XQ-4 Pro

ROS is not difficult any more!

XQ-mini

用户手册

（综合版）

BWBOT

蓝鲸智能机器人（深圳）有限公司

Table of Contents

Xiaoqiang ROS tutorial

Maintenance

Other Tutorials

Introduction

This is the GitHub version of the Xiaoqiang ROS(Robot Operating System) robot user manual. This file is automatically generated by the tutorial from community. This manual contains all the necessary information for the installation and use of Xiaoqiang, and you can learn how to use it by reading this manual.

The following tutorials focus on the various functions of using Xiaoqiang and do not include the tutorial of ROS. If you are a beginner user of ROS, follow the tutorials below while learning the basics of ROS. Instead of simply following the tutorial to enter the instructions, it is recommended to try to understand the specific meaning of each command. In case you encounter problems, please try to find out the cause of your problems on your own. This can be done through searching the problem on Google or discussing on forums such as StackOverflow.

If you encounter a tutorial or a place where ROS does not understand, you are welcome to ask questions in our ROS Slack Group.

xiaoqiang quick start guide

Quick start

Start Using

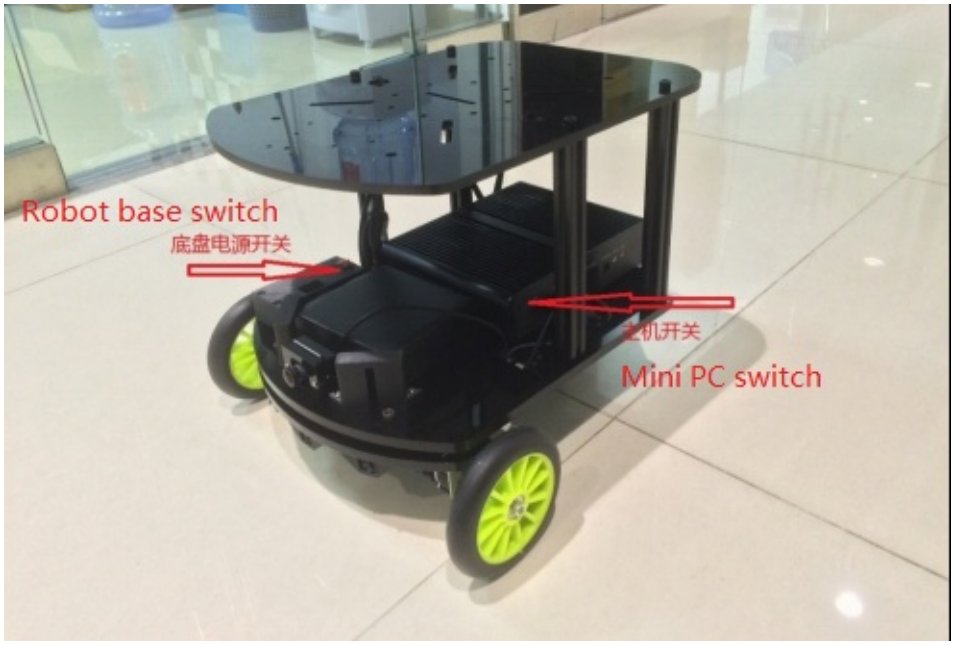
This chapter describes how to quickly use the platform. If you are not familiar with the ROS system and Ubuntu system, please read the first tutorial of the second chapter.

Set up the network

First, connect monitor to Xiaoqiang's host pc（Xiaoqiang Pro users please use the included HDMI to VGA adapter to connect, Xiaoqiang Mini users please use vga directly）。Xiaoqiang's default password is `xiaoqiang`，Please change the default password。Enter the OS and set up Xiaoqiang's wifi network connection。It is recommended to set up the router so that Xiaoqiang can use static ip, which is convenient for future connections. Setting up static IP tourial.

Product assembly

The main part of Xiaoqiang is shown in the figure below.



Place the battery flat on the free area in front of the host (the battery is blocked by two small black blocks).Connect the platform power cord according to the wire label. Installing computer host wifi antenna. USB camera and platform USB communication cable can be connected to the host's USB interface

State check

After the assembly is complete, you can start using Xiaoqiang. Turn on the Xiaoqiang host computer switch and wait for the host blue light to turn on. Xiaoqiang left power data display is normal（The normal range of battery voltage cannot be lower than 10V,The normal range of battery voltage can not be less than 10V or it will automatically shut down）

Remote connection through ssh, where xxx.xxx.xxx.xxx is Xiaoqiang's IP

```
ssh xiaoqiang@xxx.xxx.xxx.xxx
```

Check that the program is working properly and execute the following commands

```
rostopic list
```

Normally, all current ROS topics will be displayed.

```
/ORB_SLAM/Camera
/ORB_SLAM/Frame
/camera_node/image_raw
/orb_scale/scaleStatus
/rosout
/rosout_agg
/system_monitor/report
/tf
/usb_cam/brightness
/xqserial_server/Odom
```

```
/xqserial_server/Power
```

If the topic is not displayed properly, you can try to restart the service.

```
sudo service startup restart
```

Check system status

```
rostopic echo /system_monitor/report
```

If it is normal, the display is as follows

```
imageStatus: True
odomStatus: True
orbStartStatus: False
orbInitStatus: False
orbScaleStatus: False
brightness: 0
power: 12.34432
```

Where imageStatus indicates whether the camera is working properly. odomStatus indicates whether the underlying driver is working properly. The three Orb-related variables are visual navigation-related states that can be temporarily ignored（If you are interested in this area, you can communicate in the forum）. brightness is the brightness of the camera. Power is the voltage value of the current battery, If the voltage cannot be read, 0 is displayed.

remote control

Connect through ssh

```
ssh xiaoqiang@xxx.xxx.xxx.xxx
```

Start remote control program

```
rosrun nav_test control.py
```

Now you can use the arrow keys to control the movement of Xiaoqiang. Spacebar is stopped. Ctrl + C exits the program.

Software overall structure and description

Xiaoqiang's software is built on ROS. The program mainly contains the driver, navigation algorithm and slam algorithm. For robots, the software is a whole, and the dependence of each part is relatively high. For ease of management, The basic functions in the system are operated by one service. That is, the startup service mentioned earlier. This service starts the driver package and camera. Startup package is located

`/home/xiaoqiang/Documents/ros/src/startup`. This service is automatically started when the system starts. If you want to change the content of this service, you can modify the launch file in this package. For detailed operations, please refer to here. The system's navigation program uses the navigation package that comes with ROS. However, the navigation parameters are modified according to Xiaoqiang's own parameters. Navigation parameters have a great influence on the performance of navigation. You can also try to modify the parameters yourself to improve performance. The slam algorithm uses ORB_SLAM. This algorithm is currently not available in the actual production environment, but its use performance is also very good. The last is some tool software. For example, nav_test control.py related to control platform movement.， System monitor that shows the system status.

ROS Primer

Learning ROS for Robotics Programming - Second Edition.pdf. This tutorial is very basic and comprehensive, Although taking the Hydro version as an example, But it is also fully compatible with the Kinetic version, In the code example in the book, just replace the string `hydro` with `kinetic`. Please read the second and third chapters of this book in detail.

xiaoqiang tutorial (1) Basic operation introduction and remote control in LAN

Xiaoqiang Homepage

Basic operation introduction and remote control in LAN

before the start

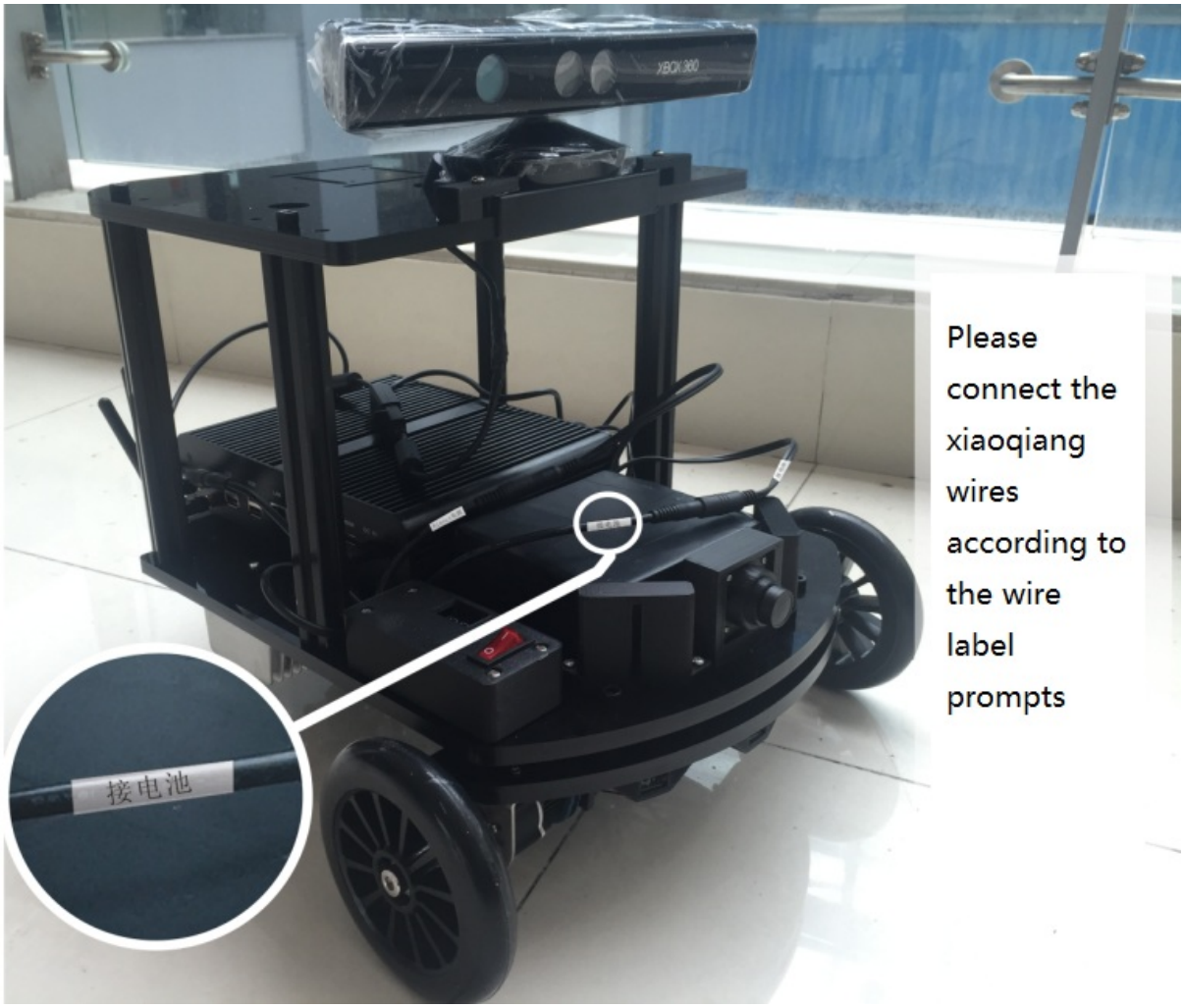
The following tutorial focuses on the use of various features of Xiaoqiang and does not include the teaching of ROS. If you are a beginner of ROS, follow up on the ROS basics while following the tutorials. Please don't just follow our tutorial and enter instructions. Understand the specific meaning of each command please. When you have problems, you should also be good at finding reasons by yourself, which will be helpful for future work and study. If you haven’t understood about tutorials or ROS, please feel free to ask questions in slack.

Xiaoqiang HomePage

Buy Xiaoqiang

Buy Xiaoqiang mini

First of all, please connect the xiaoqiang wires according to the wire label prompts. The complete structure is shown in the figure below.

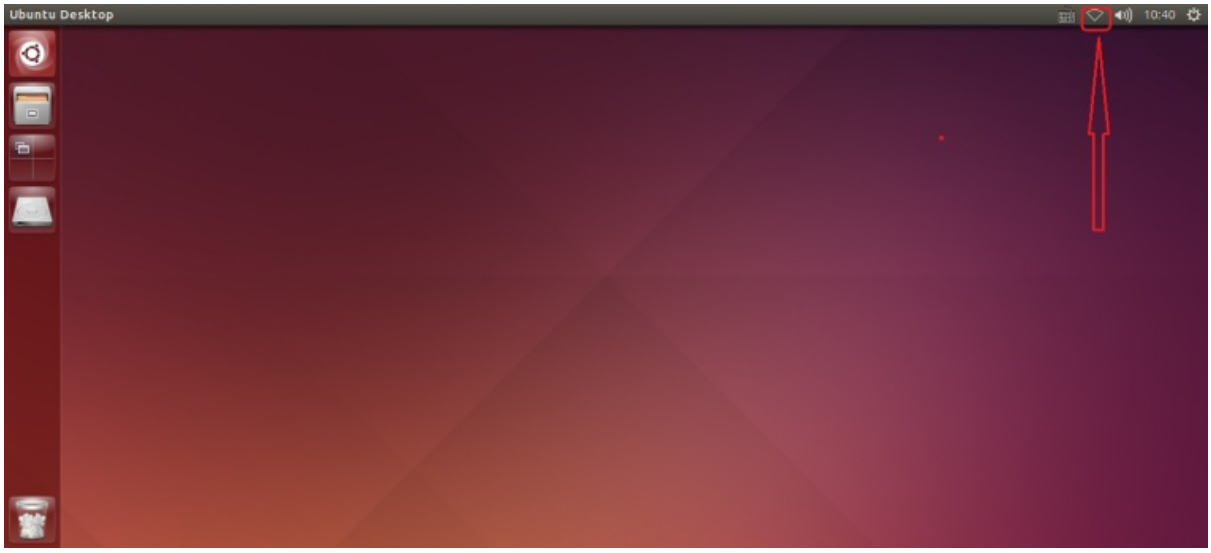


1.Configure the Xiaoqiang network

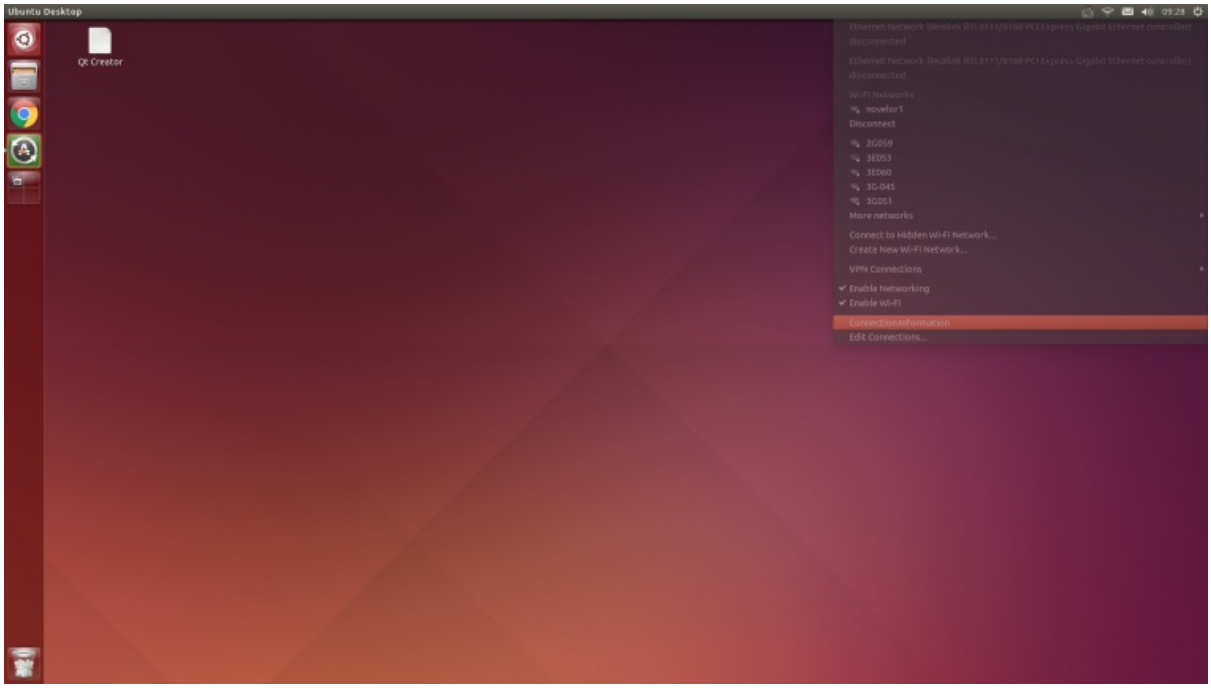
First connect Xiaoqiang's host computer with monitor（Xiaoqiang Pro users please use the included HDMI to VGA adapter to connect, Xiaoqiang Mini users please use vga directly）, The mouse and keyboard connected to the host computer. Then turn on the host computer and enter the Ubuntu system.

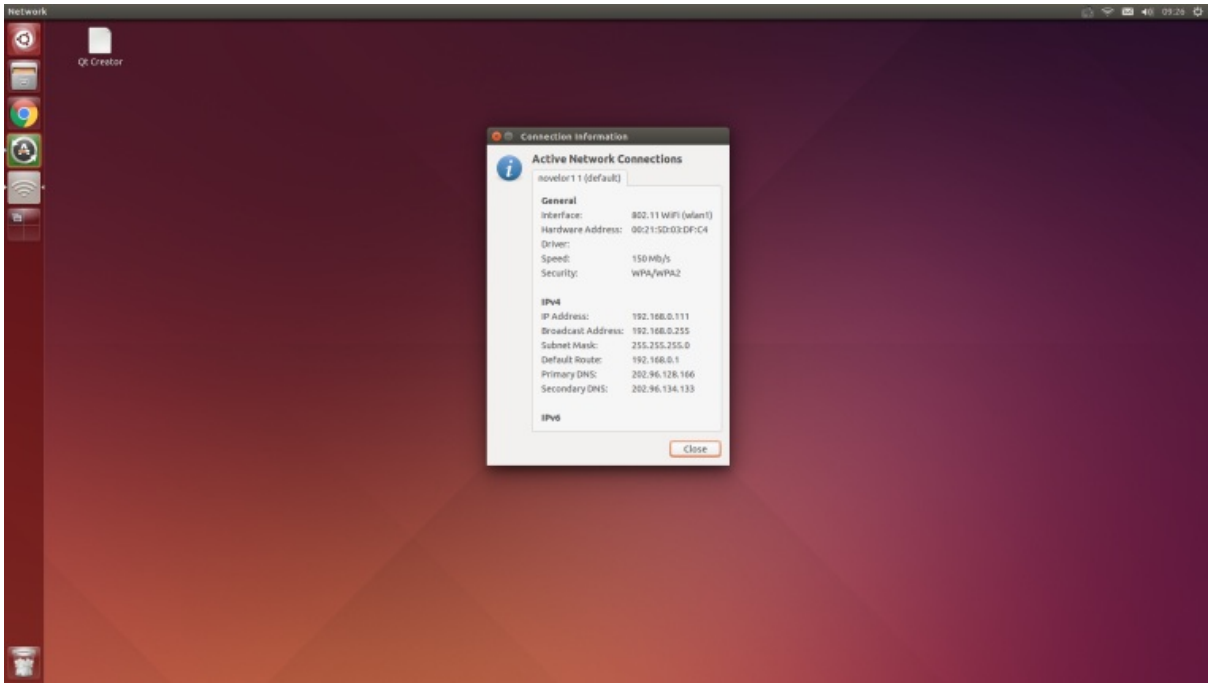
```
xiaoqiang's default password is xiaoqiang
```

Click on the location of the icon below and select the desired wireless network

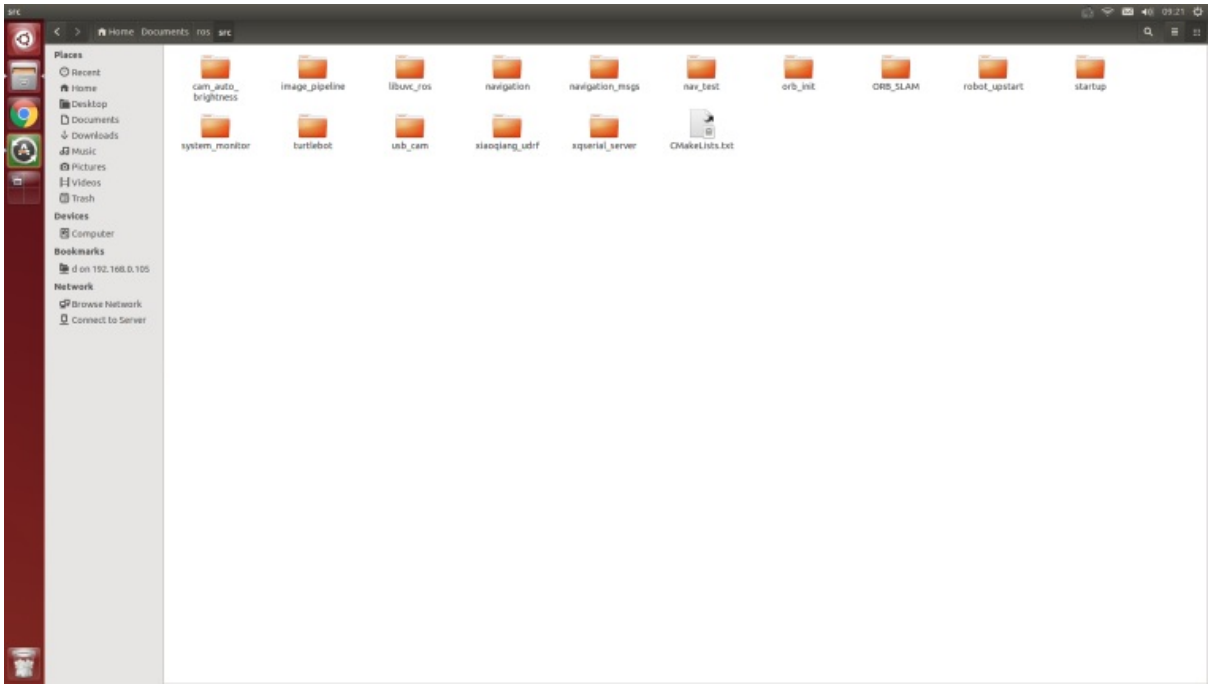


After accessing the network, click on the marked position in the figure below to get Xiaoqiang's actual ip address. Follow-up tutorials will use this ip information frequently.





Xiaoqiang's ROS default working directory is here



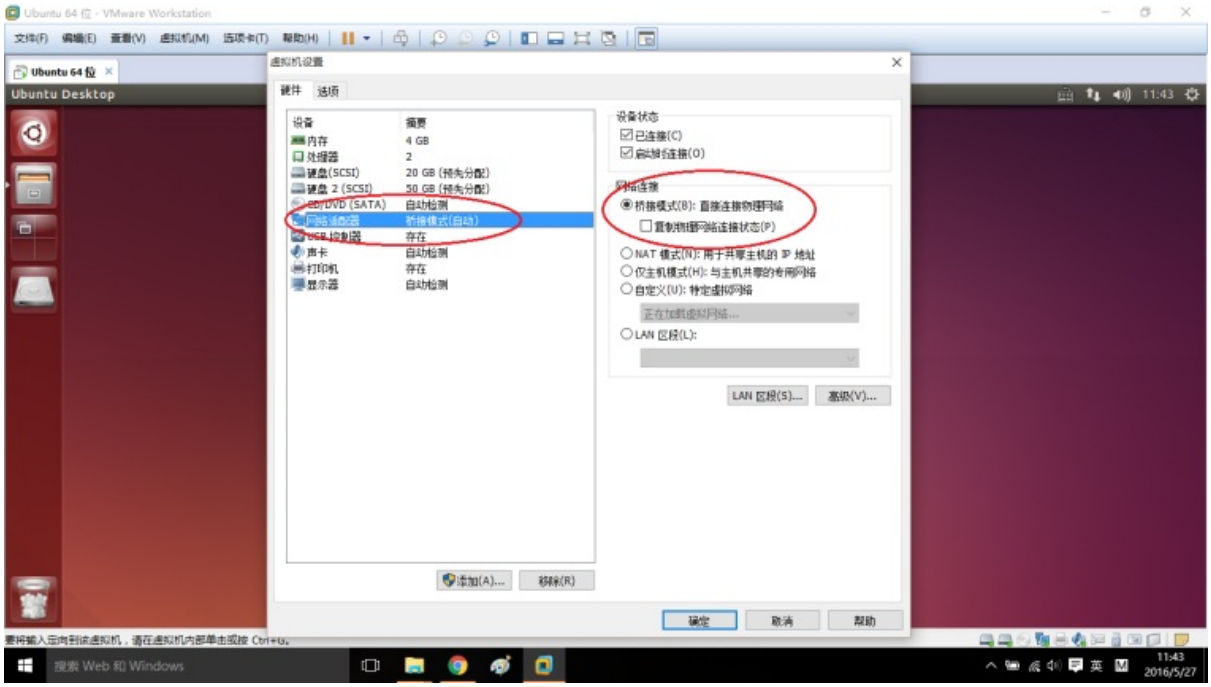
Now that Xiaoqiang has been configured, the keyboard, mouse, and monitor can be unplugged after power off. The next time Xiaoqiang is powered on, it can be used directly.

2. Local configuration

The local remote control end is preferably an x86 host with ubuntu 16.04 64 bit operating system installed. If you only have a windows platform, you can install the vmware virtual machine. Download Vmware Player from here , and then install ubuntu in the virtual machine. Mirror download and installation tutorial, it is

recommended to install Xiaoqiang iso image(already configured ROS). Finally, ensure that the virtual machine be on the same LAN as Xiaoqiang.

Note The virtual machine NIC is to be set as a bridge, as shown in the following figure. Otherwise the virtual machine will not be able to link the xiaoqiang. If you are unable to connect to xiaoqiang, you can turn off your computer's firewall and try again.



