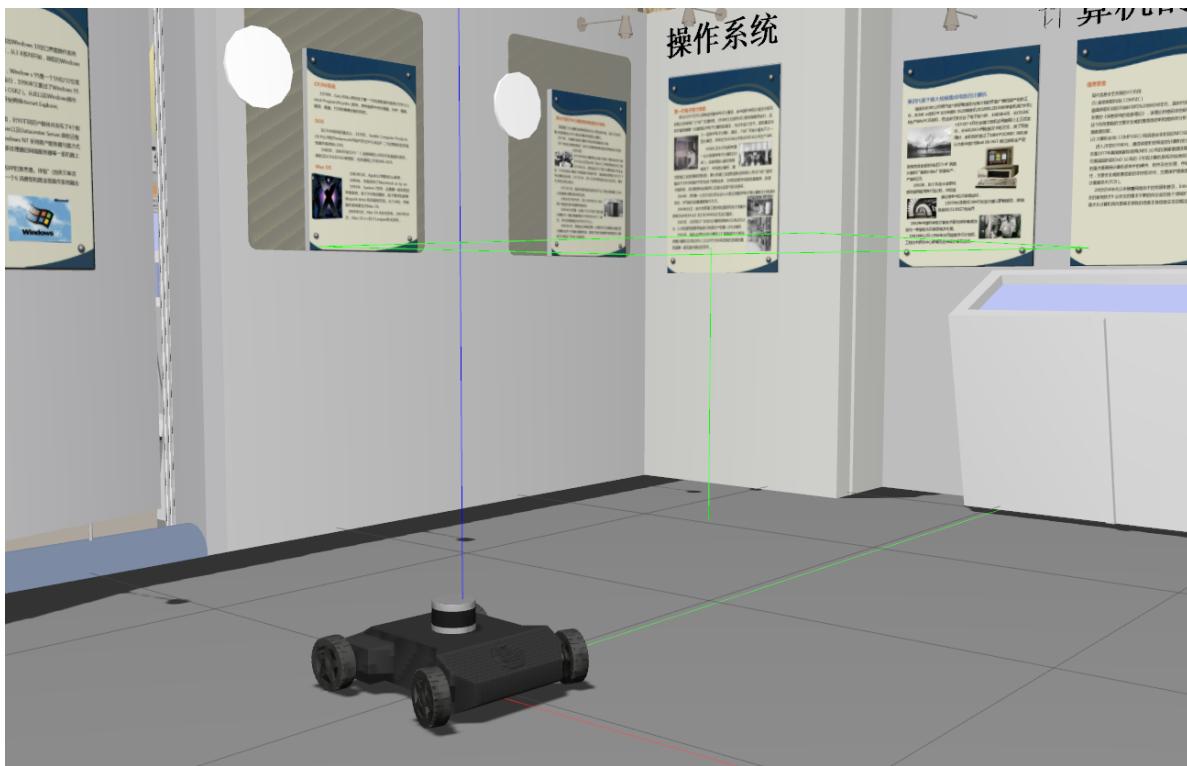


### Step 3: launch the neor\_mini+vlp16 model in Gazebo

```
# open a Terminal and add the museum model world into Gazebo's model folder
cp -r ~/neor_mini/mini_sim18_ws/src/neor_mini/models/* ~/.gazebo/models/

# open a Terminal
cd ~/neor_mini/mini_sim18_ws/
source devel/setup.bash

# start launch file and see neor_mini + vlp-16 in Gazebo
roslaunch steer_mini_gazebo steer_mini_sim_sensors_VLP16.launch
```