Start Ubuntu system configuration after system deployment

a.Install `ssh, screen` , if you install Xiaoqiang mirror please skip this operation

```
sudo apt-get install ssh screen
```

b.Install ros kinetic, if you install Xiaoqiang mirror please skip this operation, the official tutorial

c.Users who installed Xiaoqiang system image, please turn off startup service to avoid conflicts with Xiaoqiang

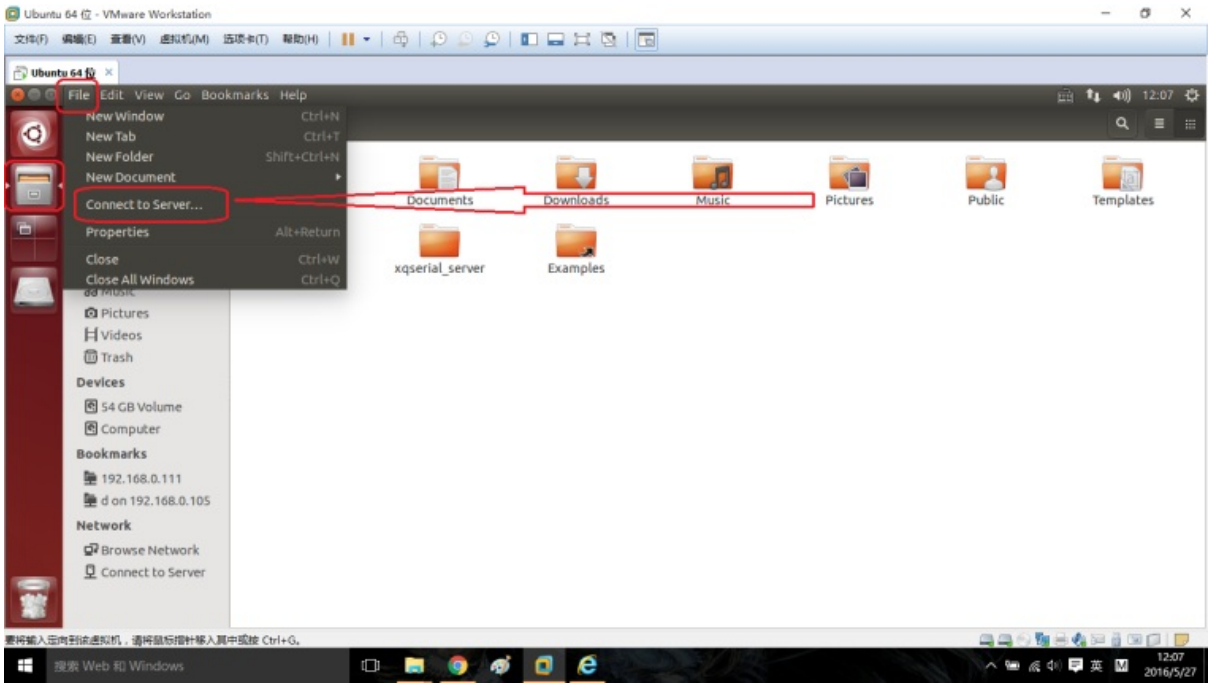
```
sudo service startup stop
rosrun robot_upstart uninstall startup
```

d.Users who installed Xiaoqiang mirror, please update Xiaoqiang_udrf package according to Xiaoqiang model(Pro?mini)

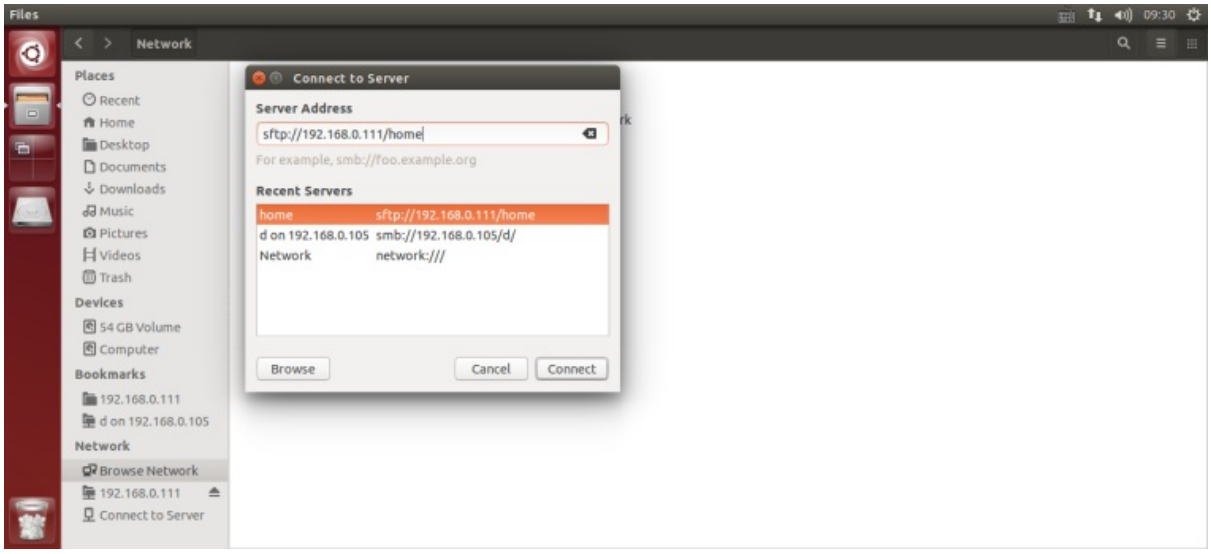
```
cd ~/Documents/ros/src/xiaoqiang_udrf
git stash
git pull
# Xiaoqiang pro user, please switch to the master branch
git checkout master
# Xiaoqiang mini user, please switch to mini branch
git checkout mini
```

e.Because the follow-up needs to frequently change the files on the Xiaoqiang host, we will now add the Xiaoqiang host remote directory to the local computer so that the file on the Xiaoqiang host can be graphically operated locally (the Xiaoqiang host is equivalent to the external hard disk of the local ubuntu system).

Click on the icon in the figure below to add the remote directory

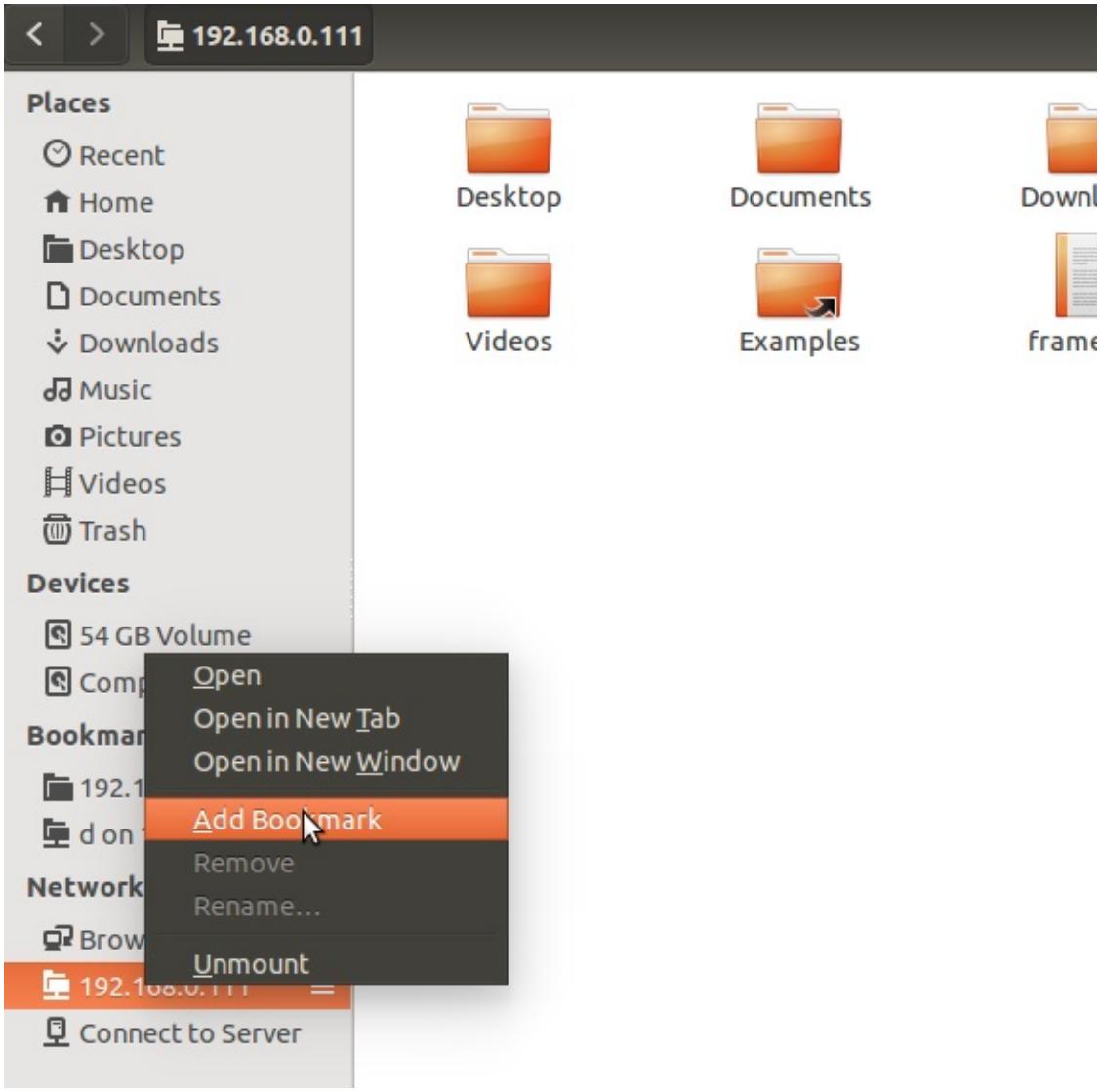


Enter Xiaoqiang's remote directory. Replace ip with the actual ip address mentioned above.

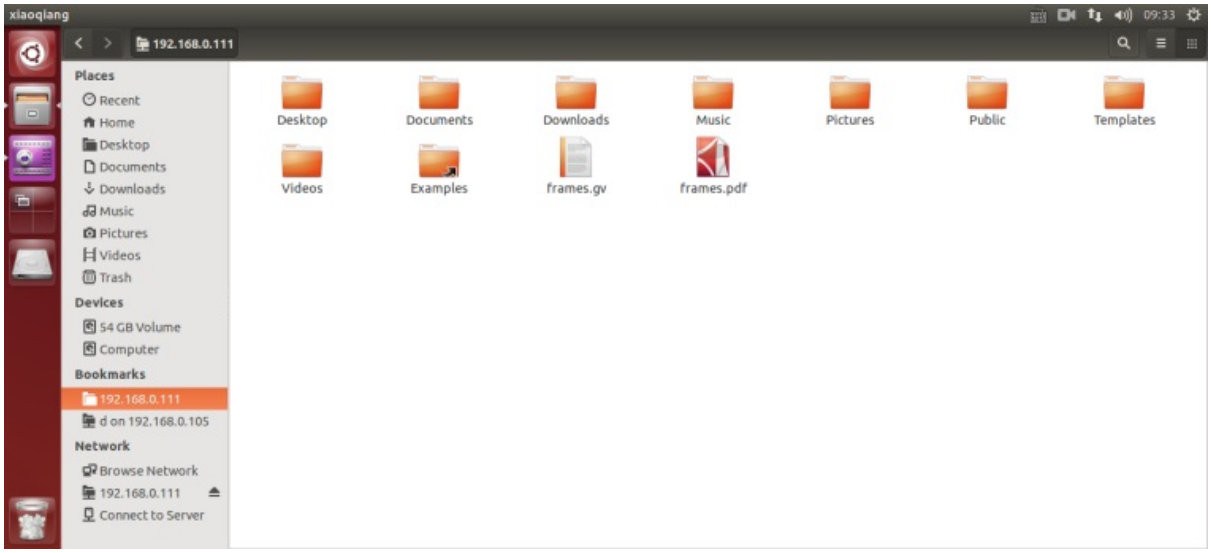


Enter the Xiaoqiang host username and password as prompted.

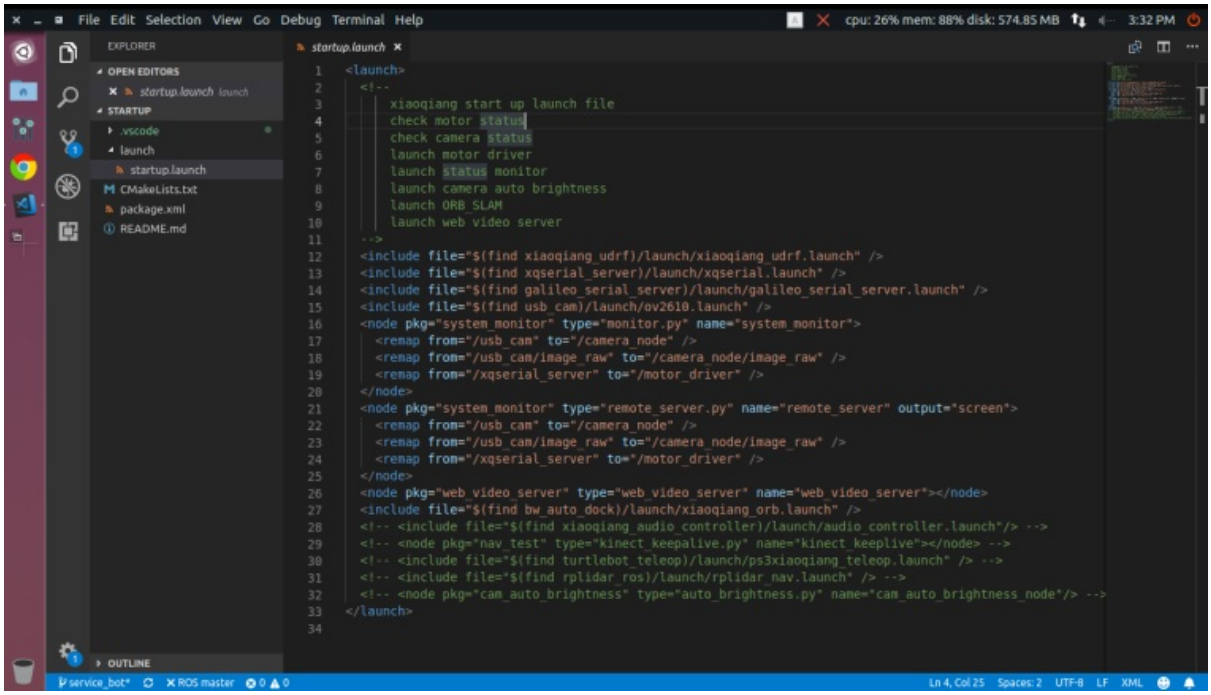
If everything is normal, the home directory of the Xiaoqiang host has been opened. For future convenience, this address can be added to the bookmark.



You click on this bookmark directly next time, you will be able to access the home directory of the Xiaoqiang host.



It is recommended to install the vscode editor (already installed in xiaoqiang system image), and it is convenient to code and edit the software package on the Xiaoqiang host.



e.Now that you have the full development and use environment of Xiaoqiang, for example, ssh logs in to the Xiaoqiang host and begins to use the keyboard to remotely control Xiaoqiang's movement.

1. Open a terminal on the local machine
2. Connect to xiaoqiang via ssh, replace xxx with actual ip

```
ssh xiaoqiang@xxx.xxx.xxx.xxx
```

3. Start remote program

```
rosrun nav_test control.py
```

4. You can start controlling the movement of Xiaoqiang through the arrow keys. Spacebar is the stop button. Press `Ctrl + C` to exits the program.

Xiaoqiang's mobile control is achieved by issuing a topic named `/cmd_vel`, This topic is the Twist type under geometry_msg, Its release method please refer to ros official document. The control.py source code on Xiaoqiang is also a good reference example.

FAQ

Q: The car can only go forward and not back, or can only move back.
A: Check whether the car's infrared sensor is triggered and the sensor will light up after triggering. After the infrared trigger, the car cannot move in the corresponding direction.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (2) Bluewhale Robot Open source code repository usage and ROS startup task configuration

Xiaoqiang Homepage

Bluewhale Robot Open source code repository usage and ROS startup task configuration.

Some of Xiaoqiang's software source code is shared with Bluewhale Robot's open source code repository, Anybody can freely download or use it for futher development.

For Xiaoqiang users, the software in the open source Code repository can be directly git cloned into Xiaoqiang's ROS working directory, and then can be compiled and used directly with ROS's `catkin_make`. Xiaoqiang's ROS working directory is: `/home/xiaoqiang/Documents/ros/src`

The following will use the startup package in the open source repository as an example to demonstrate the complete use of the open source repository

1. Startup package introduction

After the Xiaoqiang host starts up, it will automatically start the Linux service script named startup. When the service script runs, it will start the replica which is registered in ubuntu system by `startup.launch` file. Therefore, by modifying the `startup.launch` file in the startup package, and then registering this file as a startup service in the ubuntu system, we can control the booting tasks of the Xiaoqiang host.

2. Download and install startup package on Xiaoqiang host

a. In the local remote control terminal ssh connection Xiaoqiang host, refer to the configuration of the previous tutorial

```
ssh xiaoqiang@192.168.x.x
```

b. Enter Xiaoqiang's ROS working directory to see if there is a startup folder

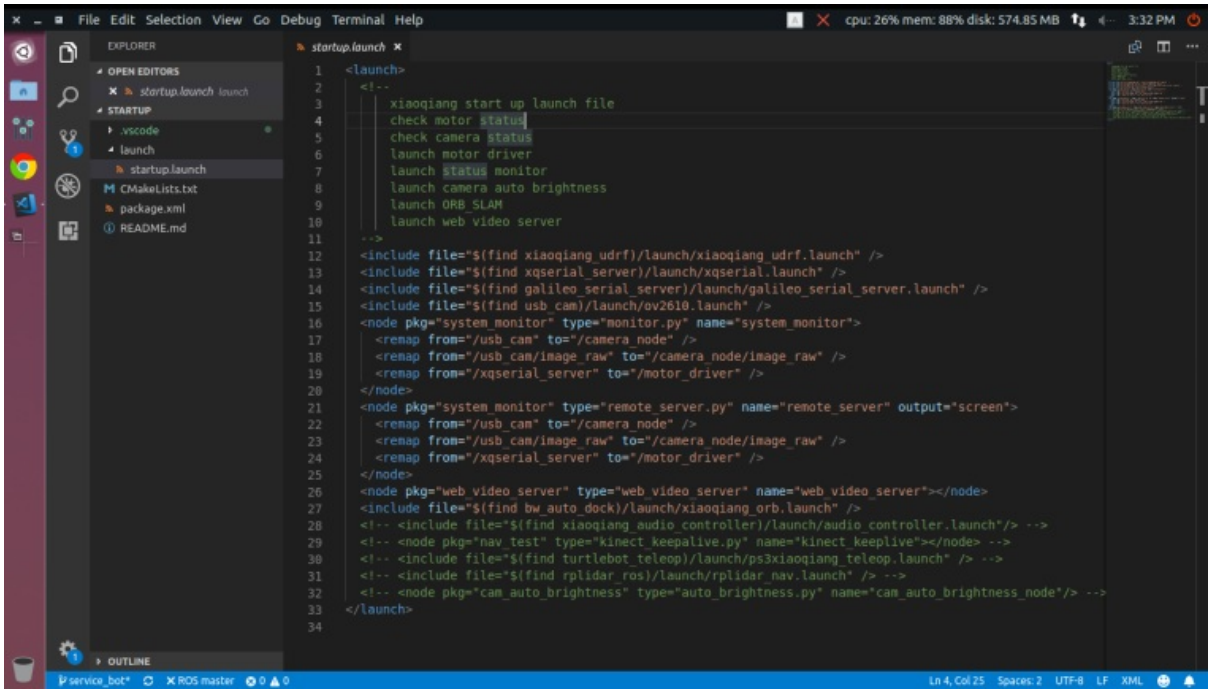
```
cd Documents/ros/src/
ls
```

If it exists, it indicates that the startup package has been installed. You can directly perform the following third step. If you want to update the startup package synchronously with the open source repository, enter the following command:

```
cd startup
git stash
git pull
cd ..
```

3.Modify the startup.launch file in the launch folder in the package

Using the vscode editor installed in the previous tutorial, Edit this file directly on the local machine（If you need to remotely access Xiaoqiang's host file directory, please refer to the previous basic operation tutorial to configure.）



In the arrow area above, add or delete the ROS launch file and ROS node that you need to launch. These items will be added to the boot of the Xiaoqiang host in the following. Xiaoqiang will automatically run these items when booted next time. Finally, save and exit.

4.Register the startup.launch file as a startup startup service on Xiaoqiang host

Please continue to enter in the ssh window in the second section above.

a. First stop and delete the previously registered startup service

```
sudo service startup stop
rosrun robot_upstart uninstall startup
```

b. Re-register startup service

```
rosrun robot_upstart install startup/launch/startup.launch
sudo systemctl daemon-reload && sudo systemctl start startup
```

5.Remotely restart Xiaoqiang's host and check if the boot startup item is loaded normally

Then enter the ssh window above

a. Send a reboot command

```
sudo shutdown -r now
```

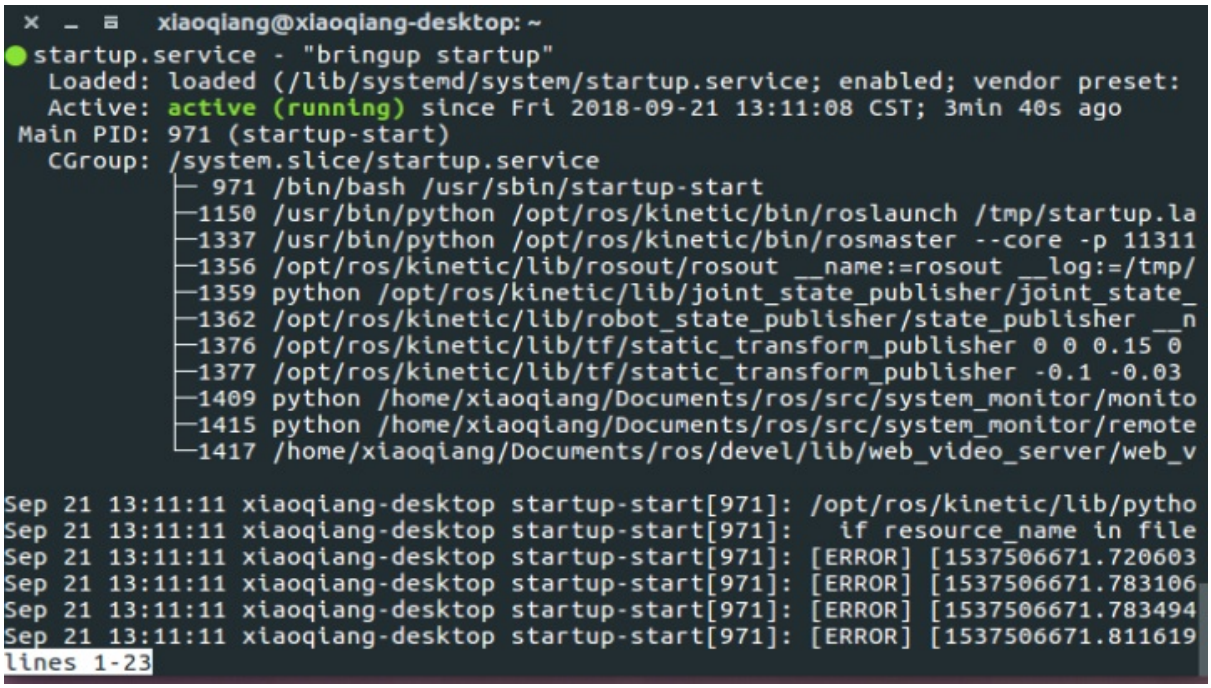
b. Start a new ssh connection

```
ssh xiaoqiang@192.168.x.x
```

c. Check the status of the startup service

```
sudo service startup status
```

Normally, it will show startup start/running as shown in the figure below.



d. You can also further see if the related topic has been published

```
rostopic list
```

Xiaoqiang Homepage Back to Index

xiaoqiang tutorial (3) Displaying Xiaoqiang Robot Model in rviz

Xiaoqiang Homepage

Displaying Xiaoqiang Robot Model in rviz

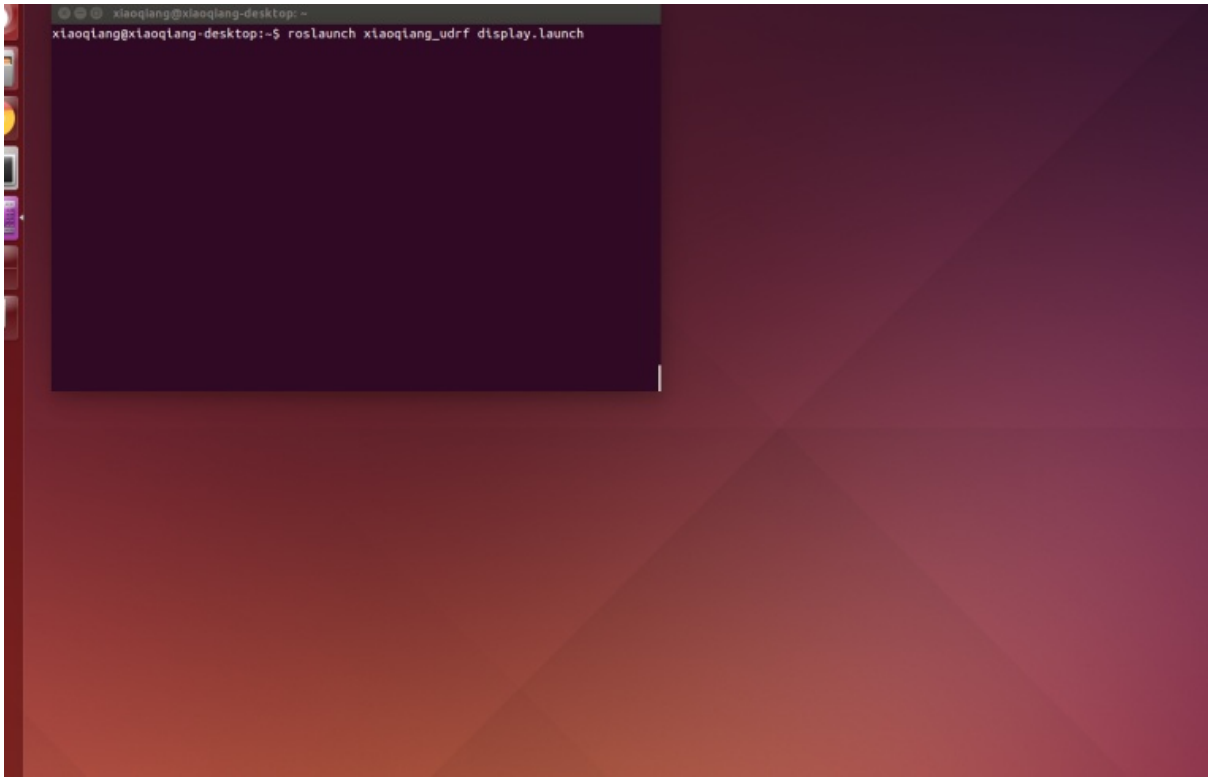
It is a cool thing to display the current pose of the robot in real time. With rviz, you can easily achieve this goal in ROS. Look at the results:

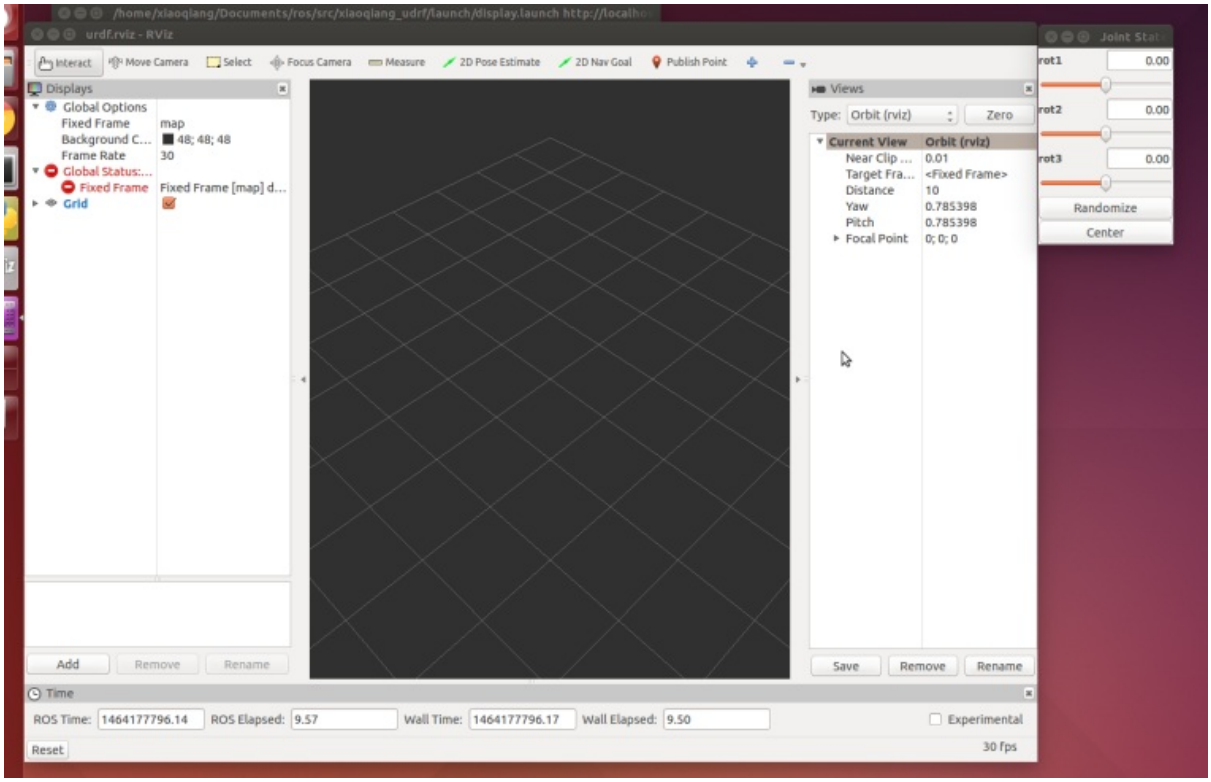
The Xiaoqiang model package located at `Documents/ros/src/xiaoqiang_udrf` and can also be downloaded from our open source repository on Github.

```
# Connect the Xiaoqiang host to the monitor and keyboard, and after booting, open the term
inal
# stop the startup task first
sudo service startup stop
roscore
# Open a new terminal on Xiaoqiang host, start this package
roslaunch xiaoqiang_udrf display.launch
```

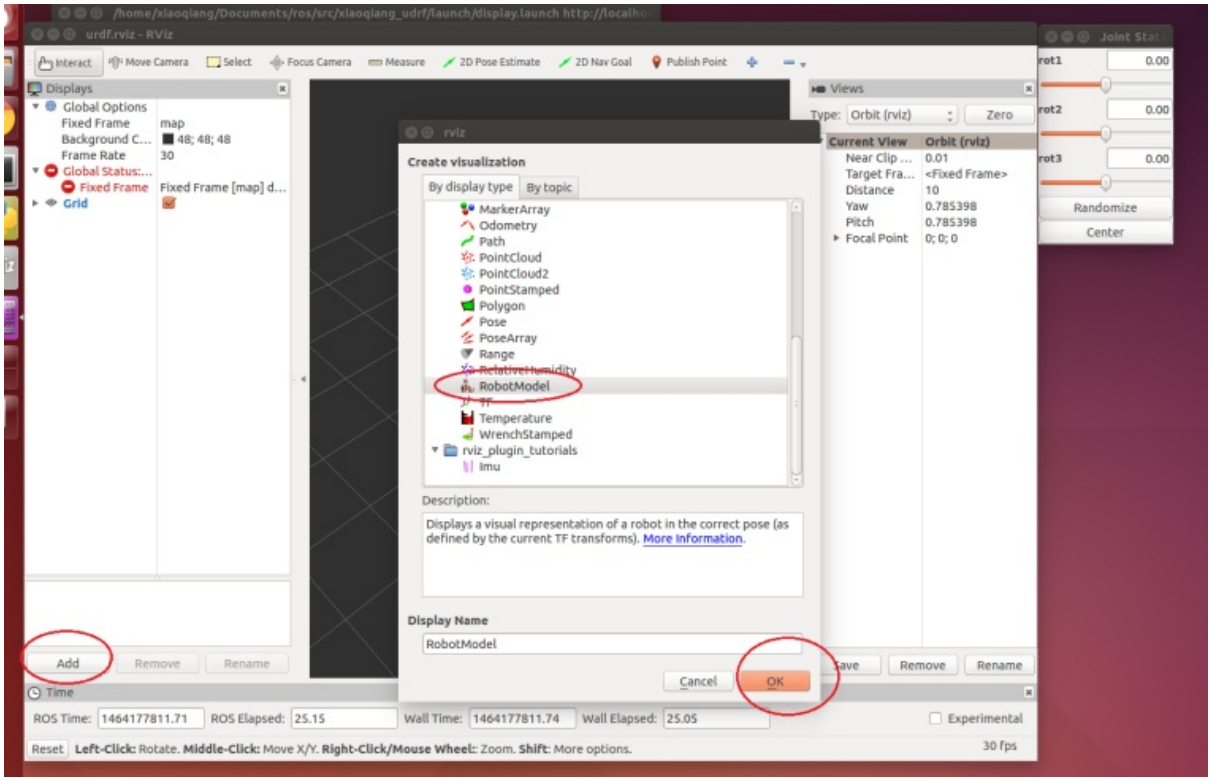
Note that this process requires a graphical interface, so there is no way to operate through a remote ssh connection. If you must use ssh connection, you can add `-X` (note the capital) option when connecting, but the experience is not good and is not recommended. It is recommended to operate through VNC. VNC installation method can refer to this article.

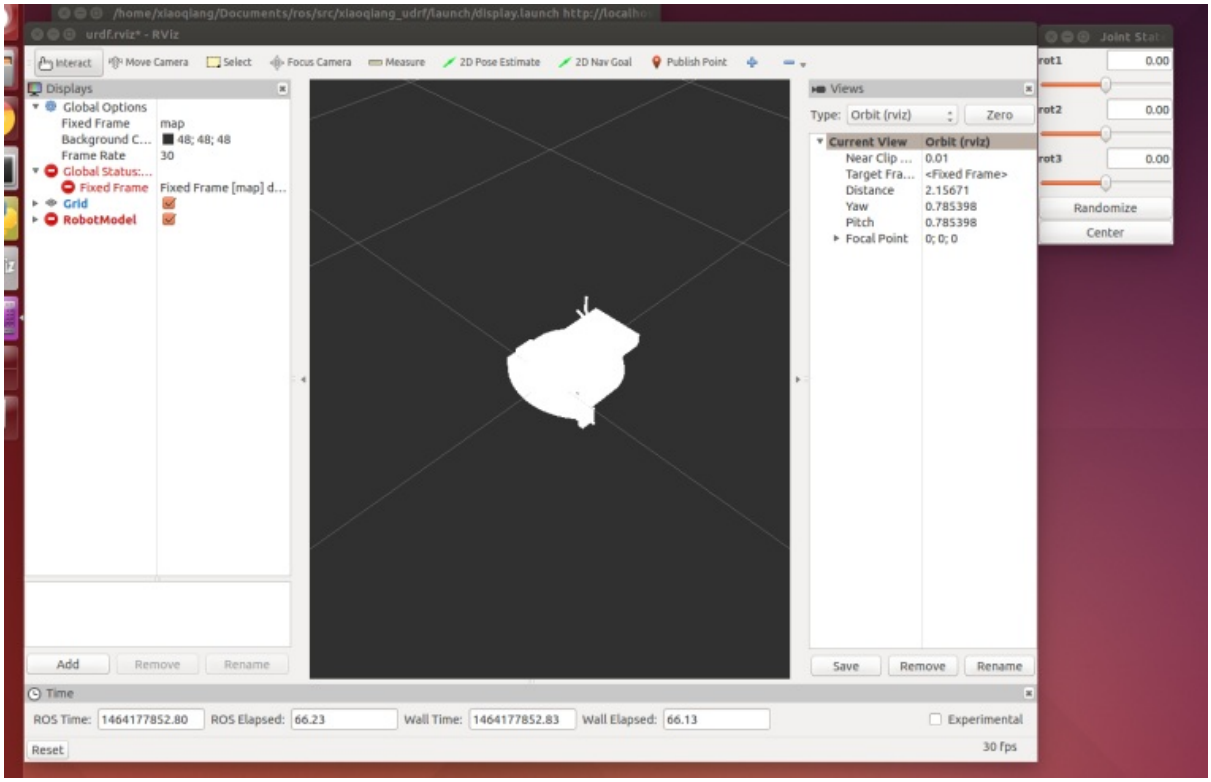
`If you want to open the model package remotely, you need to install Xiaoqiang's model package locally. For users using the Xiaoqiang system image, Xiaoqiang's model package has been installed in advance.`



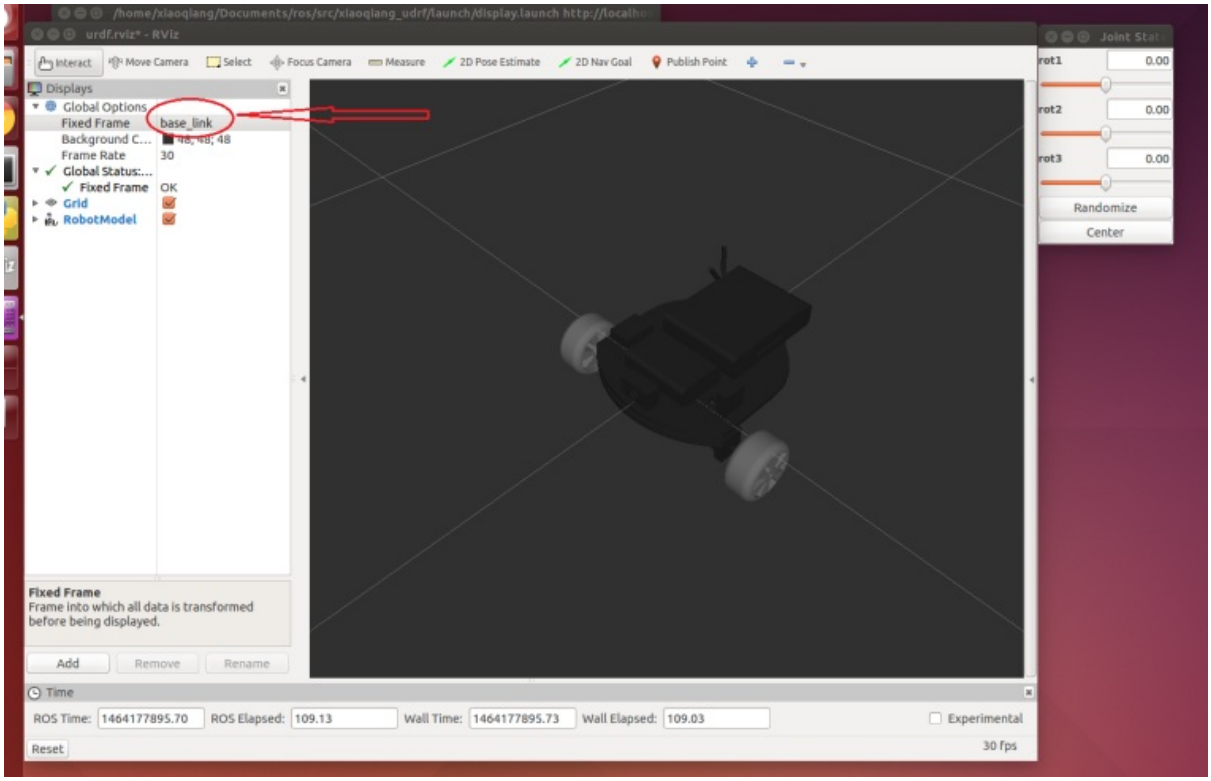


At this point, there is no thing to display, you need to add rviz display items





There is still a problem, the entire model is transparent and whitish, this is because the global coordinate system `fixed frame` in the rviz is not set properly, After map is changed to `base_link`, it will display normally

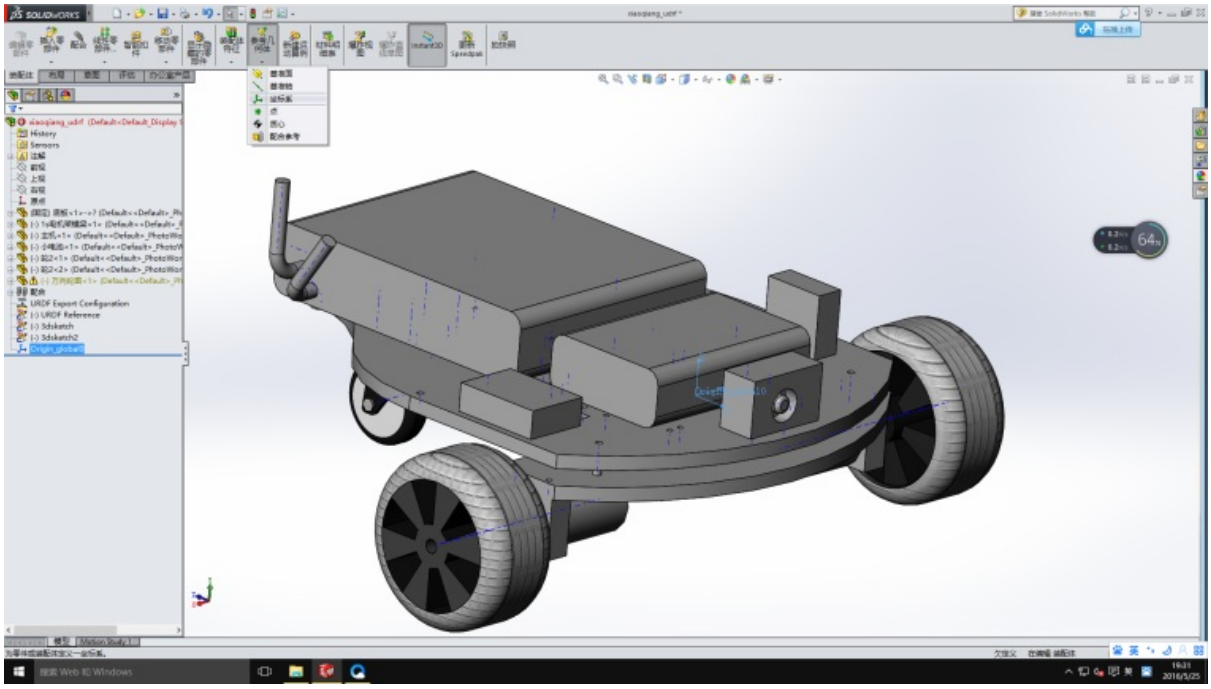


Now operate the slider in the upper right corner to turn the corresponding wheel.

Above we simply demonstrated the use of rviz to display the urdf model. The following section will describe in detail the whole process of making urdf model with solidworks under windows system.

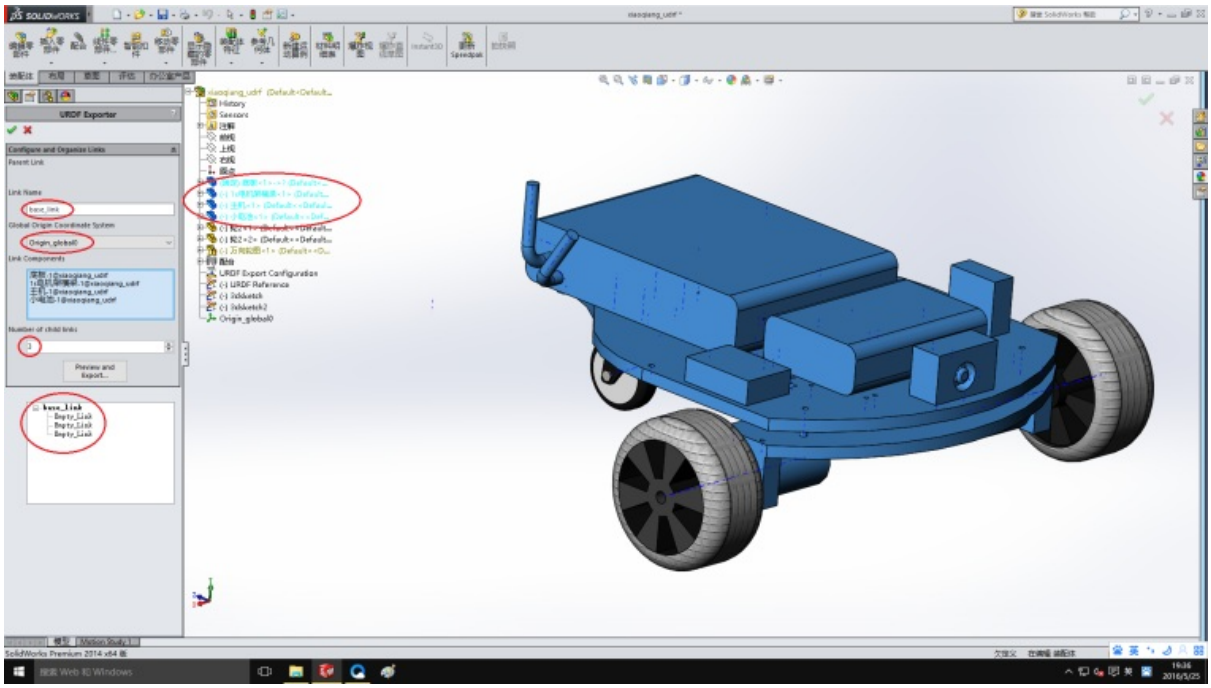
First use solidworks to create the platform model, download and install the solidwork to urdf plug-in.

After making a model, you need to add a coordinate system. This coordinate system will be used as the reference coordinate system of the entire urdf model (ie, the base_link frame in ROS).

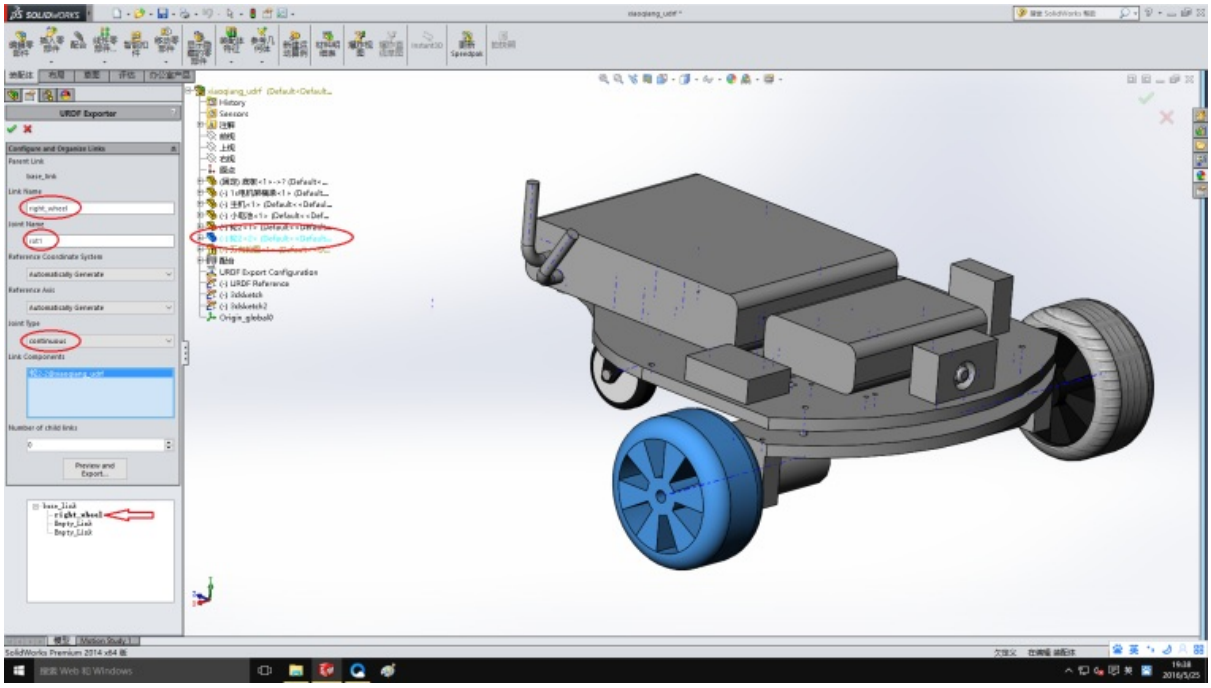


Open urdf plugin

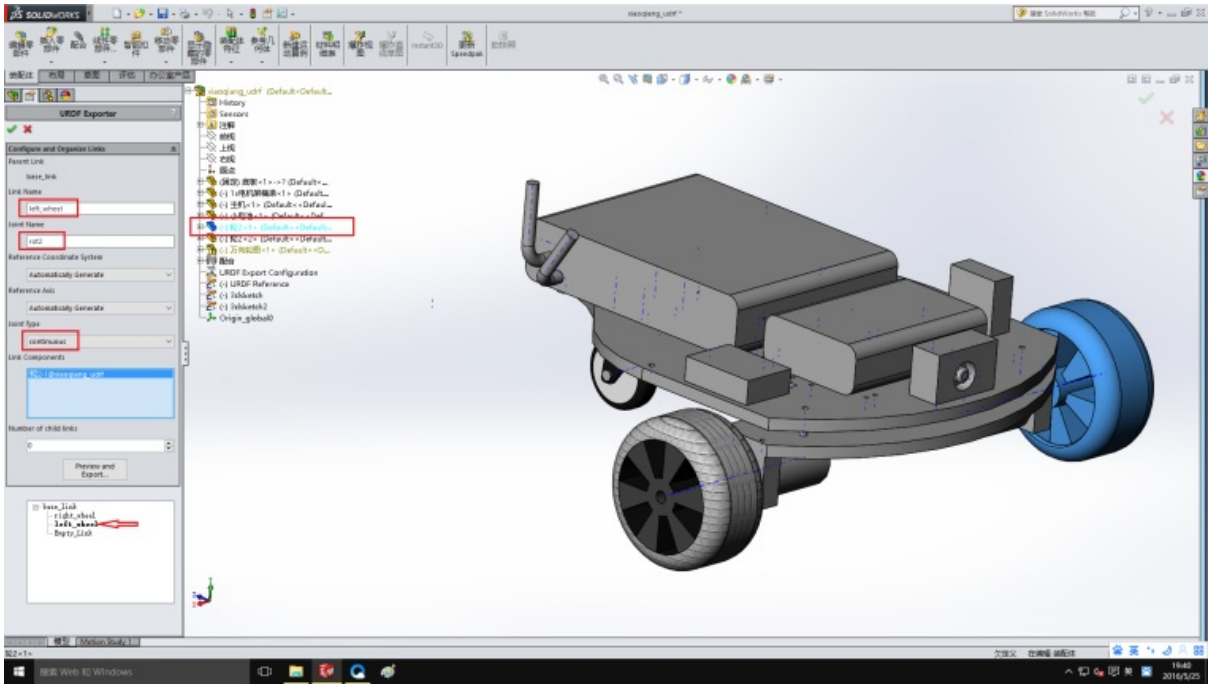
Xiaoqiang has two driving wheels and one driven wheel, so the whole model needs 3 links, 3 joints. First edit the `base_link`, pay attention to the global coordinate system above, the red area in the picture is the item you need to click or modify.