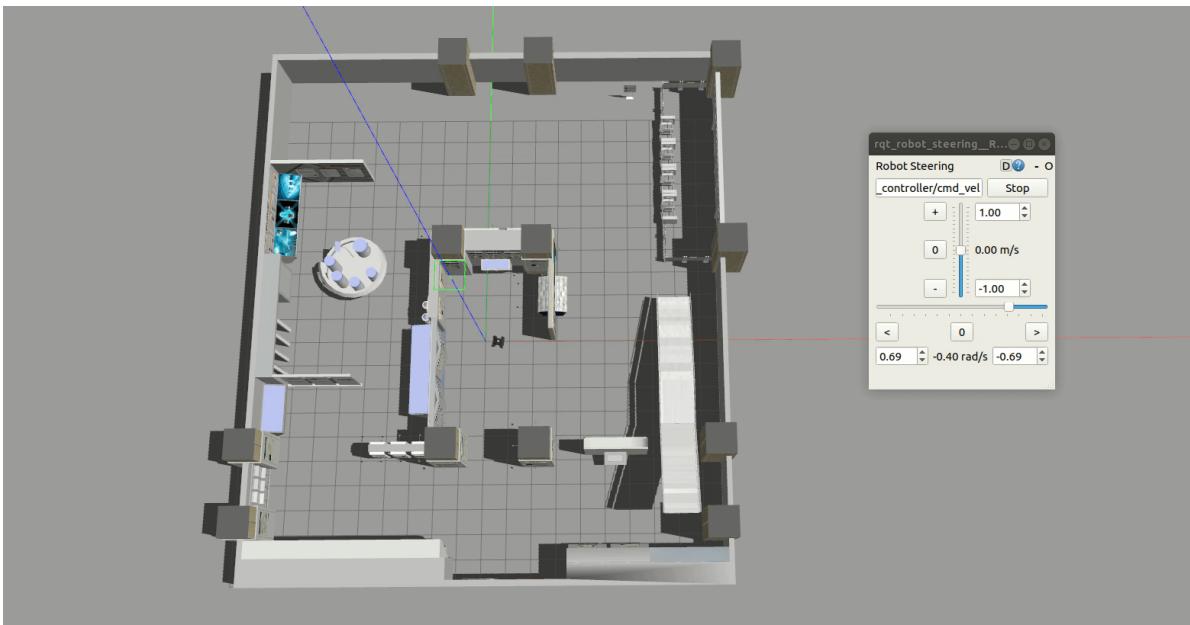
(Gazebo from: *iscas\_museum.world* )

#### Step 4: Record the data collected by VLP-16 in Gazebo

```
# open a Terminal
cd ~/neor_mini/mini_sim18_ws/
source devel/setup.bash
roslaunch steer_mini_gazebo steer_mini_sim_sensors_VLP16.launch

# open another Terminal and record VLP-16 data By rosbag
cd ~/neor_mini/mini_sim18_ws/
rosbag record -a

# and then, control the neor_mini traverses the iscas_museum world
```