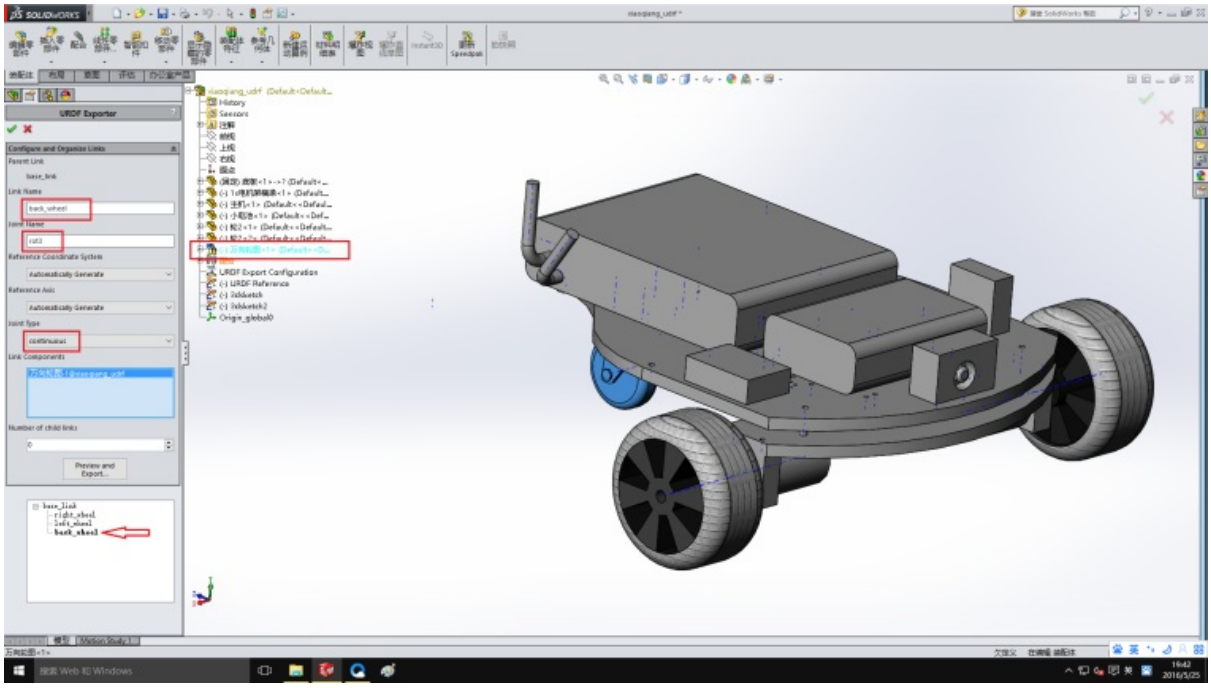


Then right wheel

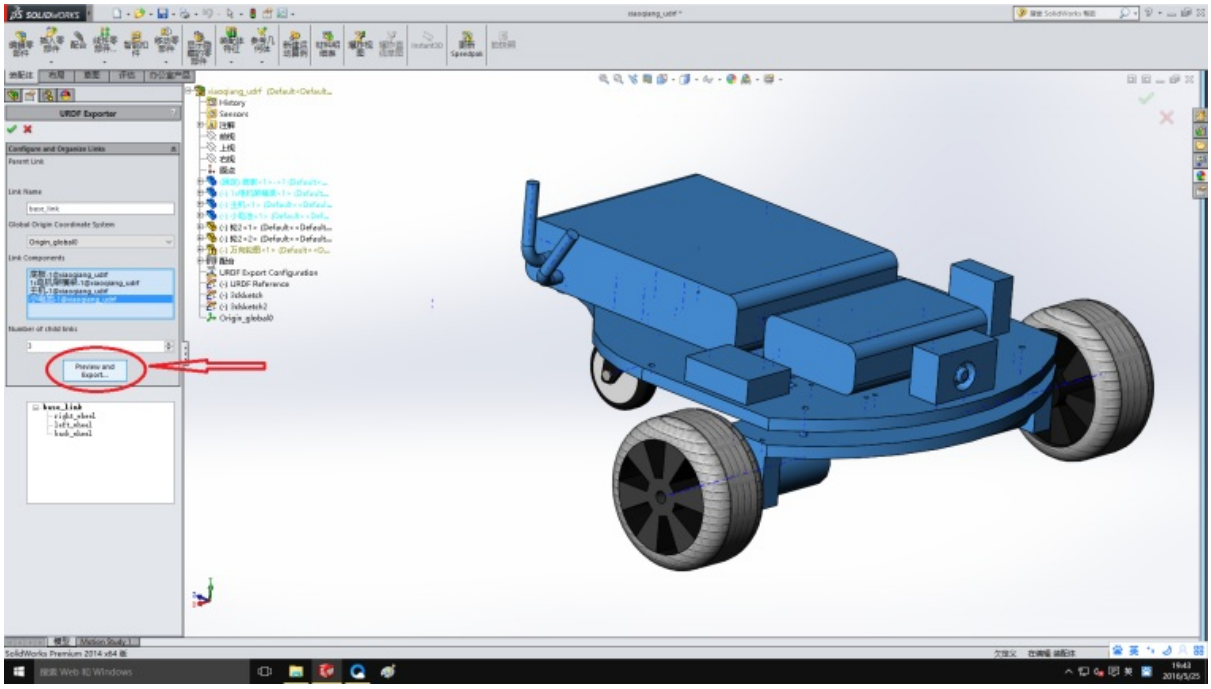


Continue the revolver and rear wheel

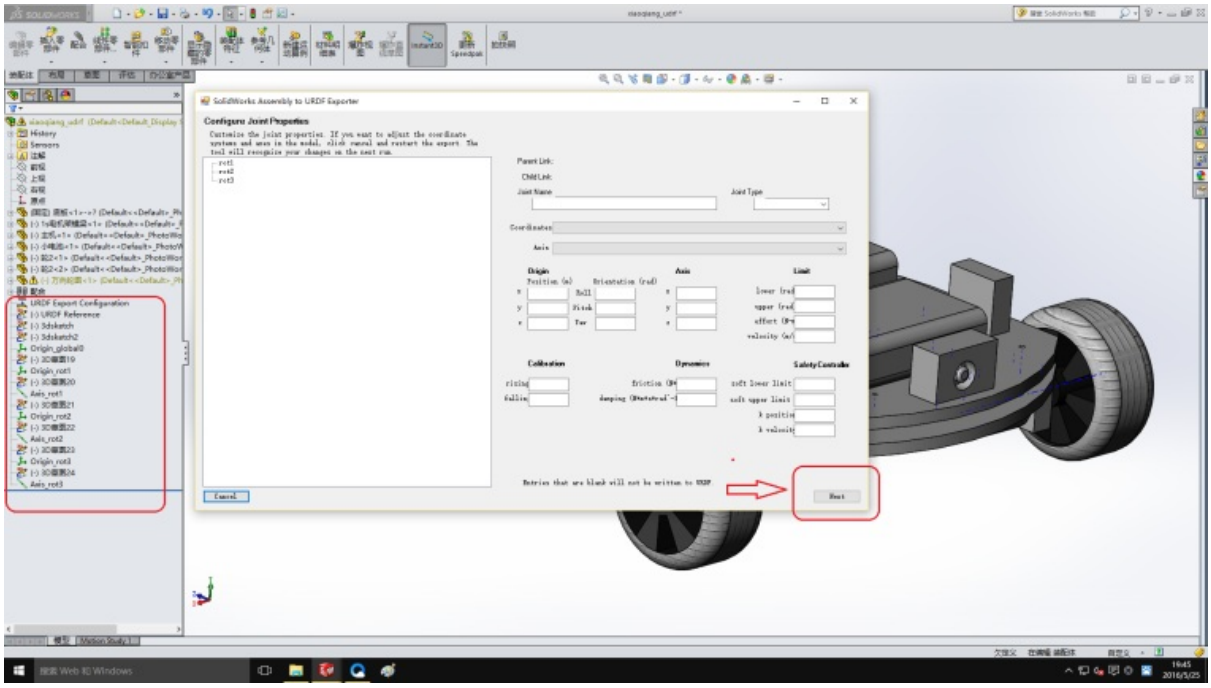


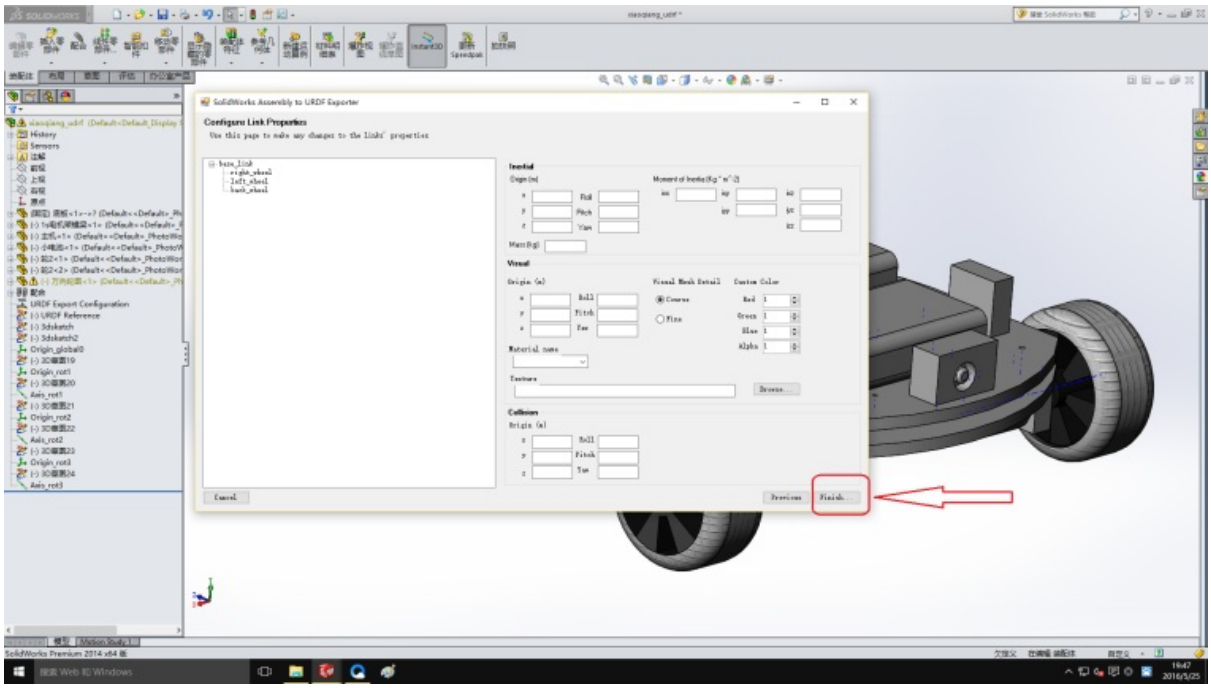


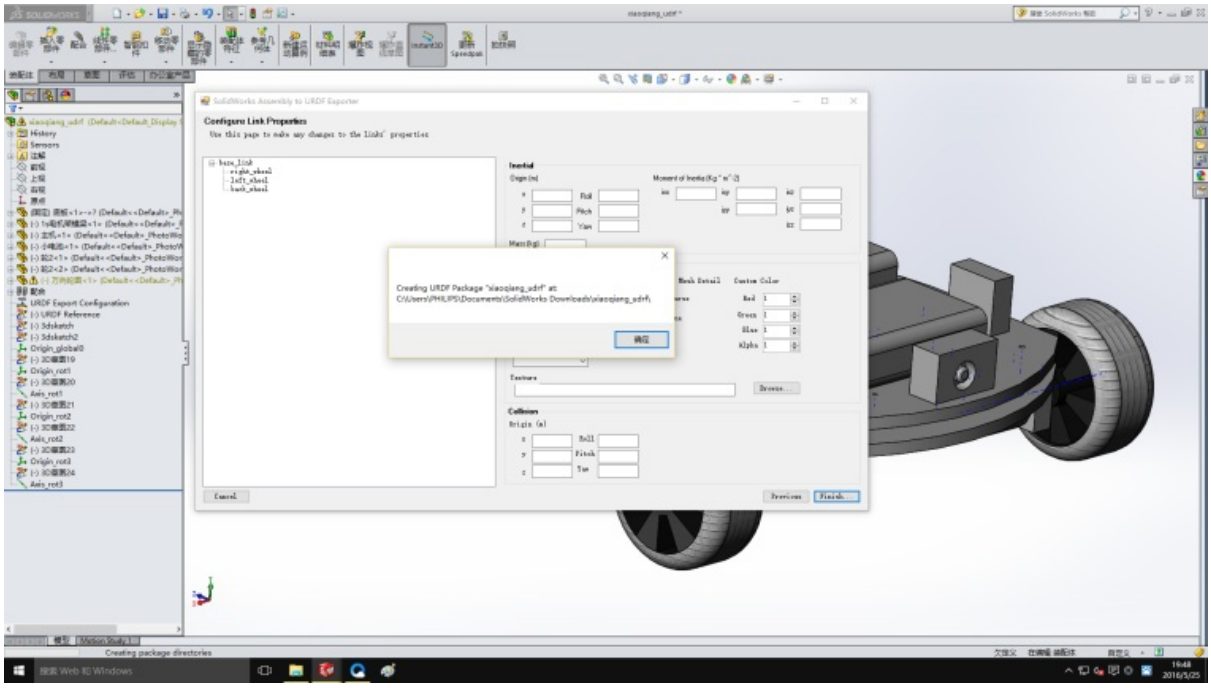
All settings are now complete, start exporting



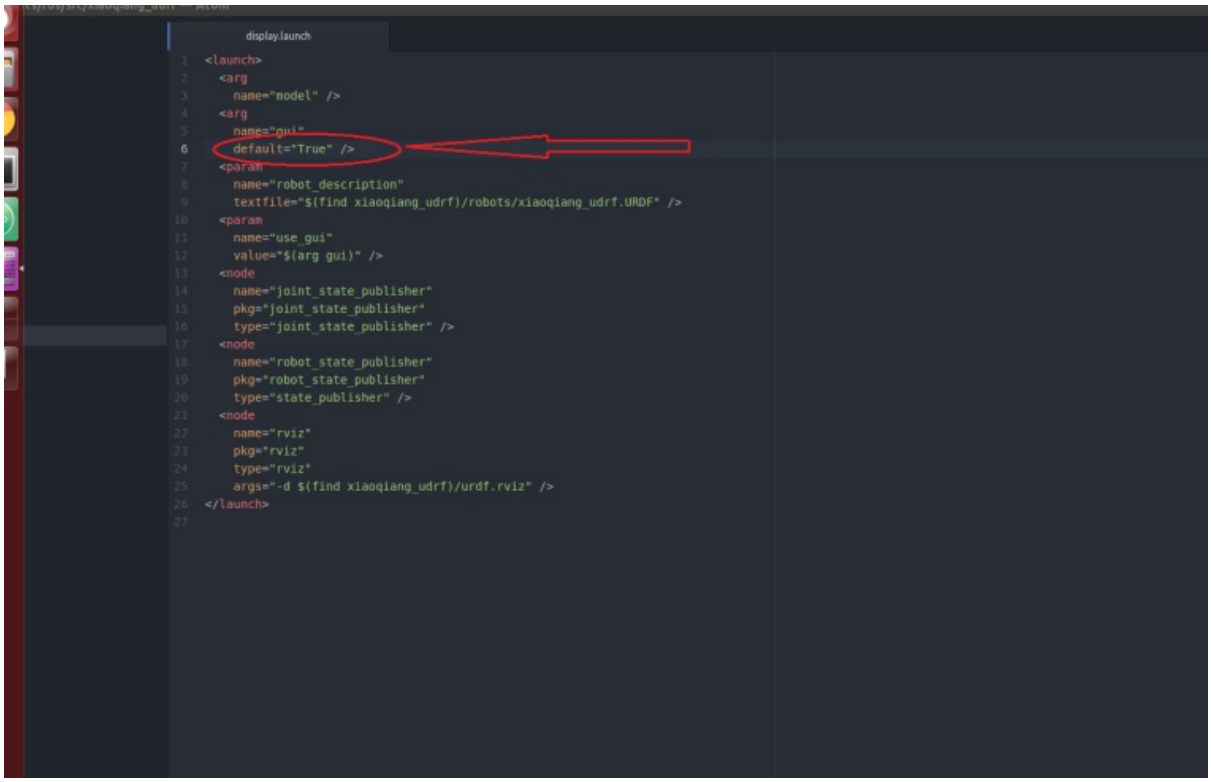
All the way next and ok go


SolidWorks Assembly to URDF Exporter
Configure Joint Properties
Cancel
Next


SolidWorks Assembly to URDF Exporter
Configure Link Properties
Cancel
Previous
Finish



Now that we have obtained the robot's urdf file, the entire generated folder is a ROS package. Modify the display.launch file in the launch folder and change false to true



Copy this ros package to the ROS workspace. After running catkin_make, it can be tested and used by the method at the beginning of this article.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (4) Inertial navigation test

Xiaoqiang Homepage

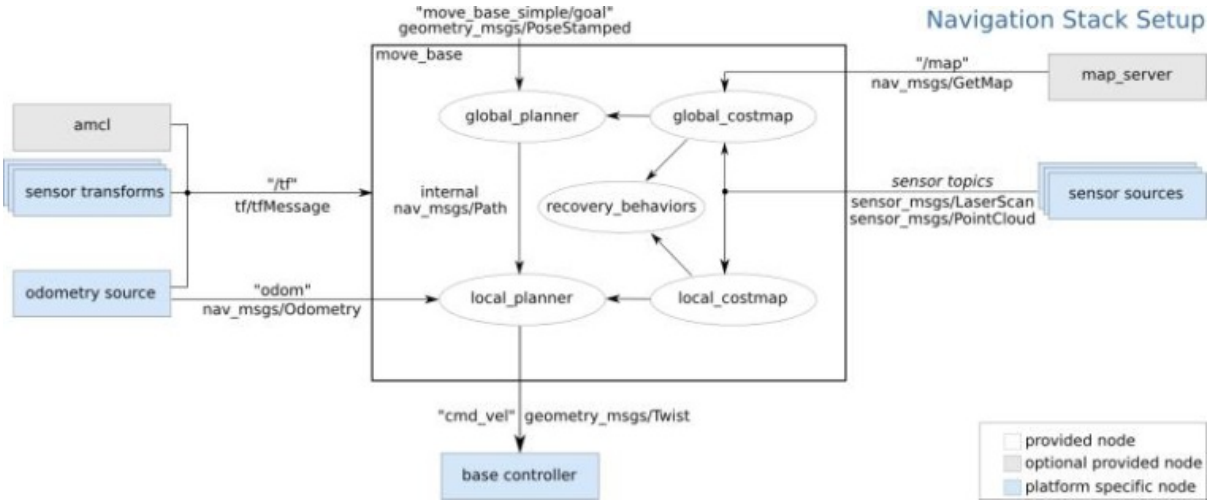
inertial navigation test

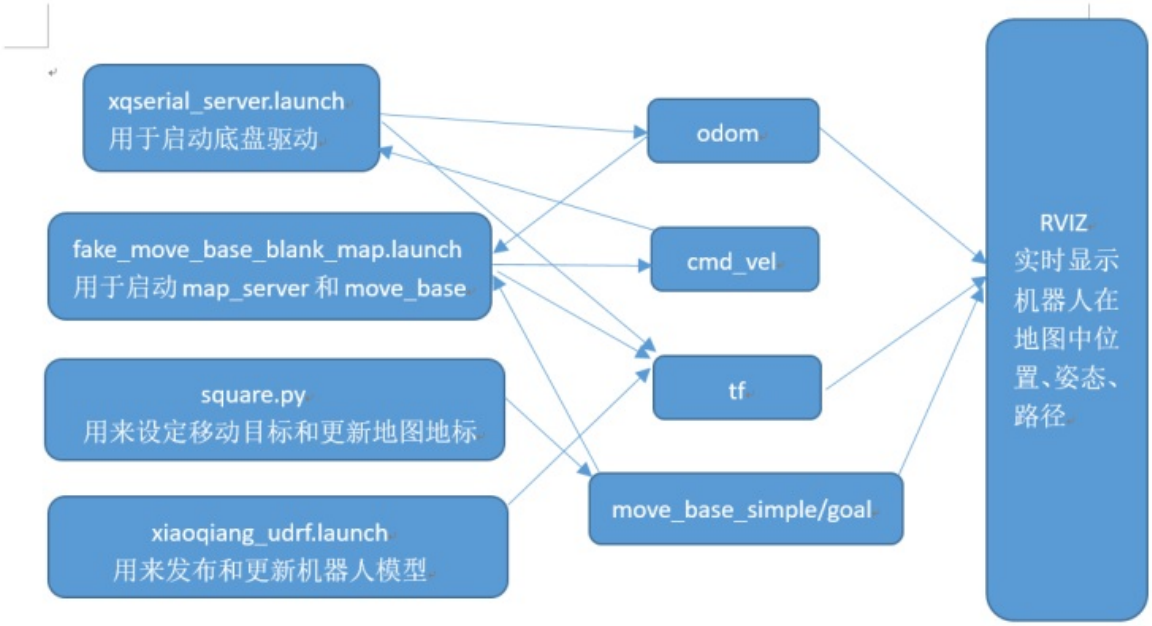
In the previous tutorial, we have maked a 3D model of xiaoqiang, we will start to test xiaoqiang's inertial navigation function. The inertial navigation here is to use Xiaoqiang's own inertial sensors (acceleration and gyroscope) and encoder information to locate. The required ROS packages are:

1. Driver xqserial_server
2. Robot model package xiaoqiang_udrf
3. Inertial Navigation Test Package nav_test.

Below is the final result of the tutorial.

the structure of ROS navigation stack is shown in the following two figures: If you are not familiar with the ROS navigation stack, please move to this tutorial





1. remote operation on Xiaoqiang host

Please ensure that Xiaoqiang has started normally. Xiaoqiang host will automatically run the three software packages mentioned after normal startup. You don't need to launch the corresponding launch file manually. If you don't have the three packages installed, please install and upgrade these three software packages yourself. Then update the startup task (please refer to the robot_upstart tutorial) and restart it.

a. Open a new terminal and start the navigation program

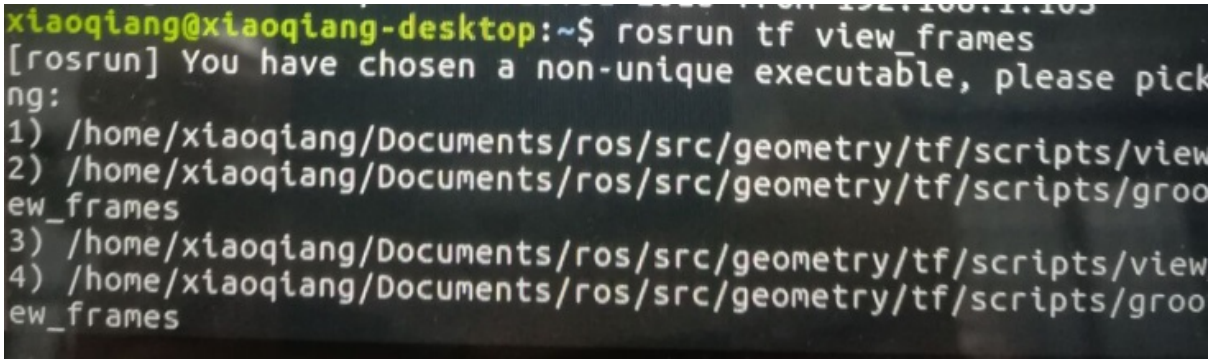
```
ssh -X xiaoqiang@192.168.xxx.xxx
# Restart the service program, some program may not be running
sudo service startup restart
roslaunch nav_test fake_move_base_blank_map.launch
```

If there is an error saying "You must specify at least three point for the robot footprint", Just ignore it. This is because `foot_print` requires setting a shape, so at least three points are required. `foot_print` is the outline shape of the robot. This parameter is used to avoid obstacles. Xiaoqiang's `foot_print` sets a circle, so there is no need to specify three points. If the tf tree that appears is not the same as the following figure, please check whether the drive is running normally.

b. Open a new terminal and check if all tf are in place

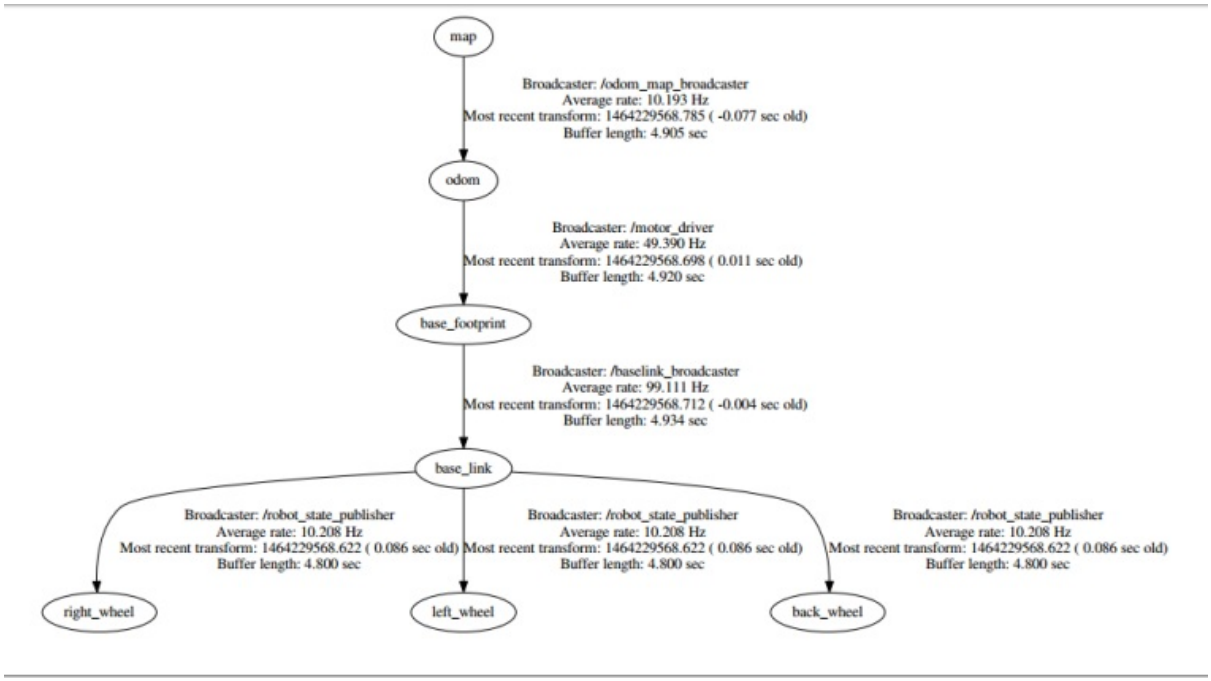
```
ssh -X xiaoqiang@192.168.xxx.xxx
rosrun tf view_frames
evince frames.pdf
```

If the output looks like following



Follow the prompts to select one `view_frame`.

Normal will show the following picture



2. Operation completed on the local machine

The local machine must be a Ubuntu system with corresponding ROS installed. Please refer to Section 1.2 of Tutorial (1) to install Xiaoqiang System Image. At the same time, it is guaranteed to be in the same local area network as Xiaoqiang. Because it is necessary to use rviz to display the Xiaoqiang pose and path trajectory in rviz on the local window (the rviz cannot be directly opened in ssh), a distributed network configuration of ROS is needed, and the robot model package `xiaoqiang_udrf` is also required to be installed on the local machine. In summary: The local machine opens its own rviz, receives and displays the topic on the Xiaoqiang host, and the Xiaoqiang model data is obtained directly from the local. The specific process is as follows:

a. Open a terminal in the local, add Xiaoqiang's ip in the local hosts file

```
sudo gedit /etc/hosts
# Add to
xxx.xxx.xxx.xxx xiaoqiang-desktop  # Please change xx to actual ip
```

b. Open a new terminal input

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
# Continue to execute
rostopic list
```

If you can see Xiaoqiang's topic, it means the configuration is successful.

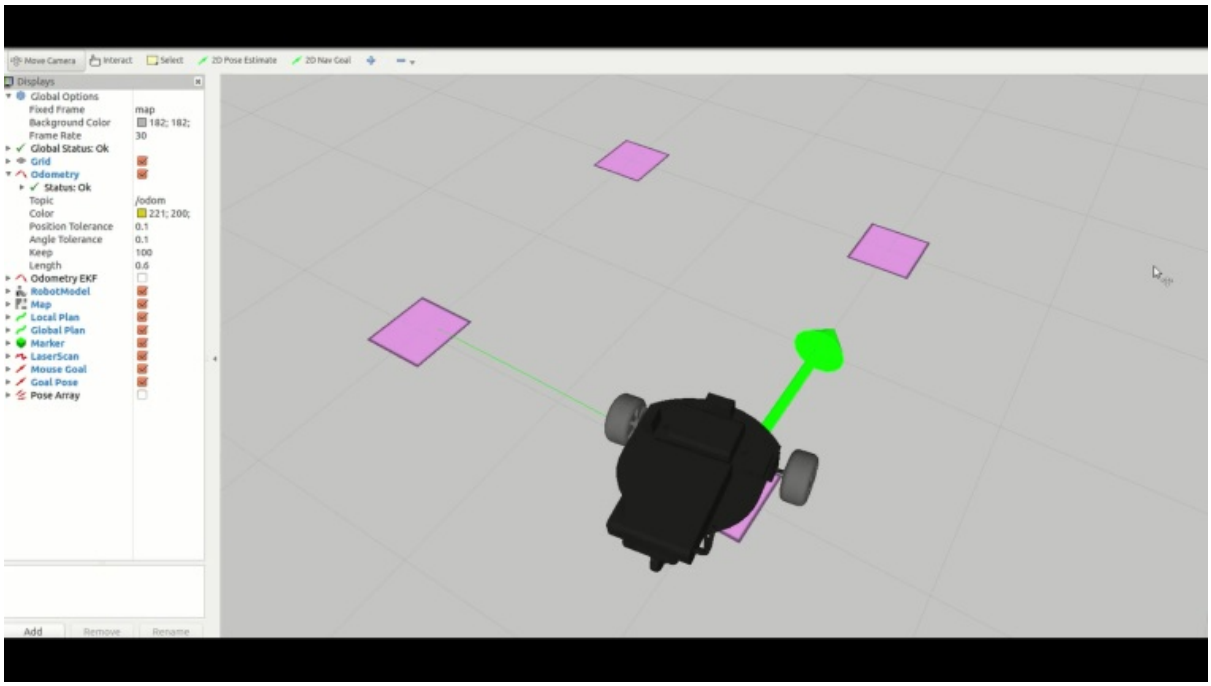
d. Users who installed Xiaoqiang system image do not need perform this step. Install the model package, update the local ROS package environment variable, because the model data needs to be read from the local

```
mkdir  ~/Documents/ros/src
cd  ~/Documents/ros/src
catkin_init_workspace
git clone https://github.com/BlueWhaleRobot/xiaoqiang_udrf.git
#Xiaoqiang pro user switches to the master branch
cd xiaoqiang_udrf
git checkout master
#Xiaoqiang mini user switches to mini branch
cd xiaoqiang_udrf
git checkout mini
# xiaoqiang XQ5 user switchs to lungu branch
cd xiaoqiang_udrf
git checkout lungu
# Completion of the installation
cd ..
cd ..
catkin_make
```

e. Open the rviz.

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
source ~/Documents/ros/devel/setup.sh
rviz
```

When the window opens, click on file->open in the upper left corner and select the `/home/xiaoqiang/Documents/ros/src/nav_test/config/nav.rviz` file in Xiaoqiang. At this time, the interface should be displayed as shown below. Please refer to the previous tutorial for how to access the files on the Xiaoqiang host.



3. Complete the last operation in the remote host ssh window

```
rosrun nav_test square.py
```

If Xiaoqiang cannot move, check if the platform driver is working properly. You can enter rostopic echo /system_monitor/report If there is a voltage display, the platform drive is normal.如If it still cannot be moved, you can check whether Xiaoqiang infrared sensor is triggered or not. The infrared sensor will glow red when triggered.

4. Now you can see the video effect at the beginning of the article in rviz, enjoy it!

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (5) xiaoqiang remote control app for Android

Xiaoqiang Homepage

xiaoqiang remote control app Android version

Client with remote control and small screen image display function xiaoqiang-with-control.apk


00:00
00:00
电量(V):0.00
已连接
G:80
关机
前进
重连
左转
停止
右转
进档
后退
退档

Client without the remote control function, with full screen display xiaoqiang-no-control.apk

Usage:

1. Ensure that Xiaoqiang and the remote control handset are in the same LAN
2. Start the server program on Xiaoqiang
3. Open the app. If everything is normal, you can see Xiaoqiang's voltage display and Xiaoqiang image data. If there is no data you can try clicking the reconnect button.

Troubleshooting

Q: Unable to connect to xiaoqiang after app launched
A: It may be because Xiaoqiang and your phone are not in the same LAN. It is also possible that Xiaoqiang's server-side program does not start. You can enter `sudo service startup restart` to restart the service program and try again.

Q: Unable to remote control after successful connection
A: Check whether the driver is operating normally. Check whether the serial port USB of xiaoqiang is properly connected. Then enter `rostopic echo /system_monitor/report` . If the voltage is normal, then the platform is normal. If the voltage does not display properly, restart the service and see `sudo service startup restart` . If the voltage is normal but still can't move, check if infrared sensors triggered. The infrared sensor will glow red when triggered.

Q: No video transmission after successful connection
A: Check if the camera USB is connected properly. Then restart the service and try again `sudo service startup restart`

Xiaoqiang Homepage Back To Index

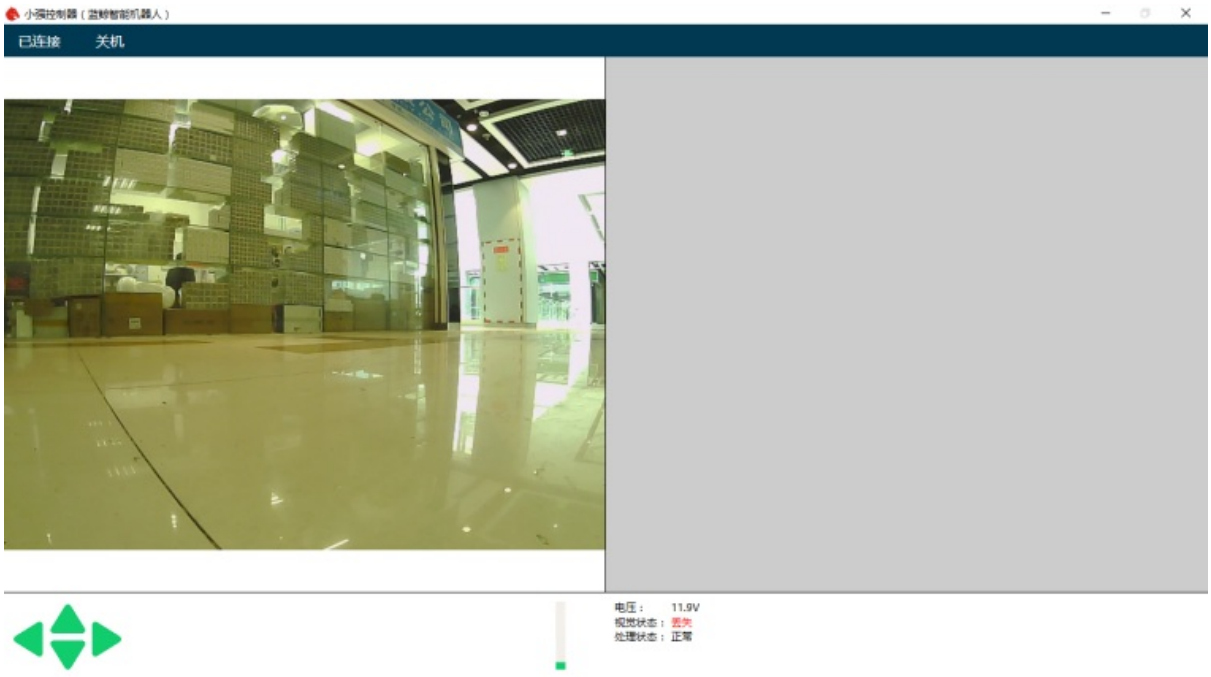
xiaoqiang tutorial (6) xiaoqiang remote control Windows client

Xiaoqiang Homepage

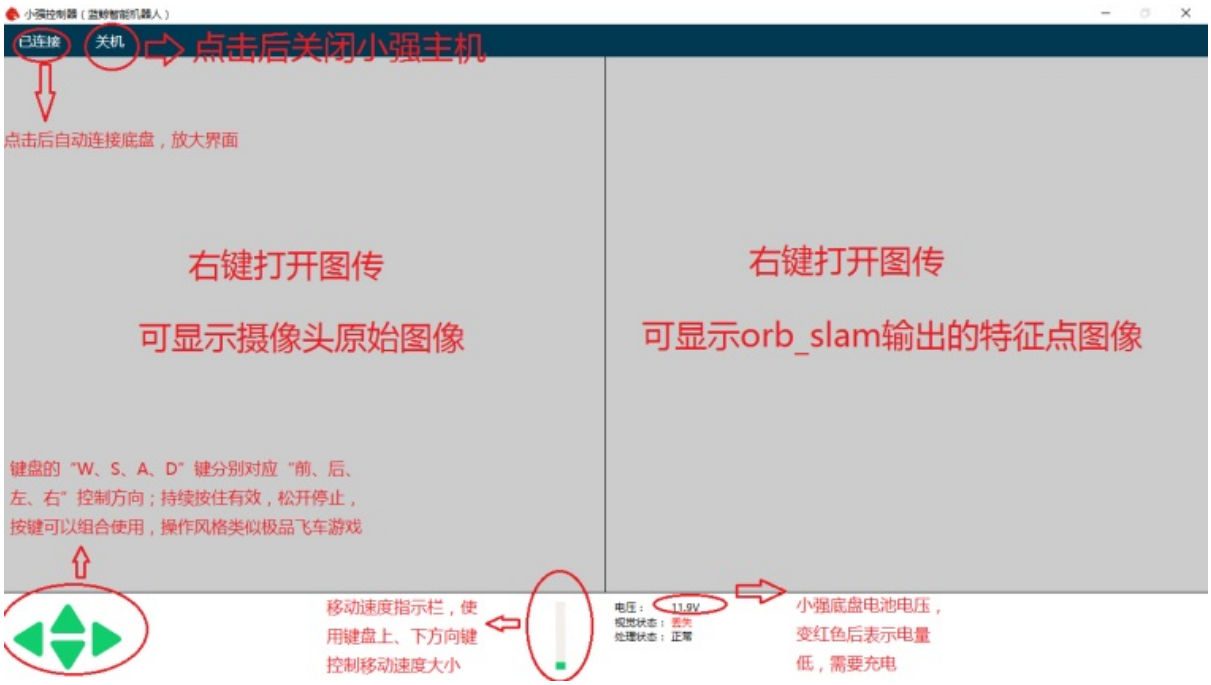
xiaoqiang remote control Windows client

`The Windows client has merged with Galileo navigation system client, please refer to` Galileo navigation system user manual

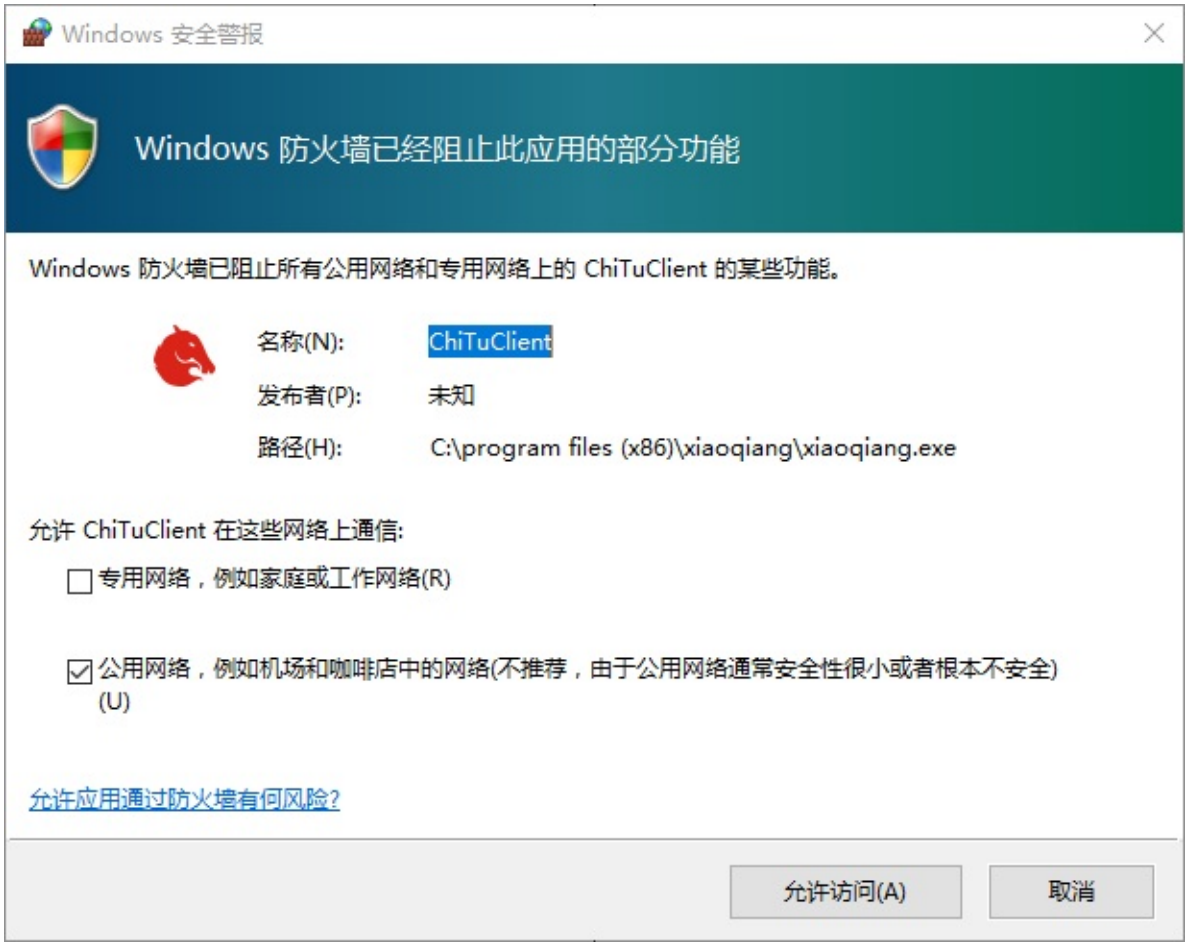
The software interface is shown below



Software installation package download Download and double click to install. Follow the instructions and click next all the way.



The first time you start the client, you will see the following prompts. Please tick "Private network and public network" and click to select "Allow access."



Troubleshooting

Q: Unable to connect after app launched
A: It may because Xiaoqiang and your computer are not in the same LAN. It is also possible that Xiaoqiang's server-side program does not start. You can enter `sudo service startup restart` to restart the server and try again.

Q: Unable to remote control after successful connection
A: Check whether driver is working properly. Check whether the serial port USB of the xiaoqiang is properly connected. Then enter `rostopic echo /system_monitor/report`, If the voltage shows normal, then the platform is normal. If not you can try to restart your service. `sudo service startup restart`. If the voltage is normal but still can't move, check if infrared sensors triggered. The infrared sensor will glow red when triggered.

Q: No video transmission after successful connection
A: Check if the camera USB is connected properly. Then restart the service and try again.”sudo service startup restart”。 enter `rostopic echo /system_monitor/report`, If imageStatus is True, shows that the image data is normal. If there is still no image displayed at this time, the client installation is abnormal. Please check the installation steps of the client.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (7) use PS3 joystick to control xiaoqiang

Xiaoqiang Homepage

use PS3 joystick to control Xiaoqiang

Principle: This tutorial involves 3 packages, ps3joy is responsible for converting ps3 bluetooth accept signals to standard linux devices (/dev/input/js0). The joy_node node is responsible for converting the above joy device data into the joy data type in ros. turtlebot_teleop_joy is responsible for converting the above joy data topic into motion instructions `/cmd_vel`

Steps:

0. The first time you use the joystick, you need to bind the joystick to the Bluetooth receiver. You can start directly from step 1 if you have bind the device before.

If you bought the joystick and xiaoqiang at the same time, Then we have already bind the device for you.

The binding method refers to `Quick use method step 1` in this article

1. Start ps3joy and bind the ps3 joystick to the bluetooth receiver

```
# Make sure the Bluetooth receiver is plugged into the host usb port
sudo bash
rosrun ps3joy ps3joyfake_node.py
```

The following prompts appear normally

```
root@xiaoqiang-desktop:~# rosrun ps3joy ps3joyfake_node.py
No inactivity timeout was set. (Run with --help for details.)
Waiting for connection. Disconnect your PS3 joystick from USB and press the pairing button
.
```

If the following error is indicated Press the handle pairing key in the following figure

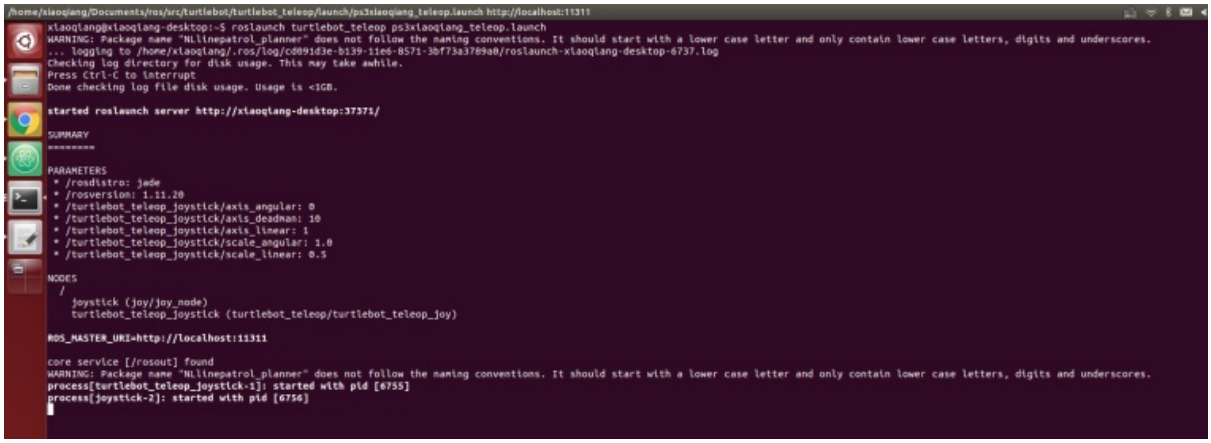
If the pairing is successful, the upper window will output a result similar to the following

```
root@xiaoqiang-desktop:~# rosrun ps3joy ps3joyfake_node.py
No inactivity timeout was set. (Run with --help for details.)
Waiting for connection. Disconnect your PS3 joystick from USB and press the pairing button
.
Connection activated
```

2. Start joy_node and turtlebot_teleop_joy

```
roslaunch turtlebot_teleop ps3fakexiaoqiang_teleop.launch
```

After the normal start as shown in the figure below



`ps3fakexiaoqiang_teleop.launch` file content is as follows

```
<launch>
    <node pkg="turtlebot_teleop" type="turtlebot_teleop_joy" name="turtlebot_teleop_joysti
ck">
    <param name="scale_angular" value="0.4"/>
    <param name="scale_linear" value="0.4"/>
    <param name="axis_deadman" value="10"/>
    <param name="axis_linear" value="1"/>
    <param name="axis_angular" value="0"/>
    <param name="axis_enbar" value="12"/>
    <param name="axis_disenbar" value="14"/>
    <remap from="turtlebot_teleop_joystick/cmd_vel" to="/cmd_vel"/>
    <remap from="turtlebot_teleop_joystick/joy" to="/joy"/>
  </node>
</launch>
```

The parameters in the above launch file correspond to: Linear speed maximum (scale_linear)、Angular speed maximum (scale_angular)，Throttle key (axis_deadman)、Forward and backward axis (axis_linear)、Left and right shafts (axis_angular)，Platform infrared enable key (axis_enbar)，Platform infrared close button (axis_disenbar).

3. Hold down the handle throttle key (key 10 in the figure below) and now use the left pusher to control the platform's back and forth movement and steering (-1、+1 rocker in the image below)


SONY
SELECT
START
1+
0+
0-
1-
3+
2+
2-
3-
17
16
19


SONY
SELECT
START
0
3
4
7
5
6
12
15
13
14
16
1
2

According to these button numbers, the relevant parameters in the launch file can be modified to change the button mapping relationship

Pattern play:

Purchase ps3 mobile phone holder, Android mobile phone loaded Xiaoqiang picture app, so you can achieve remote control.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (8) kinect v1 ROS driver test and installation

Xiaoqiang Homepage

kinect v1 ROS driver test and installation

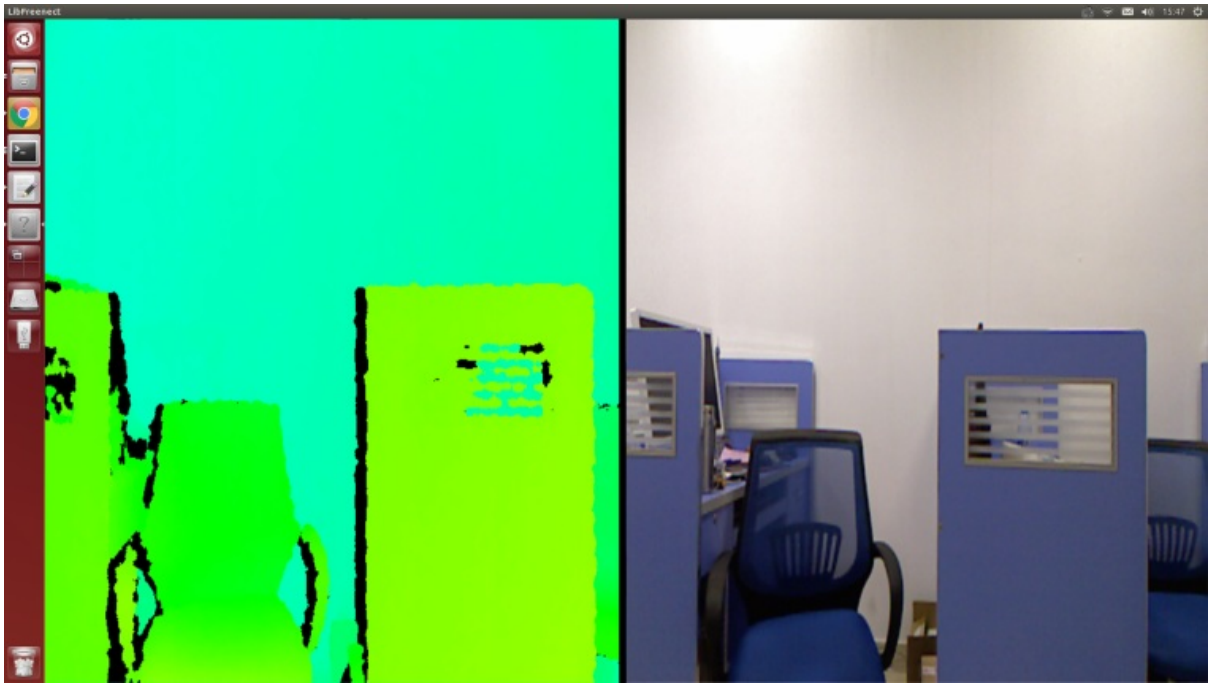
Xiaoqiang outputs a 12V power supply (DC head, labeled “kinect power supply”) for kinect power supply.

1. libfreenect test

Connect the Xiaoqiang host with monitor and keyboard and open a new terminal input on the Xiaoqiang host

```
freenect-glview
```

You can see the similar figure below



2. ROS drive test

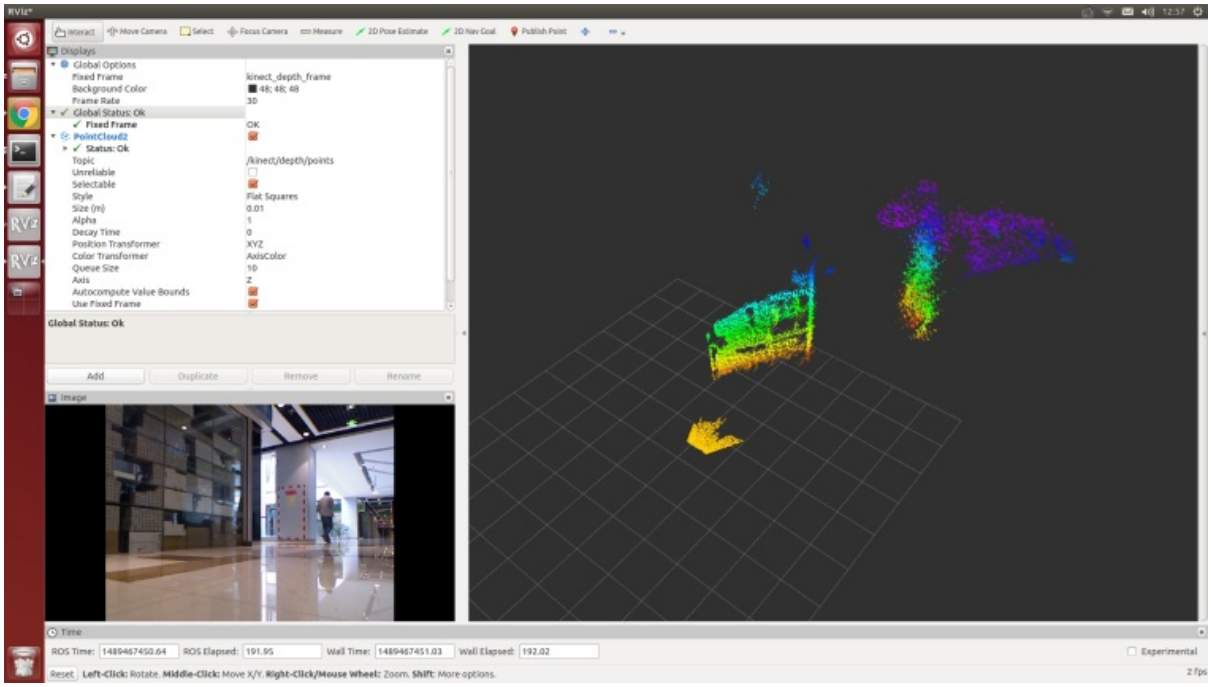
Close the program in step 1, open a new terminal, use freenect_launch to start the relevant kinect node

```
roslaunch freenect_launch  freenect-xyz.launch
```

Open a new window to open rviz

```
rviz
```

Select the content to be displayed, such as kinect rgb image and depth point cloud, the display result is as follows



The settings of kienct functions is in `/home/xiaoqiang/Documents/ros/src/freenect_stack/freenect_launch/launch/examples/freenect-xyz.launch`

```
<launch>
  <include file="$(find freenect_launch)/launch/freenect.launch">
    <arg name="camera"                          value="kinect" />
    <arg name="motor_processing"                value="true" />
    <arg name="audio_processing"                value="false" />
    <arg name="rgb_processing"                  value="true" />
    <arg name="ir_processing"                   value="false" />
    <arg name="depth_processing"                value="true" />
    <arg name="depth_registered_processing"     value="false" />
    <arg name="disparity_processing"            value="false" />
    <arg name="disparity_registered_processing" value="false" />
    <arg name="num_worker_threads"              value="4" />
  </include>
</launch>
```

Turn on or off the feature by setting true or false

3. The following describes the ros driver installation procedure of kienct v1

If you use xiaoqiang system image, then you don't need to install the following drivers. These drivers were already install.

Need to install three software:

a.libfreenect

b.rgbd_launch

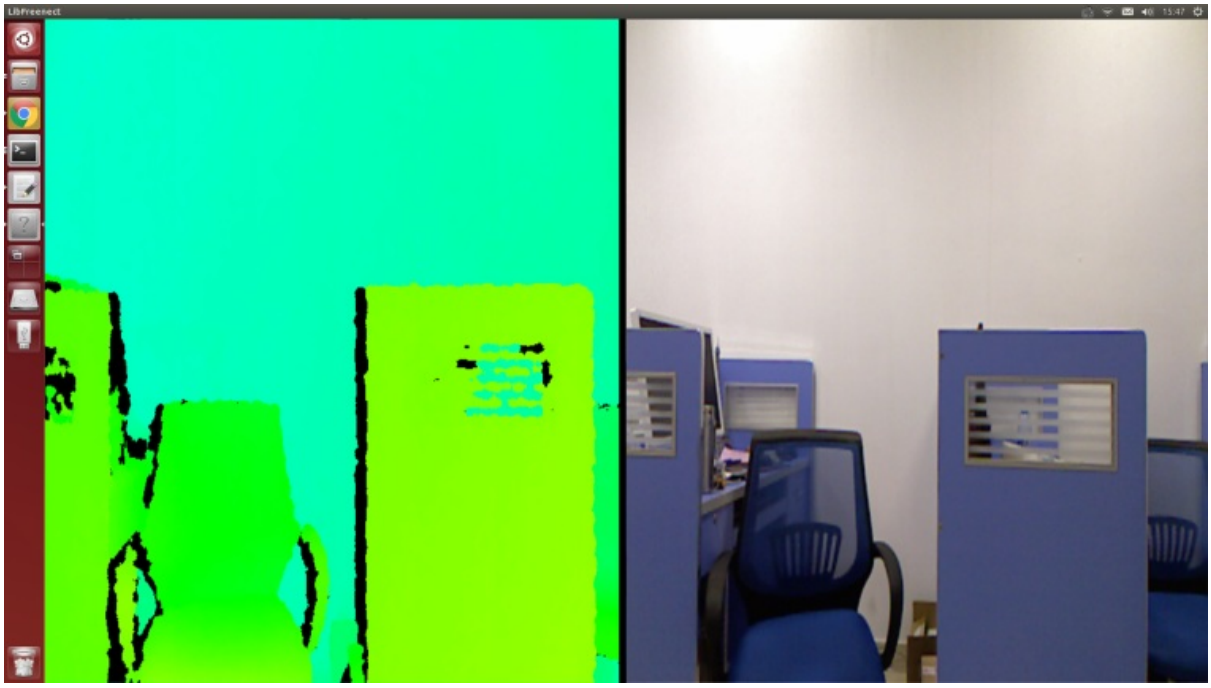
c.freenect_stack

a. libfreenect

First connect the kinect v1 to the xiaoqiang host, then open a terminal and enter the following code

```
cd Documents

sudo apt-get install git-core cmake freeglut3-dev pkg-config build-essential libxmu-dev li
bxi-dev libusb-1.0-0-dev

git clone git://github.com/OpenKinect/libfreenect.git
cd libfreenect
mkdir build
cd build

//The key point is, the following configuration will enable kinect audio and solve the ins
tallation path problem

cmake .. -DCMAKE_INSTALL_RPATH:STRING="/usr/local/bin;/usr/local/lib" -DBUILD_REDIST_PACKA
GE=OFF

make
sudo make install
sudo ldconfig /usr/local/lib64/
sudo freenect-glview
```

You should see the output image of the kinect now , and then configure the peripheral privilege configuration



```
sudo adduser $xiaoqiang video
#Please replace xiaoqiang with your own computer's account name
```

Add a udev rule, first open the 51-kinect.rules file

```
sudo gedit /etc/udev/rules.d/51-kinect.rules
```

Copy the contents below and save and exit

```
# ATTR{product}=="Xbox NUI Motor"
SUBSYSTEM=="usb", ATTR{idVendor}=="045e", ATTR{idProduct}=="02b0", MODE="0666"
# ATTR{product}=="Xbox NUI Audio"
SUBSYSTEM=="usb", ATTR{idVendor}=="045e", ATTR{idProduct}=="02ad", MODE="0666"
# ATTR{product}=="Xbox NUI Camera"
SUBSYSTEM=="usb", ATTR{idVendor}=="045e", ATTR{idProduct}=="02ae", MODE="0666"
# ATTR{product}=="Xbox NUI Motor"
SUBSYSTEM=="usb", ATTR{idVendor}=="045e", ATTR{idProduct}=="02c2", MODE="0666"
# ATTR{product}=="Xbox NUI Motor"
SUBSYSTEM=="usb", ATTR{idVendor}=="045e", ATTR{idProduct}=="02be", MODE="0666"
# ATTR{product}=="Xbox NUI Motor"
SUBSYSTEM=="usb", ATTR{idVendor}=="045e", ATTR{idProduct}=="02bf", MODE="0666"
```

After logging off the user and reentering the system, you can now enable kinect directly without sudo.

```
freenect-glview
```

b. Install rgbd_launch

`rgbd_launch` contains generic launch files required by the driver installation package openni_launch or freenect_launch. There are two main launch files:

1. `processing.launch.xml`： Install a series of nodelets to process data from the RGB-D driver openni_camera or freenect_camera, You can also set parameters to simplify processing nodelets images.
2. `kinect_frames.launch`： Install the tf tree for kinect. The file can also be started internally from openni_launch or freenect_launch.