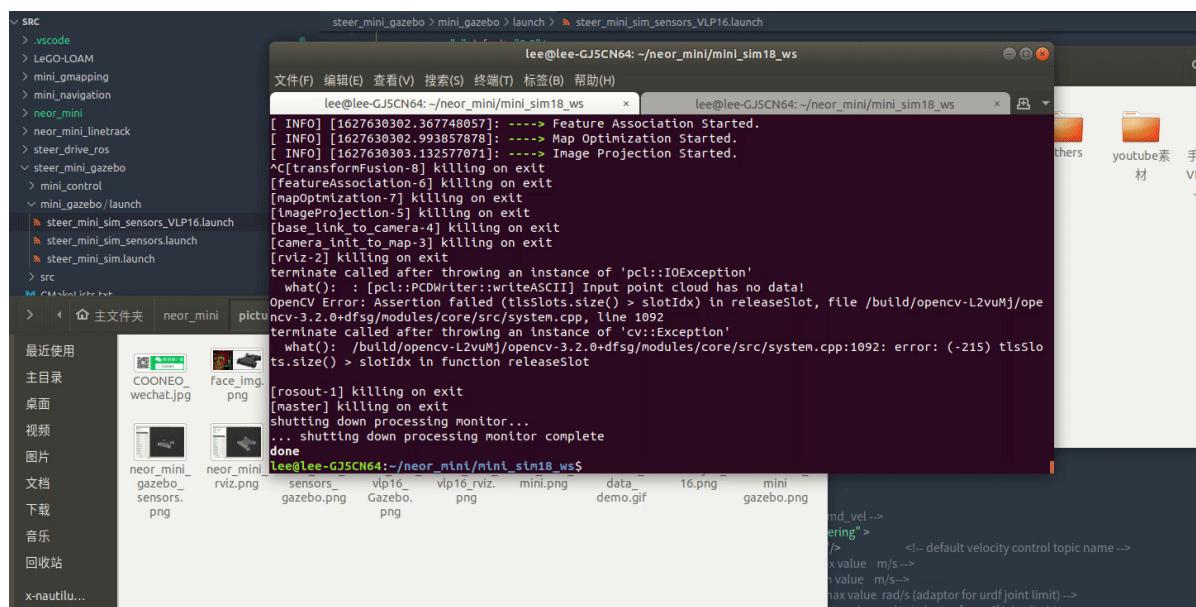


### Step 5: Play the Record data && Mapping by Lego\_Loam

```
# open a Terminal
cd ~/neor_mini/minisim18_ws/
source devel/setup.bash
roslaunch lego_loam run.launch

# open another Terminal and "cd" in your bag file folder
cd ~/neor_mini/minisim18_ws/
source devel/setup.bash
rosbag play ####.bag      # replace with your own or current bag file's name

# and then, you will see mapping by LegLoam
```



Congratulations!!! You can run Velodyne-16 Lidar in Gazebo with neor\_mini and Mapping by Lego\_Loam.

The Lego\_loam ROS Package from The RobustFieldAutonomyLab.

```

@inproceedings{legoloam2018,
  title={LeGO-LOAM: Lightweight and Ground-Optimized Lidar Odometry and Mapping on Variable Terrain},
  author={Shan, Tixiao and Englot, Brendan},
  booktitle={IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)},
  pages={4758-4765},
  year={2018},
  organization={IEEE}
}

```

## Chapter 4: Simulation of Automatic Obstacle Avoidance Based on Three-channel Ultrasonic

### Corresponding WeChat article

开源！手把手教你多路超声波传感器避障仿真

原创 Lee COONEO 8月6日

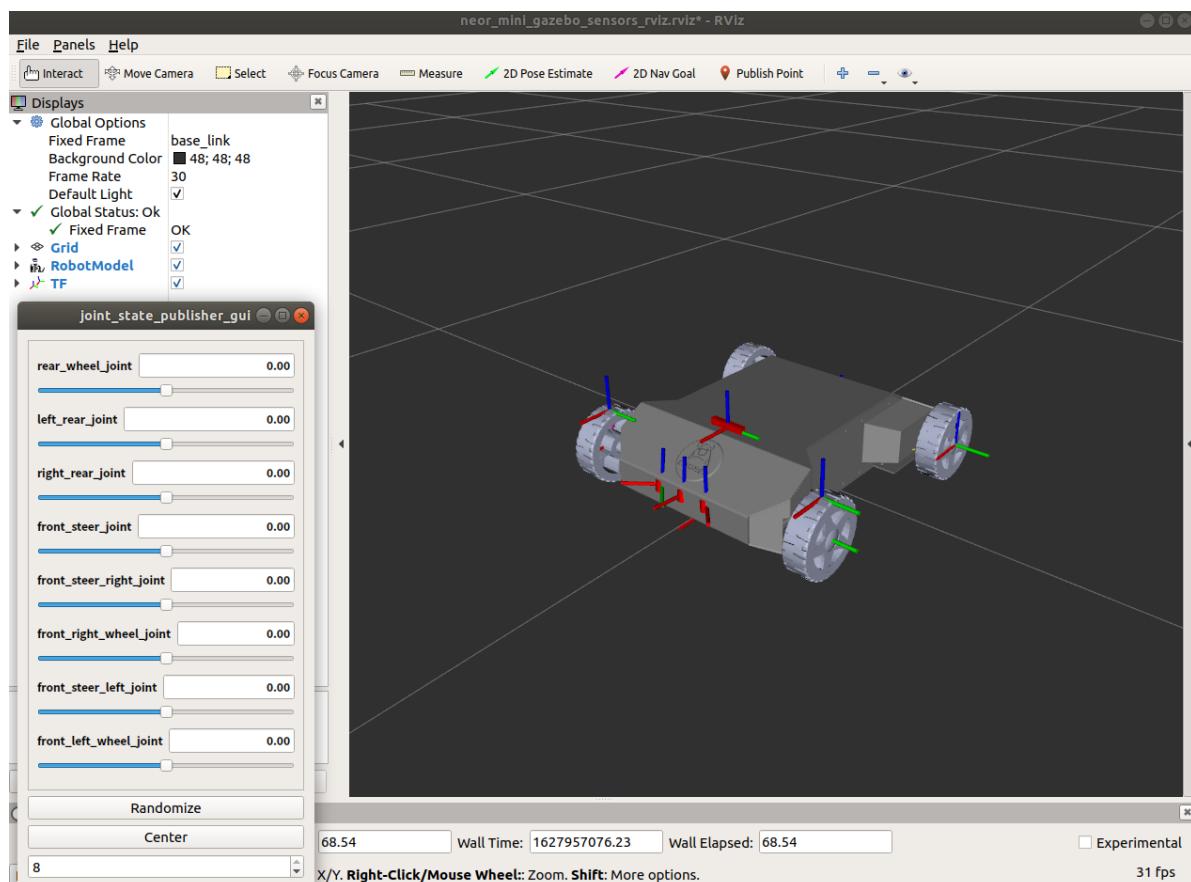
step 1: Visualization of neor\_mini after adding an ultrasonic sensor.

```

# open a Terminal
cd ~/neor_mini/minisim18_ws/
source devel/setup.bash      # if failed, please catkin_make all packages

# launchUltrasonars sensors
roslaunch neor_mini display_gazebo_sensors_ultrasonars.launch