The `rgbd_launch` file contains multiple distributed launch files. But only `processing.launch.xml` can be modified externally.

```
cd ~/Documents/ros/src
git clone  https://github.com/ros-drivers/rgbd_launch.git
cd ..
catkin_make
```

c. Install freenect_stack

```
cd ~/Documents/ros/src
git clone  https://github.com/BlueWhaleRobot/freenect_stack.git
cd ..
catkin_make
```

d. Driver installation is complete, you can now use kinect in ROS, for example, in rviz view kinect output point cloud, refer to step 2 at the beginning of this section.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (9) use rostopic to control kinect tilt angle

Xiaoqiang Homepage

use rostopic control kinect tilt angle

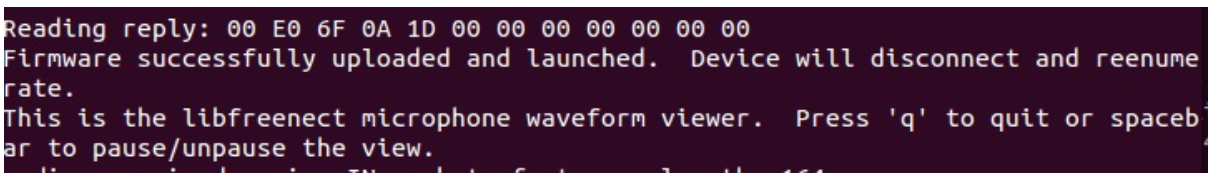
Prepared work:

Please check the kinect version, indicated on the kinect base label. For the users of the model1473, due to the defect of the drive (which does not affect other functions of the kinect, only the motor), the following operations need to be performed first, and the model1414 user can directly skip.

ssh login xiaoqiang host

```
ssh xiaoqiang@192.168.0.xxx -X
freenect-micview
```

If the following figure appears, close the above command and continue the tutorial



Steps:

1. Open a new window in the local virtual machine, start the freenect_stack driver

ssh login Xiaoqiang host

```
ssh xiaoqiang@192.168.0.xxx -X
roslaunch freenect_launch freenect-xyz.launch
```

The normal startup will appear below, if there is a red error (driver defect), please update the `freenect_stack` program through git pull.

```
[ INFO] [1477406854.865362860]: Number devices connected: 1
[ INFO] [1477406854.865453964]: 1. device on bus 000:00 is a Xbox NUI Camera (2
e) from Microsoft (45e) with serial id 'A70774703536333A'
[ INFO] [1477406854.866242209]: Searching for device with index = 1
[ INFO] [1477406855.502427696]: flushDevice

[ INFO] [1477406855.502642152]: Starting a 3s RGB and Depth stream flush.
[ INFO] [1477406855.503054171]: Opened 'Xbox NUI Camera' on bus 0:0 with serial
number 'A70774703536333A'
[ WARN] [1477406856.952469775]: Could not find any compatible depth output mode
for 1. Falling back to default depth output mode 1.
[ INFO] [1477406856.961696739]: rgb_frame_id = 'kinect_rgb_optical_frame'
[ INFO] [1477406856.961735786]: depth_frame_id = 'kinect_depth_optical_frame'
[ WARN] [1477406856.975615344]: Camera calibration file /home/xiaoqiang/.ros/ca
era_info/rgb_A70774703536333A.yaml not found.
[ WARN] [1477406856.975681775]: Using default parameters for RGB camera calibra
ion.
[ WARN] [1477406856.975777743]: Camera calibration file /home/xiaoqiang/.ros/ca
era_info/depth_A70774703536333A.yaml not found.
[ WARN] [1477406856.975820217]: Using default parameters for IR camera calibrat
on.
[ INFO] [1477406859.826134535]: Stopping device RGB and Depth stream flush.
```

2.Open a new window in the local virtual machine, release the motor angle control command

ssh login Xiaoqiang host

```
ssh xiaoqiang@192.168.0.xxx -X
rostopic pub /set_tilt_degree std_msgs/Int16 '{data: -20}' -1
```

If all goes well, you can now see that the elevation of the kinect keeps getting smaller. The `{data: -20}` number in the above command represents the angle and can be set to an integer between 30 and -30. Insert the kinect cable into the host's blue Color usb3.0 port so that kinect can work properly.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (10) use kinect for autonomous mobile and obstacle avoidance

Xiaoqiang Homepage

Click to watch the demo video

principle:

The `freenct_stack` package provides a kinect driver, and its published point cloud is transformed into an obstacle grid distribution image by `image_pipeline`. After the `nav_test` software package starts the navigation program, it analyzes the obstacle distribution map automatically, and then moves autonomously according to the target navigation point published by the rviz.

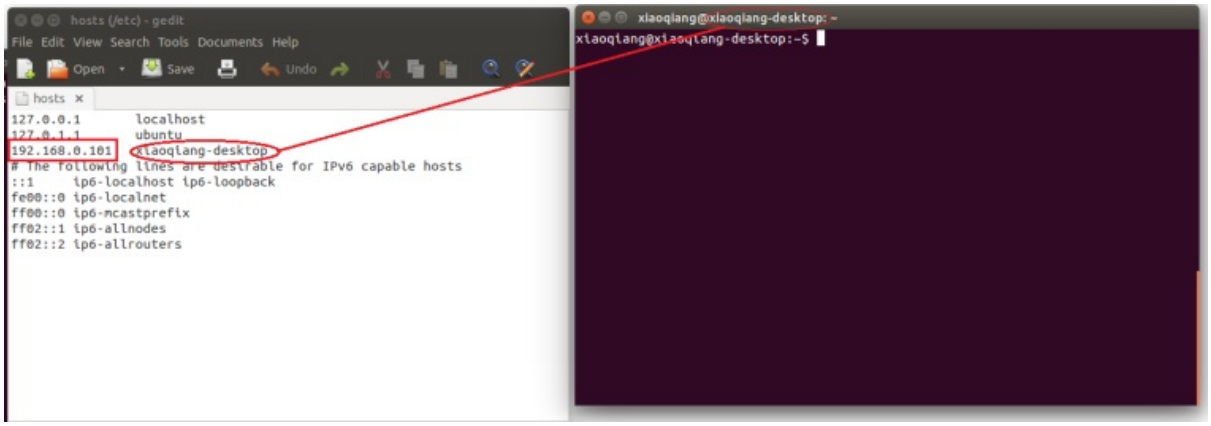
Steps：

1. Configure the hosts file of the host and the local virtual machine so that the two computer can access the corresponding ros data.

1.a Configure the local virtual machine

```
sudo gedit /etc/hosts
```

Replace the ip address in the figure below with the actual value of the platform

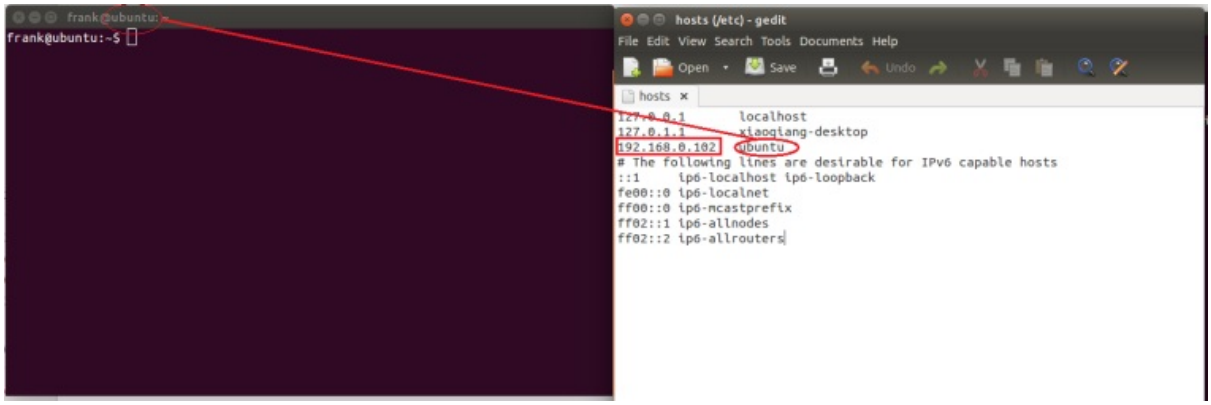


1.b Configuration Xiaoqiang Host

LAN ssh login Xiaoqiang host

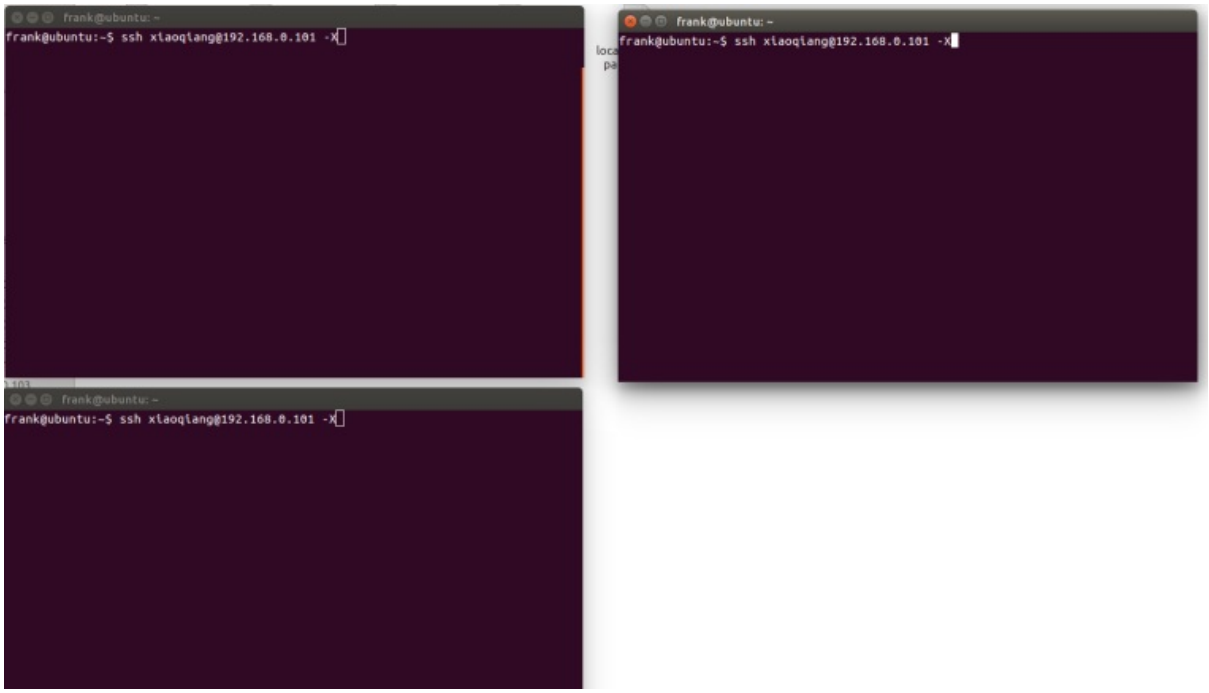
```
ssh xiaoqiang@192.168.0.101 -X
sudo gedit /etc/hosts
```

Replace the ip address in the following figure with the actual value of the virtual machine and change the host name to the virtual machine name



2. Open three windows in the local virtual machine, respectively ssh login Xiaoqiang host, start the relevant software package mentioned in the principle section

2.a Ssh login



2.b Start the kinect driver in the first window

For kinect v1

```
roslaunch freenect_launch kinect-xyz.launch
```

For Kinect v2

```
roslaunch kinect2_bridge kinect2-xyz.launch
```

For astrapro

```
roslaunch astra_launch astrapro.launch
```

2.c Set kinect angle in the second window, this angle is not arbitrary

For kinect v1

```
rostopic pub /set_tilt_degree std_msgs/Int16 '{data: -19}' -1
```

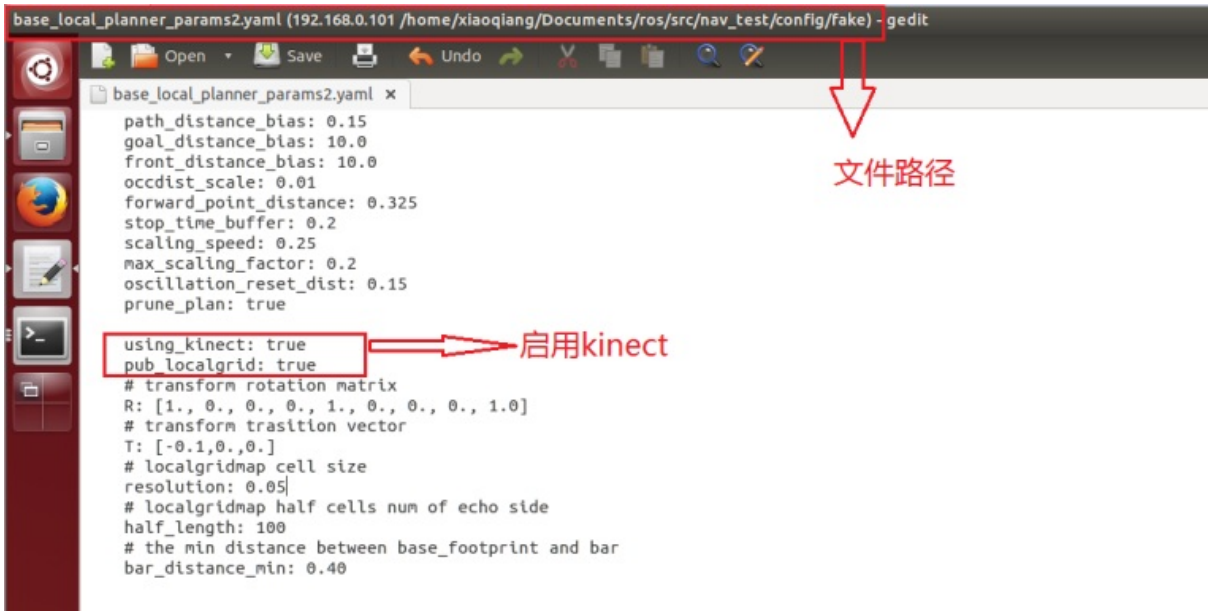
For Kinect v2

Since the kinect v2 does not have a pitch angle motor, manually adjust the kinect v2 to the maximum depression angle

For astrapro

Since the astrapro does not have a pitch angle motor, manually adjust the astrapro to the maximum depression angle.

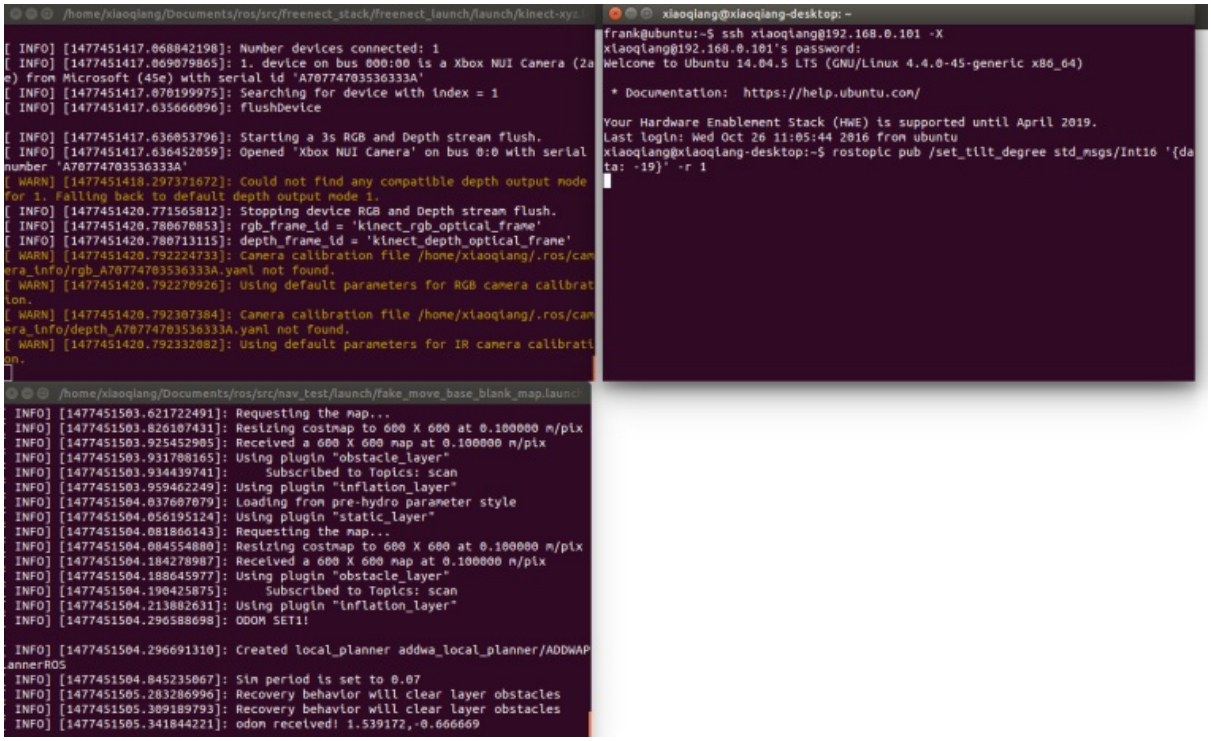
2.d Edit the platform navigator configuration file /home/xiaoqiang/Documents/ros/src/nav_test/config/fake/base_local_planner_params2.yaml to enable kinect



2.e Launch the platform navigation program in the third window

```
roslaunch nav_test fake_move_base_blank_map.launch
```

2.f If all normal, there will be an interface similar to the following figure. All configurations on xiaoqiang have completed.

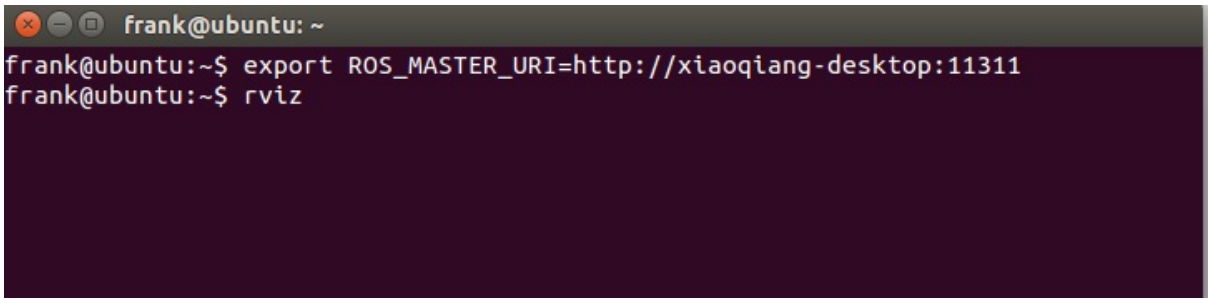


3.Open a new window in the local virtual machine and start rviz

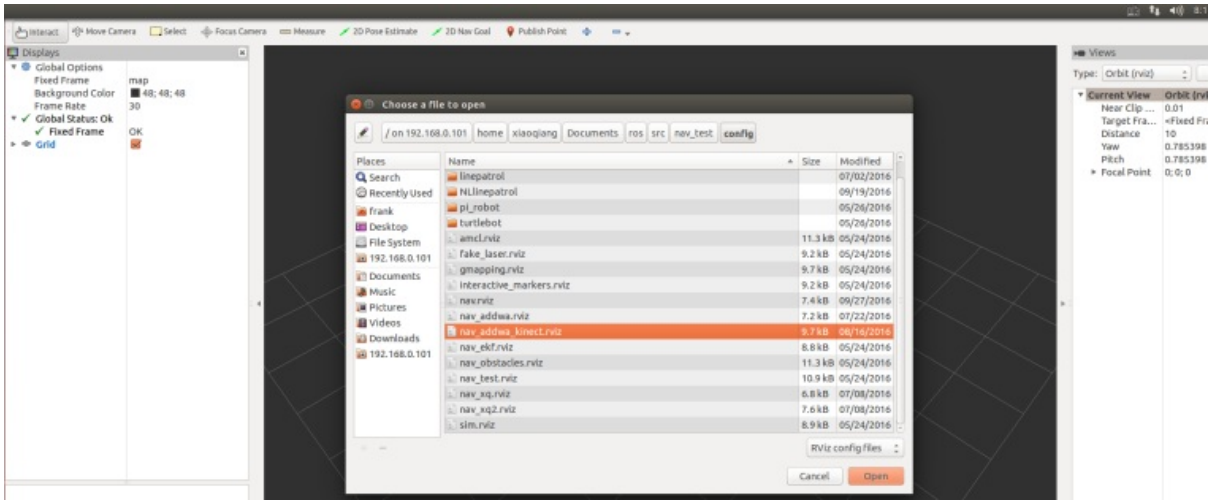
3.a After joining ros LAN, open rviz

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
rviz
```

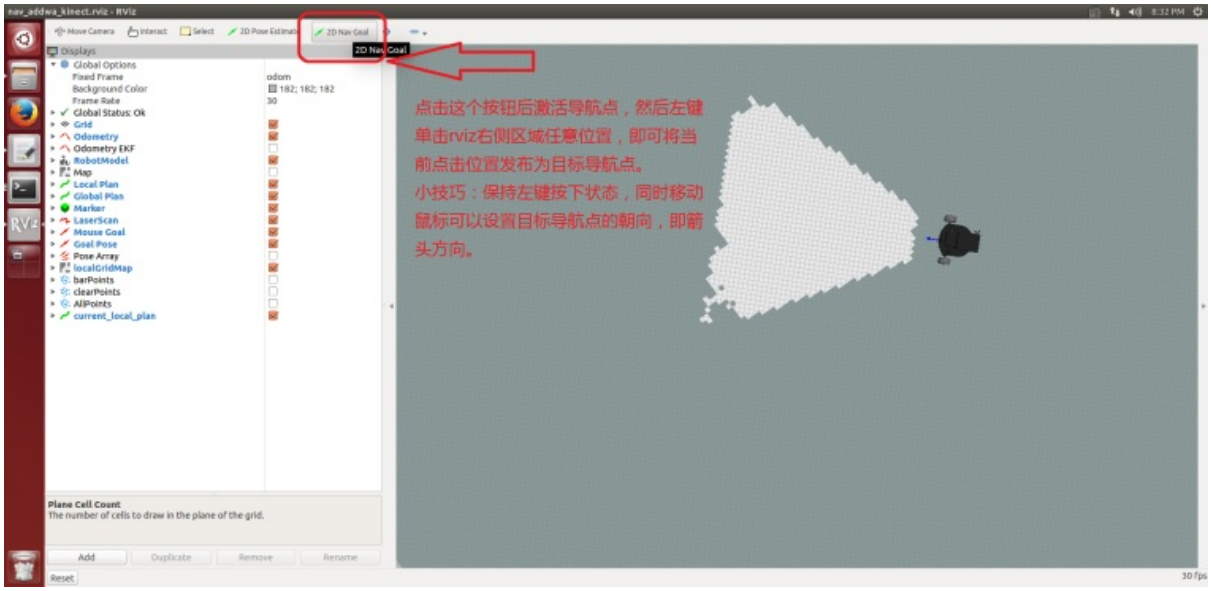
Note: If Xiaoqiang's model cannot be displayed, Xiaoqiang model package should be installed locally.



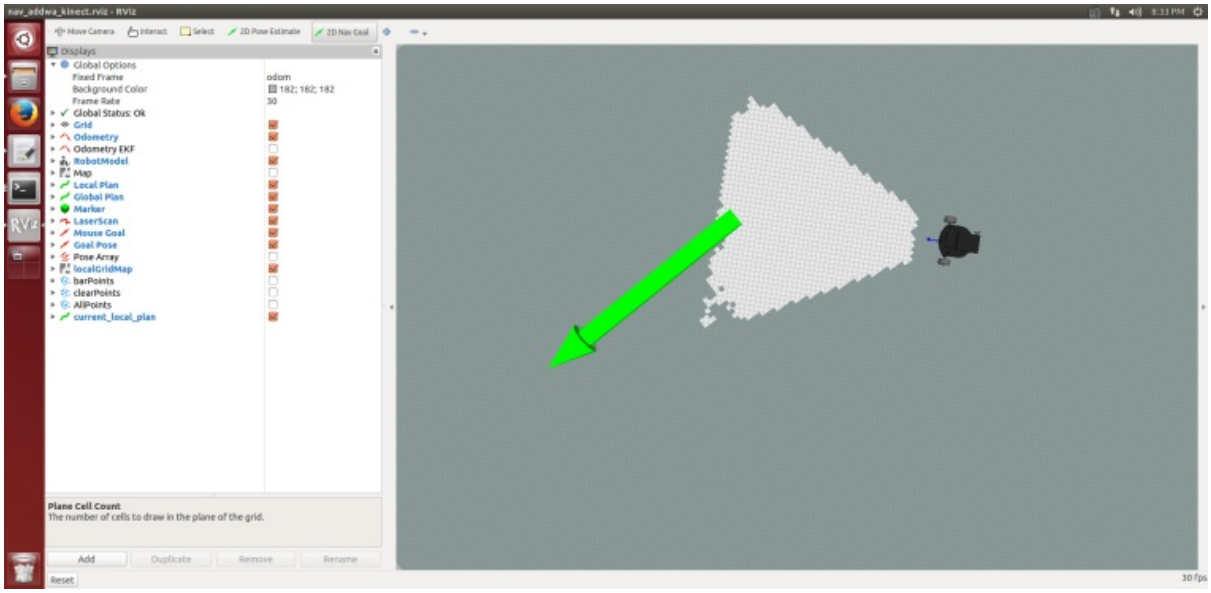
3.b Click open config in the upper left corner of the rviz interface and select the /home/xiaoqiang/Documents/ros/src/nav_test/config/nav_addwa_kinect.rviz configuration file on Xiaoqiang’s host.



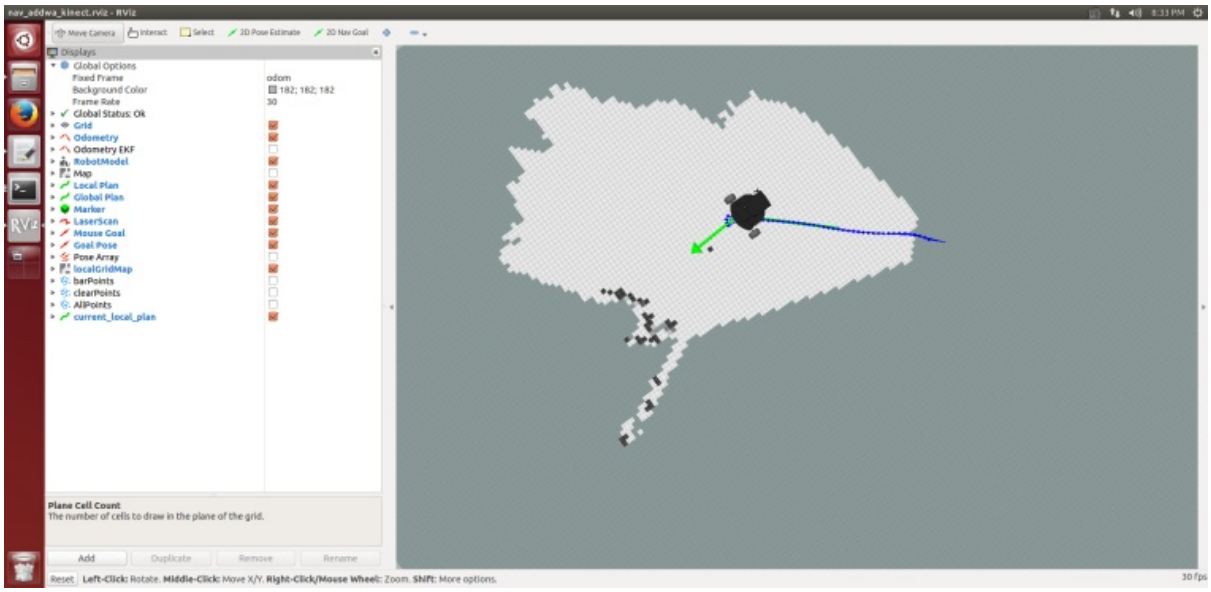
3.c Normally, a picture similar to the one below will appear in rviz. Now that all configurations have been completed, the next step is to publish navigation targets.



3.d Randomly publish a target point, Xiaoqiang will start autonomous movement



3.e Xiaoqiang reaches the target point, please continue to try other positions. This tutorial ended.



Please insert the kinect data cable into the blue host USB3.0 port of xiaoqiang to ensure the normal operation of the driver. Model 1473 kinect users please refer to the preparation method in tutorial (9).

If xiaoqiang has been moving backwards, it can be seen in rviz that there is a black area in front of xiaoqiang, and the black area has been following Xiaoqiang's movement. This situation indicates that the kinect installation or kienct angle is not in right. Please check the kinect mounting bracket, remove the kienct film and re-execute the instructions in the tutorial.

FAQ

Q: Map shows normally and the car can also be remote controlled, although published the target point vai rviz to the car , the car does not move to the target point.
A: In general, this problem is a network setup problem. This tutorial requires the hosts record to be set up between the xiaoqiang and the local machine, and to be able to access each other directly. After setting up the IP record, you can ping each other on the xiaoqiang and local computer to check the network connection. For example type following cmd on local machine