```



step 2: Start ultrasonic obstacle avoidance simulation in Gazebo (Stop step one)

```
# open one Terminal  
cd ~/neor_mini/mini_sim18_ws/  
source devel/setup.bash      # if failed,please catkin_make all packages  
  
roslaunch steer_mini_gazebo steer_mini_sim_sensors_ultrasonars.launch
```



```
# open another Terminal  
cd ~/neor_mini/mini_sim18_ws/  
source devel/setup.bash      # if failed,please catkin_make all packages  
  
# launch the ultra_avoid_obstacle node  
roslaunch ultra_avoid_obstacle ultra_avoid_obstacle_node.launch
```



Congratulations!!!

2021.09.17

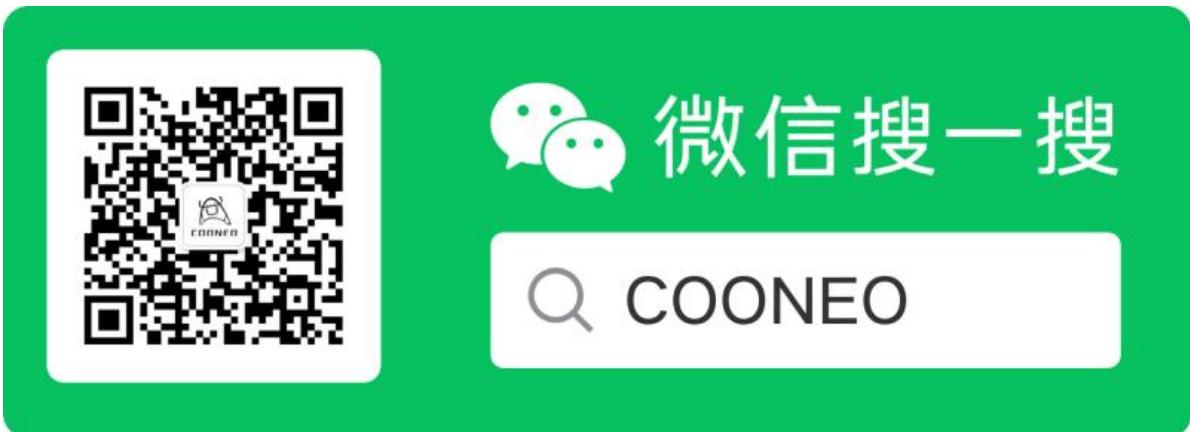
author:ZhaoXiang Li

COONEO Co.,Ltd

Web:<http://cooneo.cc>

E: [cooneo@outlook.com](mailto:cooneo@outlook.com)

For more details,you can search "COONEO" in your WeChat.



neor\_mini