```
ping xiaoqiang-desktop
```

Enter the following cmd on xiaoqiang

```
ping ubuntu # Suppose your computer name is ubuntu
```

If we cannot ping between the two successfully, then you need check your network settings.

Xiaoqiang Homepage Back To Index

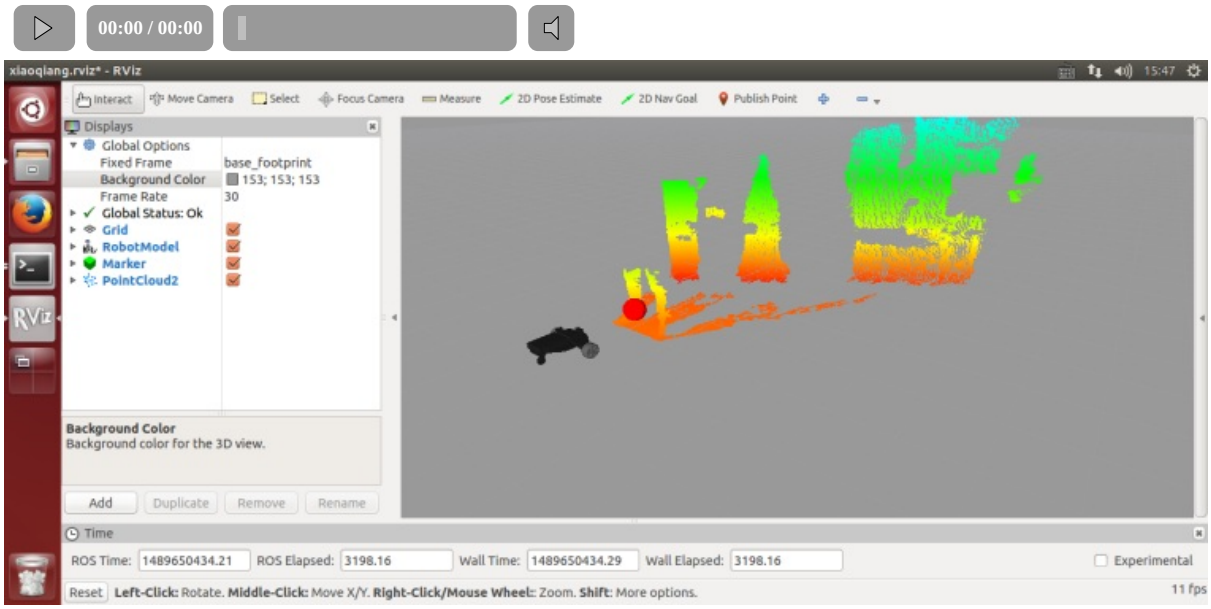
xiaoqiang tutorial (11) kinect follow package turtlebot_follower

Xiaoqiang Homepage

kinect follow package turtlebot_follower

`turtlebot_follower` uses the point cloud image feed back by the depth camera to calculate the coordinates of the point cloud in a certain area as the target following point, and controls the platform movement to achieve the following function according to this coordinate and the set safety distance.

After Xiaoqiang identifies the human legs, a red ball is set as the target point in the human leg position, demo video 1



1.Install the package

After ssh logs in to the host, enter the ros workspace, download and install the test package

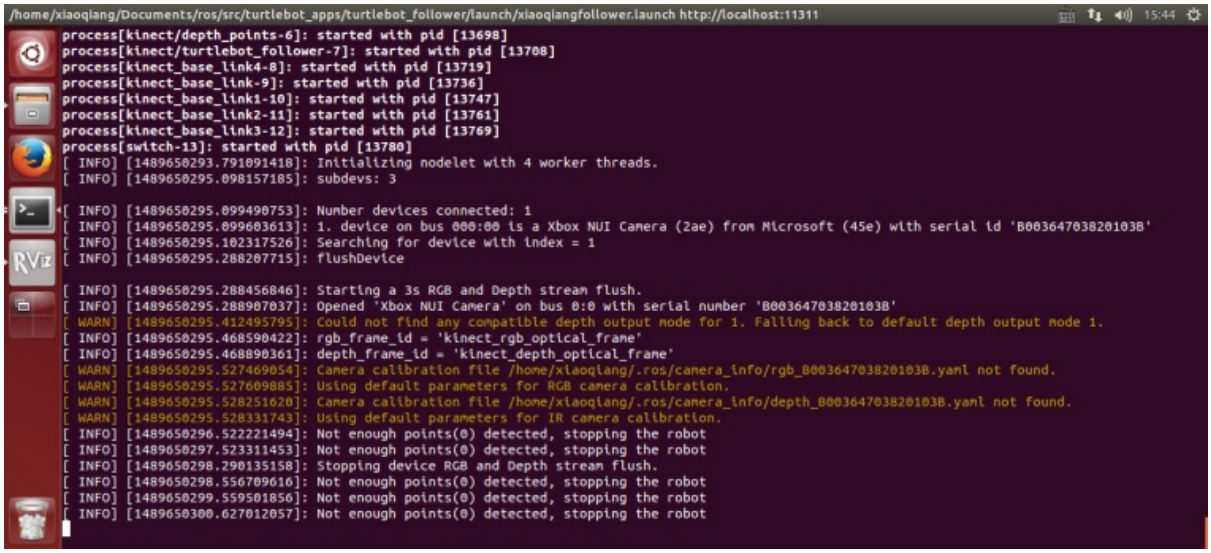
```
ssh xiaoqiang@192.168.xxx.xxx
cd Documents/ros/src/
```

```
git clone https://github.com/turtlebot/turtlebot_msgs.git
git clone https://github.com/BlueWhaleRobot/turtlebot_apps.git
cd ..
catkin_make
```

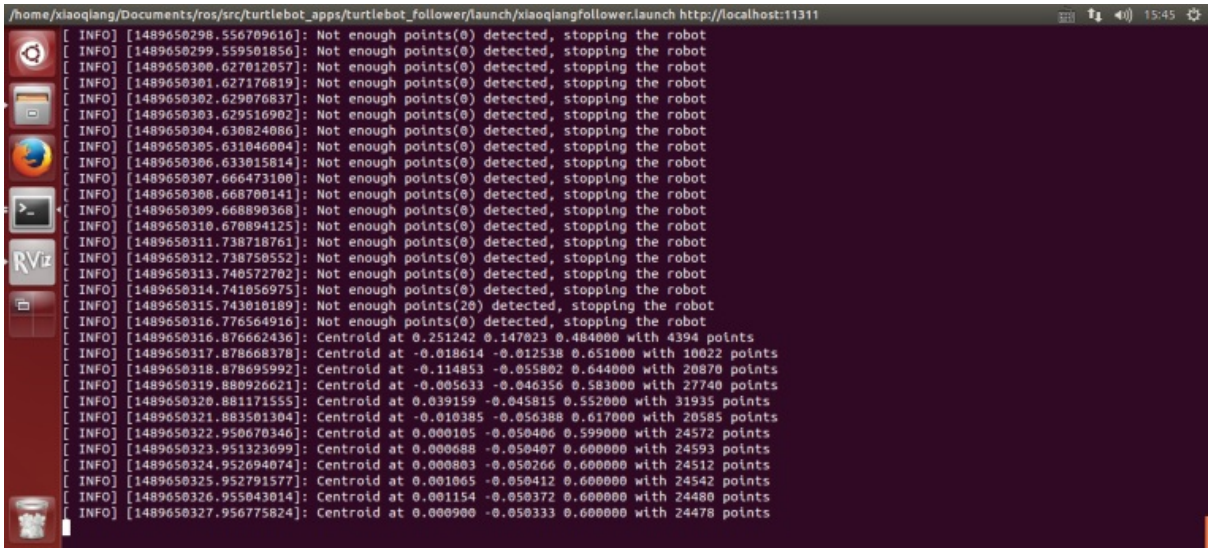
2.Ensure that Xiaoqiang is 2 meters * 2 meters in front of the open space without debris, first check the kinect angle is horizontal, if not in the horizontal state, please turn off the platform power, start the `turtlebot_follower` package on the Xiaoqiang host

```
ssh xiaoqiang@192.168.xxx.xxx
roslaunch turtlebot_follower xiaoqiangfollower.launch
```

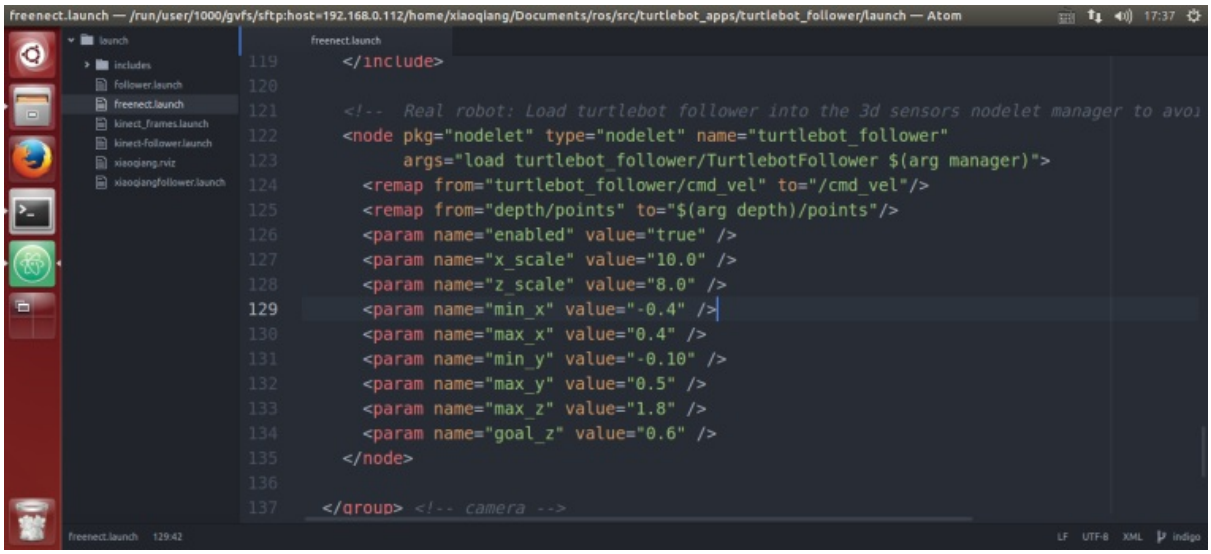
The following figure will appear after normal startup



1. At this point, someone enters Xiaoqiang's front view and activates Xiaoqiang's follow function. Xiaoqiang starts to move with the person's movement.



Modify the parameters in the `/home/xiaoqiang/Documents/ros/src/turtlebot_apps/turtlebot_follower/launch/freenect.launch` file on the Xiaoqiang host, similar to the following figure. Then you can control the following performance



Xiaoqiang Homepage Back To Index

xiaoqiang ROS robot tutorial (12) display point cloud for kinect2

Xiaoqiang Homepage

1.Start kienct v2 ROS driver

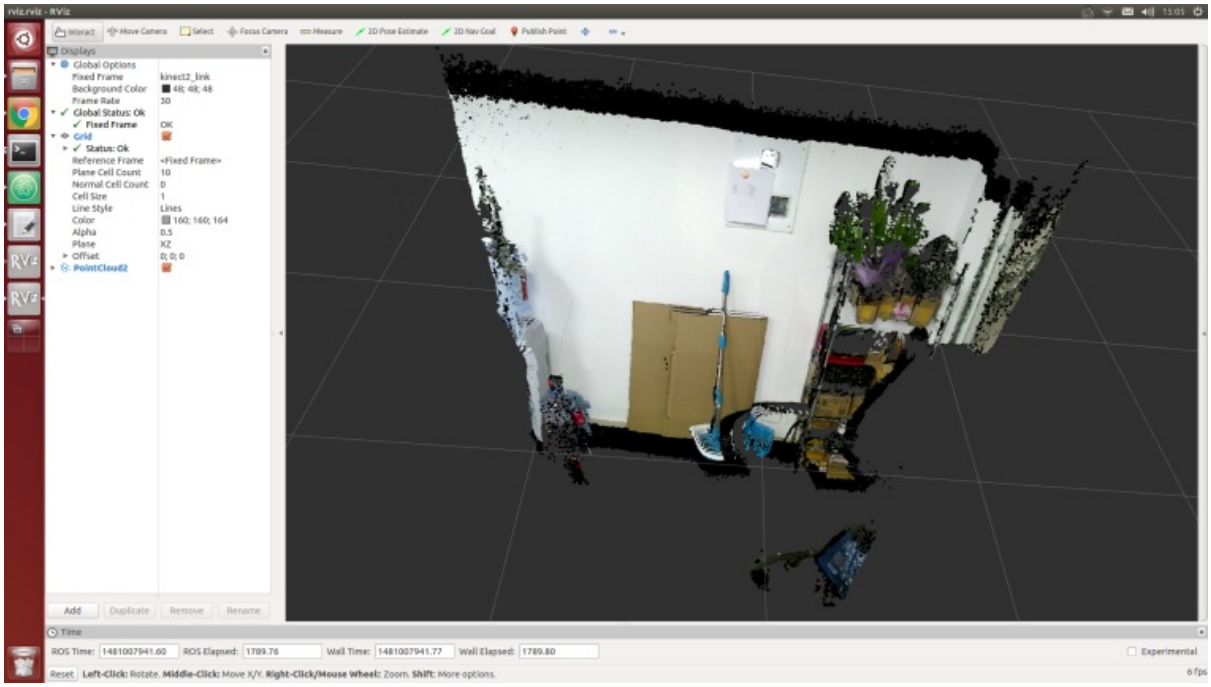
The Xiaoqiang platform outputs a 12V power supply (DC head with “kinect power supply” tag) for kinect power supply, and the kinect v2 needs to be inserted into the blue host USB 3.0 interface of the Xiaoqiang. Connect the Xiaoqiang host to the monitor and keyboard. Open a terminal on the Xiaoqiang host and enter the following command

```
roslaunch kinect2_bridge kinect2-xyz.launch
```

2.Open a new terminal, start rviz

```
rviz
```

Open this rviz configuration file `/home/xiaoqiang/Documents/ros/src/iai_kinect2/kinect2_bridge/launch/rviz.rviz` , Click to download this file. If everything is normal, an interface similar to the one below can appear



Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (13) rplidar A2 LiDAR useage and set udev rules for serial devices for xiaoqiang

Xiaoqiang Homepage

rplidar A2 LiDAR useage and set udev rules for serial devices for xiaoqiang

The 1, 2, 3, and 4 steps of the tutorial in this section are only used to demonstrate the method of adding serial devices to Xiaoqiang. These rules are already added in Xiaoqiang system image. Xiaoqiang users should directly jump to step 5 to test the lidar after connecting the hardware.

Xiaoqiang host and motor driver communicate through the serial port, In the actual development process, we may add serial peripherals to Xiaoqiang. This can lead to confusion over the serial number (ttyUSB*), causing anomalies in the xiaoqiang's ros driver and serial device. The following uses the rplidar A2 lidar as an example to demonstrate how to resolve serial port conflicts by modifying the device serial number specified in the udev file. The source of this method

1.Check the ID of each serial device

```
sudo apt-get install expect-dev
unbuffer udevadm monitor --environment | grep 'ID_SERIAL='
```

After the USB to serial cable of the platform is re-plugged, the terminal will print out the ID information of this device. For example, `"Silicon_Labs_CP2102_USB_to_UART_Bridge_Controller"` in the following figure.

Then re-inserted the lidar's usb adapter into the host, and the terminal will also print the lidar's ID information. For example, `"Prolific_Technology_Inc._USB-Serial_Controller_0001"` in the following figure.

2．Please create a udev rule file based on the ID of the serial device you obtained. Specify platform communication USB to serial port as `ttyUSB001` and lidar as `ttyUSB002` .

```
sudo gedit  /etc/udev/rules.d/60-persistent-serial.rules
```

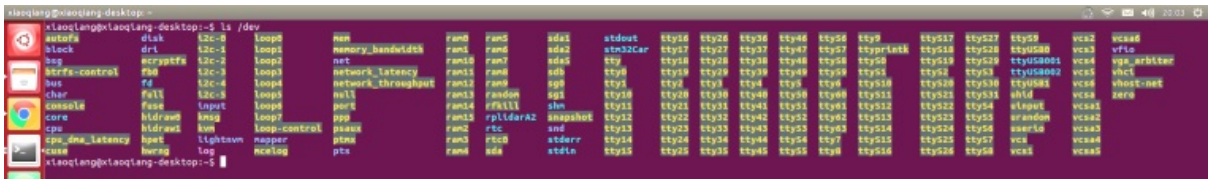
Enter the following content and save it. Please replace the string following `ID_SERIAL` with the ID you obtained in step 1.

```
ACTION!="add", GOTO="persistent_serial_end"
SUBSYSTEM!="tty", GOTO="persistent_serial_end"
KERNEL!="ttyUSB[0-9]*", GOTO="persistent_serial_end"

# This is old 11.10 style: IMPORT="usb_id --export %p"
IMPORT{builtin}="path_id"
ENV{ID_SERIAL}=="Prolific_Technology_Inc._USB-Serial_Controller"         , SYMLINK="stm32P
latform"        , SYMLINK+="ttyUSB001" , OWNER="xiaoqiang"
ENV{ID_SERIAL}=="Silicon_Labs_CP2102_USB_to_UART_Bridge_Controller_0001" , SYMLINK="rplida
rA2"       , SYMLINK+="ttyUSB002" , OWNER="xiaoqiang"

LABEL="persistent_serial_end"
```

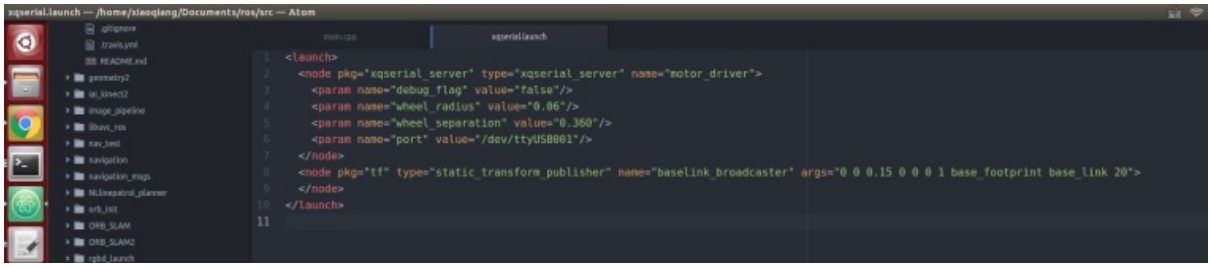
Update system udev rules

```
sudo udevadm control --reload
```

Re-plug all USB devices, now the platform communication USB to serial successfully identified as `ttyUSB001` , lidar is identified as `ttyUSB002` , regardless of the device insertion order and port.

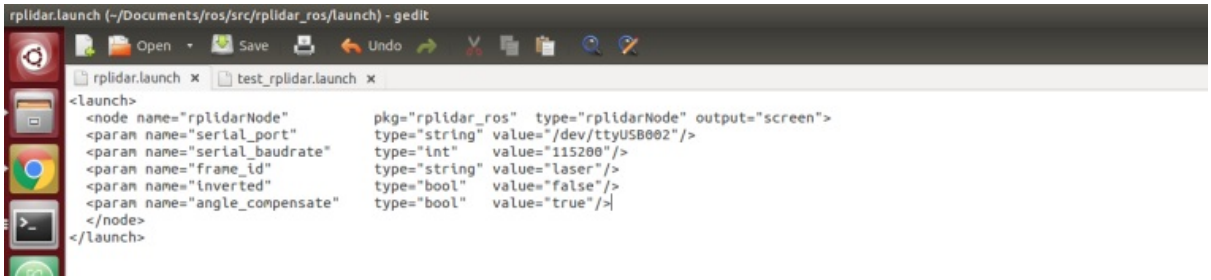


3．Modify the ROS driver node launch file, set the serial device as `ttyUSB001` .



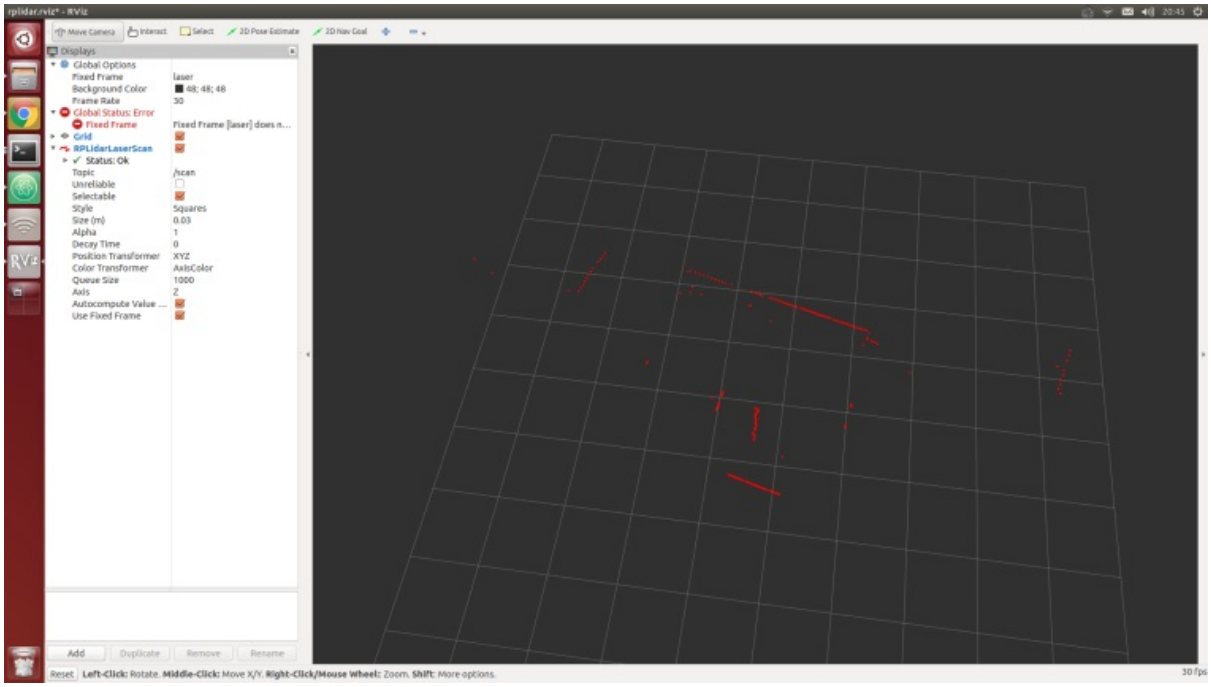
4．Modify the ROS driver node launch file for rplidar A2 and set the serial device as `ttyUSB002` .

```
# Driver installation
cd ~/Documents/ros/src
git clone https://github.com/BlueWhaleRobot/rplidar_ros.git
cd  ..
catkin_make
```



1. After restarting Xiaoqiang, it is now possible to use the lidar and xiaoqiang normally at the same time. For example, run the following command to test the lidar.

```
roslaunch rplidar_ros view_rplidar.launch
```



Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (14) using rplidar A2 with gmapping

Xiaoqiang Homepage

Using rplidar A2 with gmapping

1.Start the gmapping node

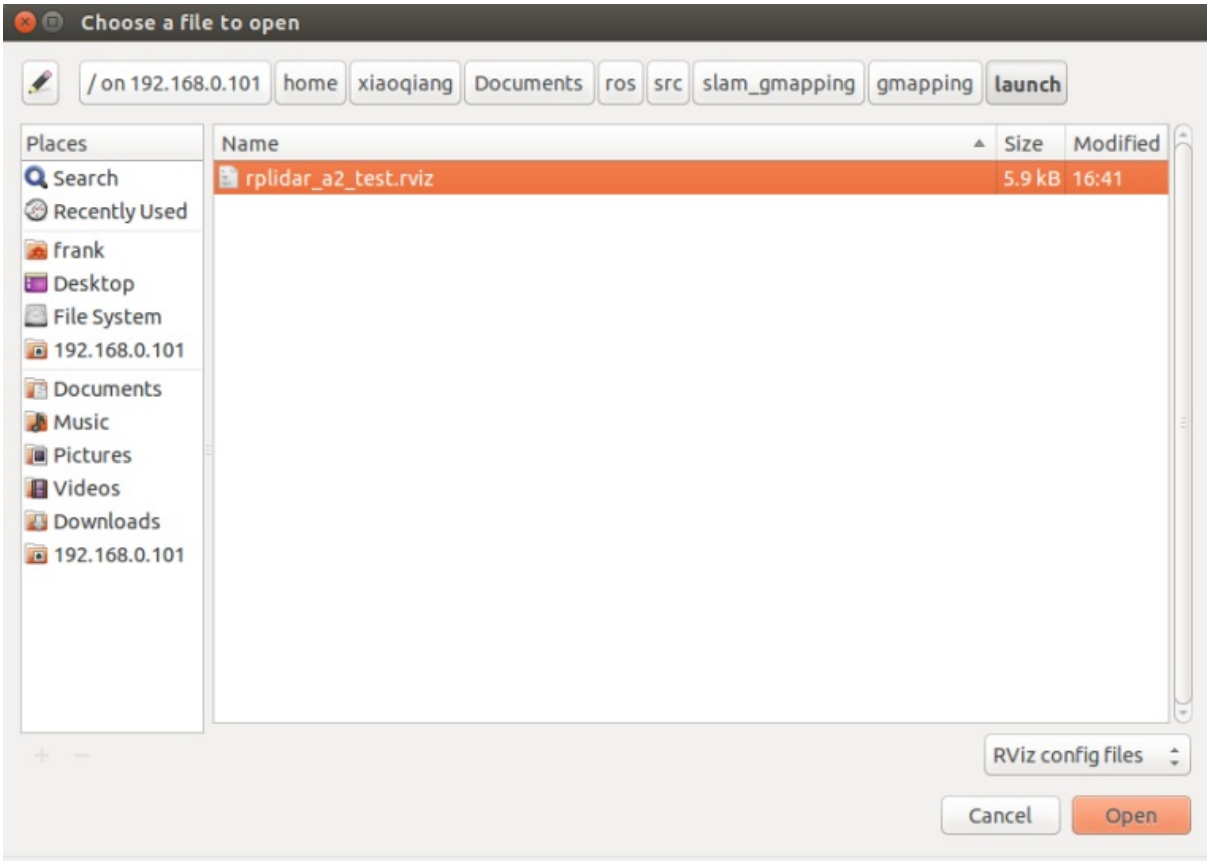
Ensure that the lidar is properly installed, and launch the gmapping launch file after ssh login the host.

```
ssh xiaoqiang@192.168.XXX.XXX
roslaunch gmapping slam_gmapping_xiaoqiang_rplidar_a2.launch
```

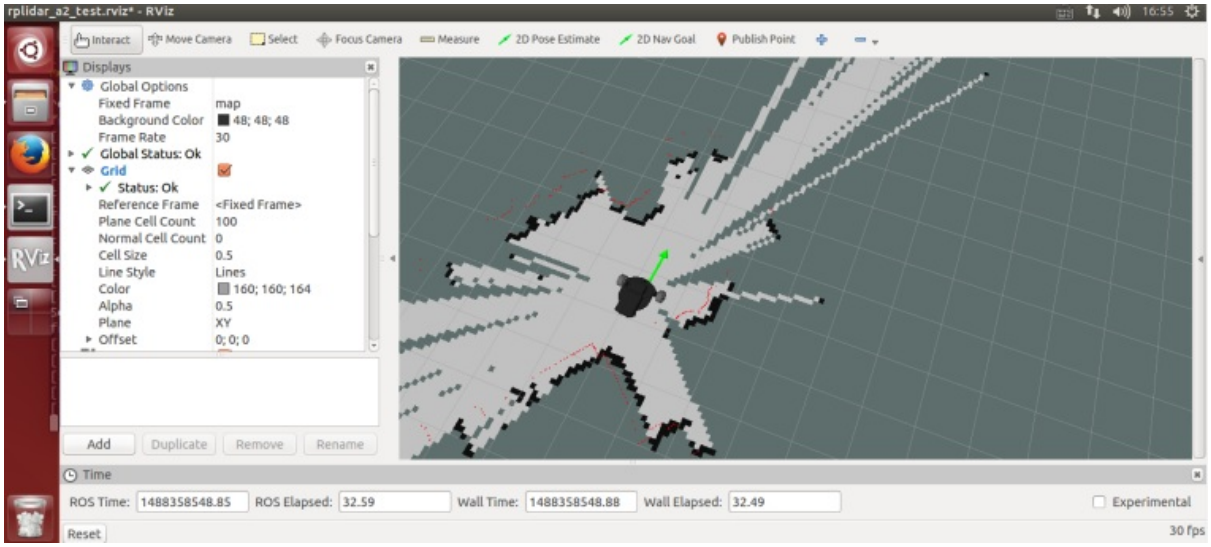
Open rviz in the local virtual machine, select the `slam_gmapping/gmapping/launch/rplidar_a2_test.rviz` configuration file and open it in Xiaoqiang ROS directory.

`Note: Some systems can't do this. You can copy that file directly to your local computer and open it locally.`

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
rviz
```



Wait a few seconds, normal results similar to the following figure will appear.



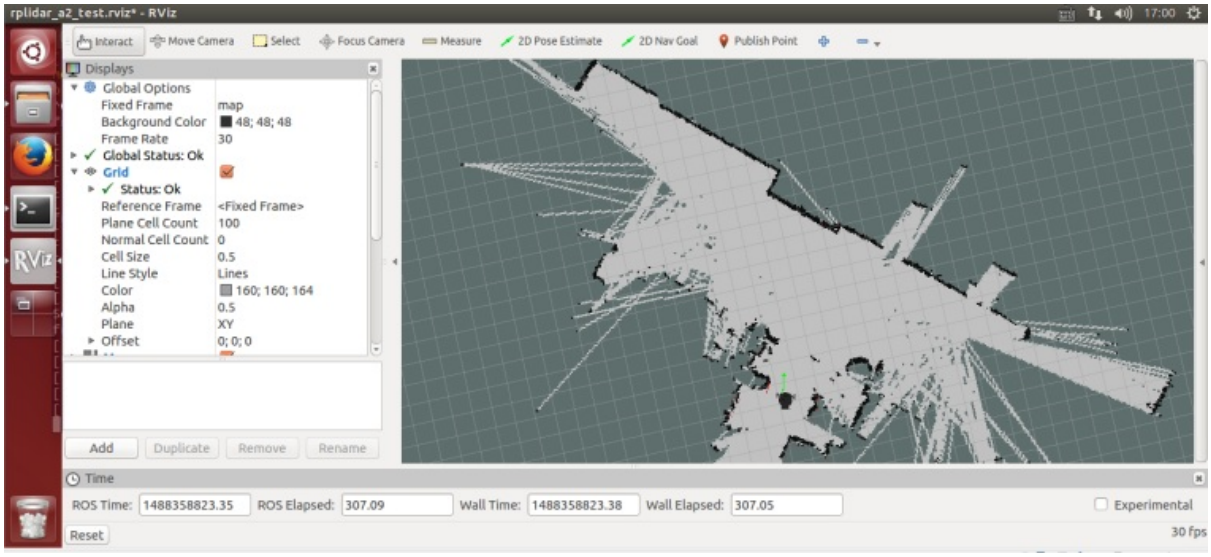
2.Remote control Xiaoqiang and start to build a map

The first way: use the windows remote control client, refer to this post

The second way:using the ssh remote control

```
ssh xiaoqiang@192.168.XXX.XXX
rosrun nav_test control.py
```

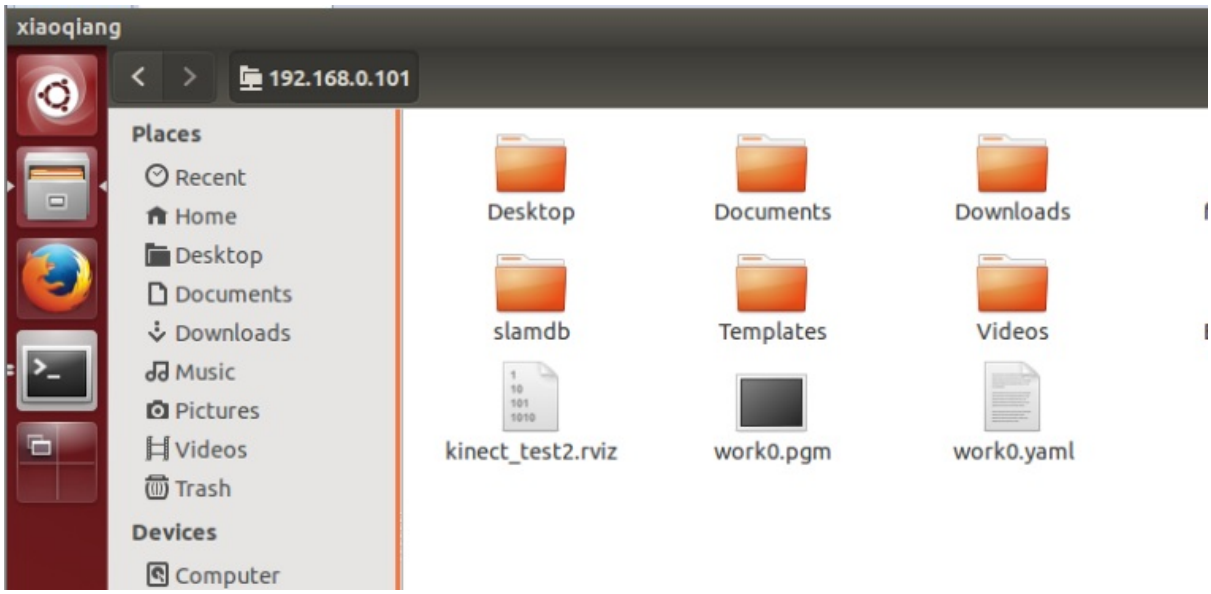
The third way: use mobile app, refer to this post Xiaoqiang mobile remote control app for Android



3.Save the map

ssh login Xiaoqiang, in the Xiaoqiang home directory save the map as the beginning of work0 file.

```
ssh xiaoqiang@192.168.XXX.XXX
rosrun map_server map_saver -f work0
```



Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (15) AMCL navigation test

Xiaoqiang Homepage

AMCL Navigation Test

The following will demonstrate the AMCL navigation operation using rplidar a2 as the scan input and the map file created in Tutorial 14 as the global map.

1 preparations

Install and upgrade `nav_test` , `laser_filters` package first.

1.1 ssh login Xiaoqiang host and cd to Xiaoqiang's ros workspace

```
ssh xiaoqiang@192.168.xxx.xxx -X
cd Documents/ros/src/
```

1.2 Update upgrade package

```
cd  laser_filters
git stash
git pull
cd ..
cd nav_test
git stash
git pull
cd ..
cd ..
catkin_make
```

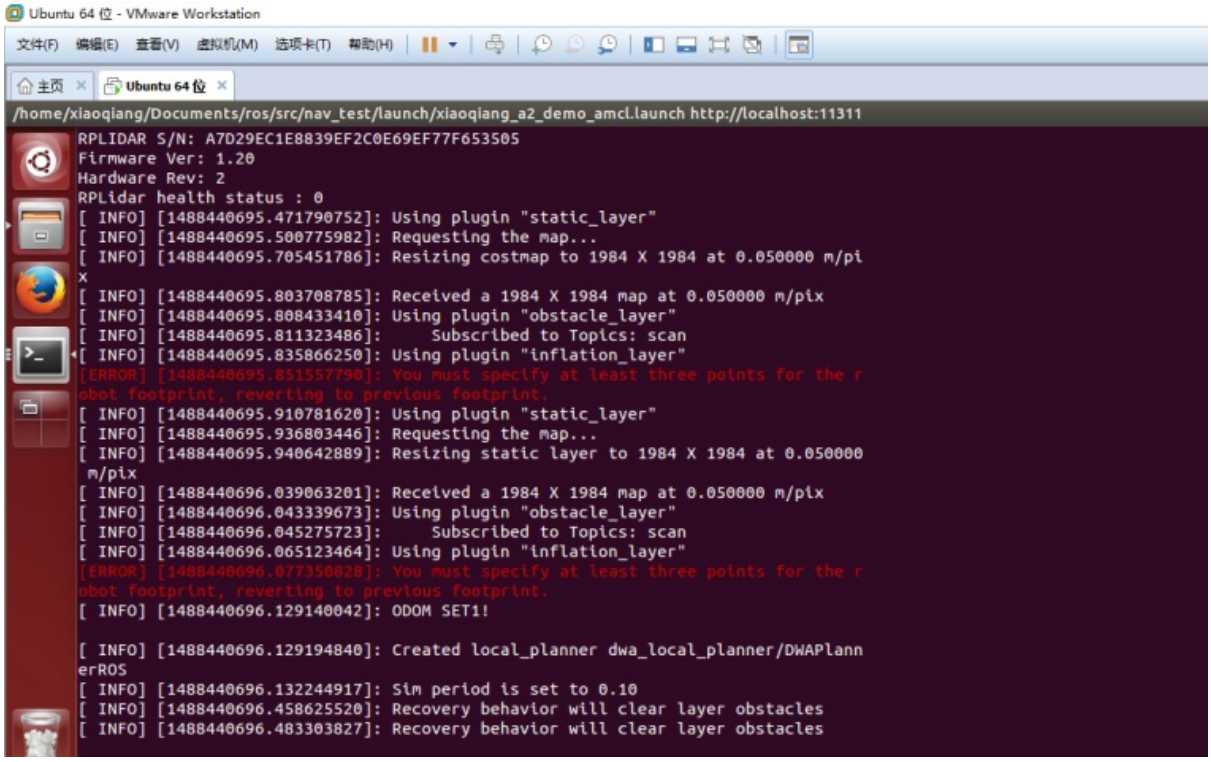
1.3 Update the Xiaoqiang hosts file and the hosts file of the local virtual machine so that Xiaoqiang and the local virtual machine can communicate with each other. Refer to sections 1.A and 1.B in Tutorial 13.

2.Start navigation node

First, copy the two map files created in Tutorial 14 to `/home/xiaoqiang/Documents/ros/src/nav_test/maps/` , overwrite the files with the same name.

```
roslaunch nav_test xiaoqiang_a2_demo_amcl.launch
```

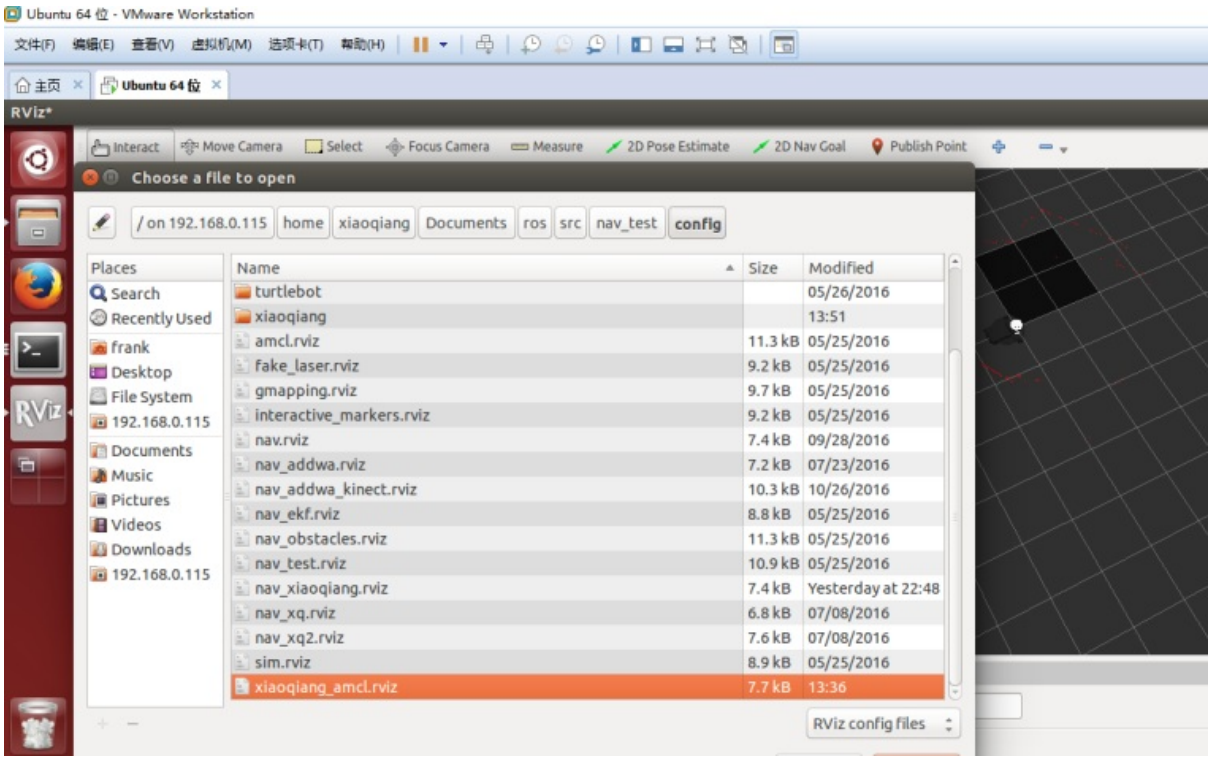
Normally there will be similar results in the figure below, while the lidar starts to rotate



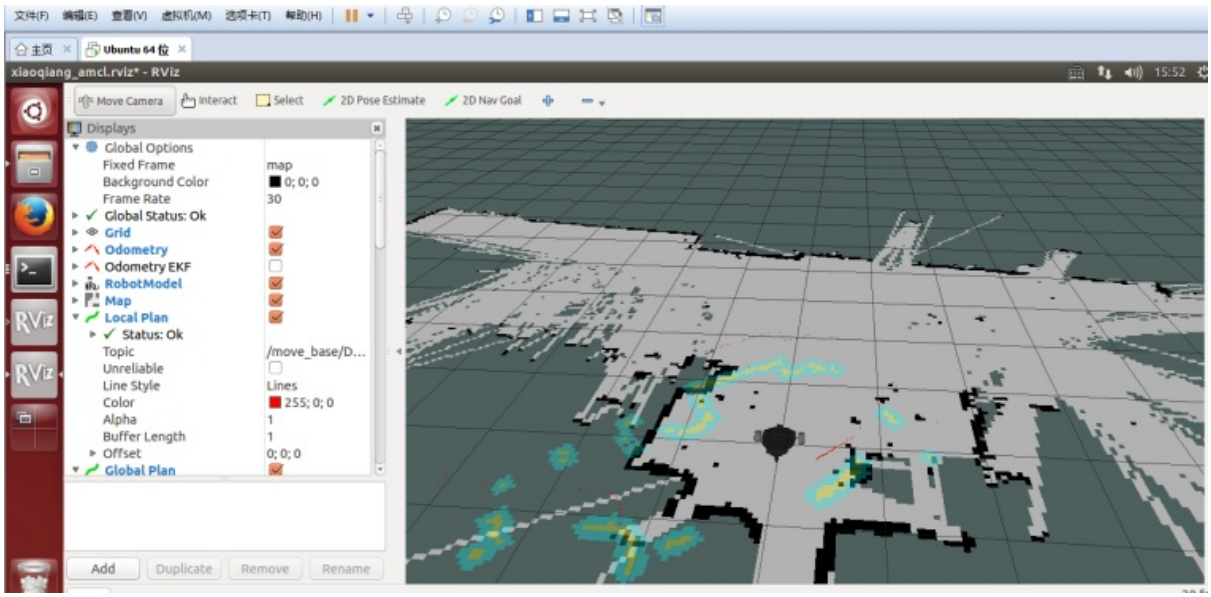
3 Start rviz

3.1 Start rviz in the local virtual, select the open `nav_test/config/xiaoqiang_amcl.rviz` configuration file in the work directory of Xiaoqiang ros

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
rviz
```

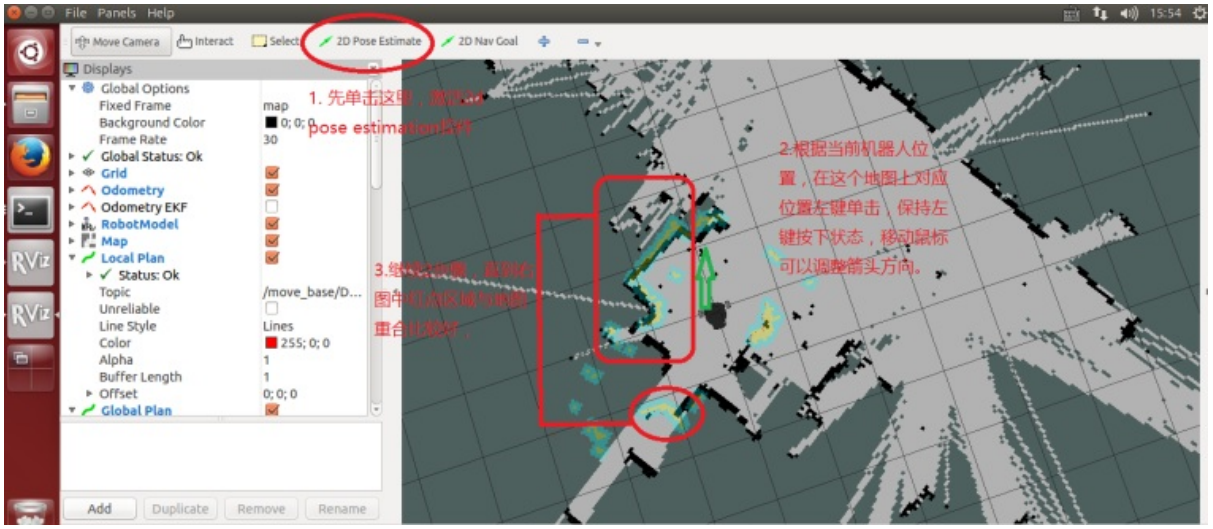


3.2 After waiting for a few seconds, rviz will normally have a screen similar to the one below.

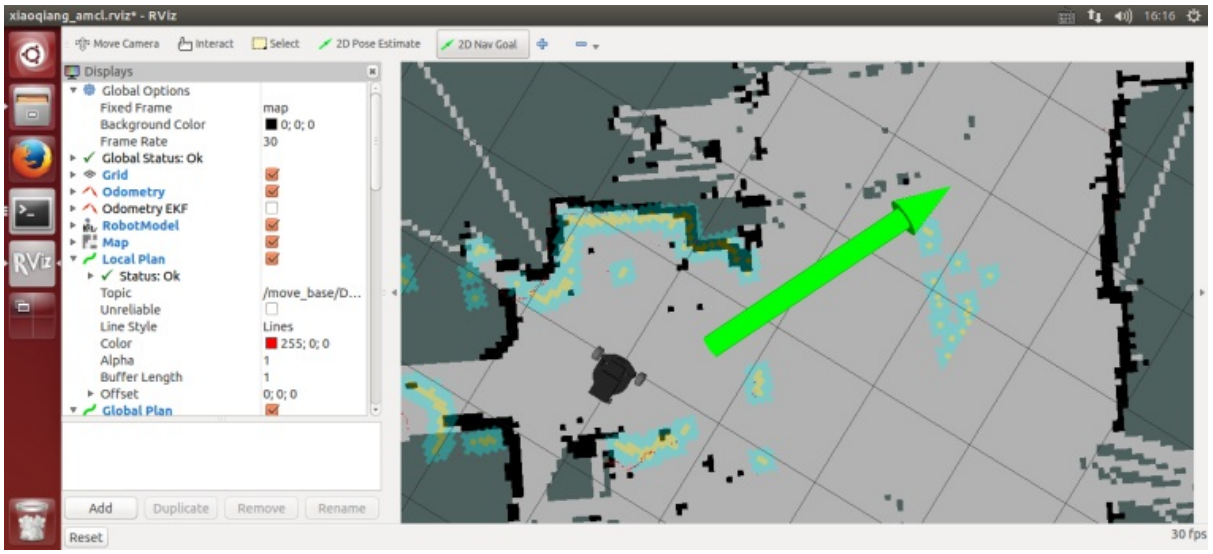


4.Start navigation test

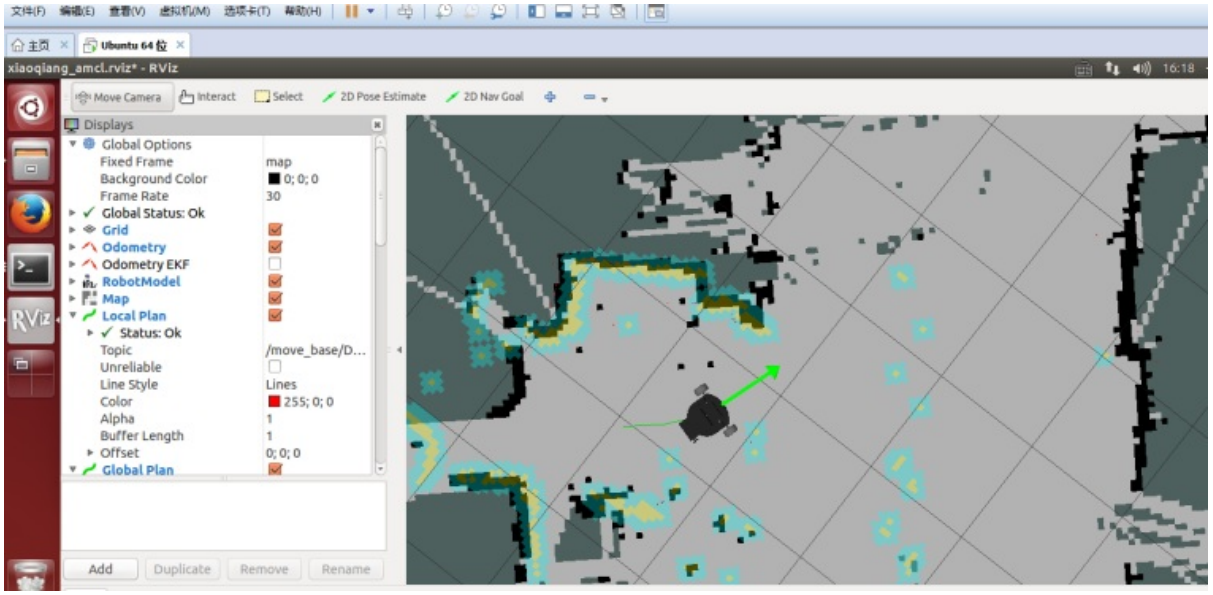
4.1 In rviz, use 2D Pose Estimation to set the position of the initial pose of the robot in the map. Because the AMCL algorithm needs a more accurate initial value, the actual position of the robot in the map can be further matched by the current liadr scanning dot matrix.



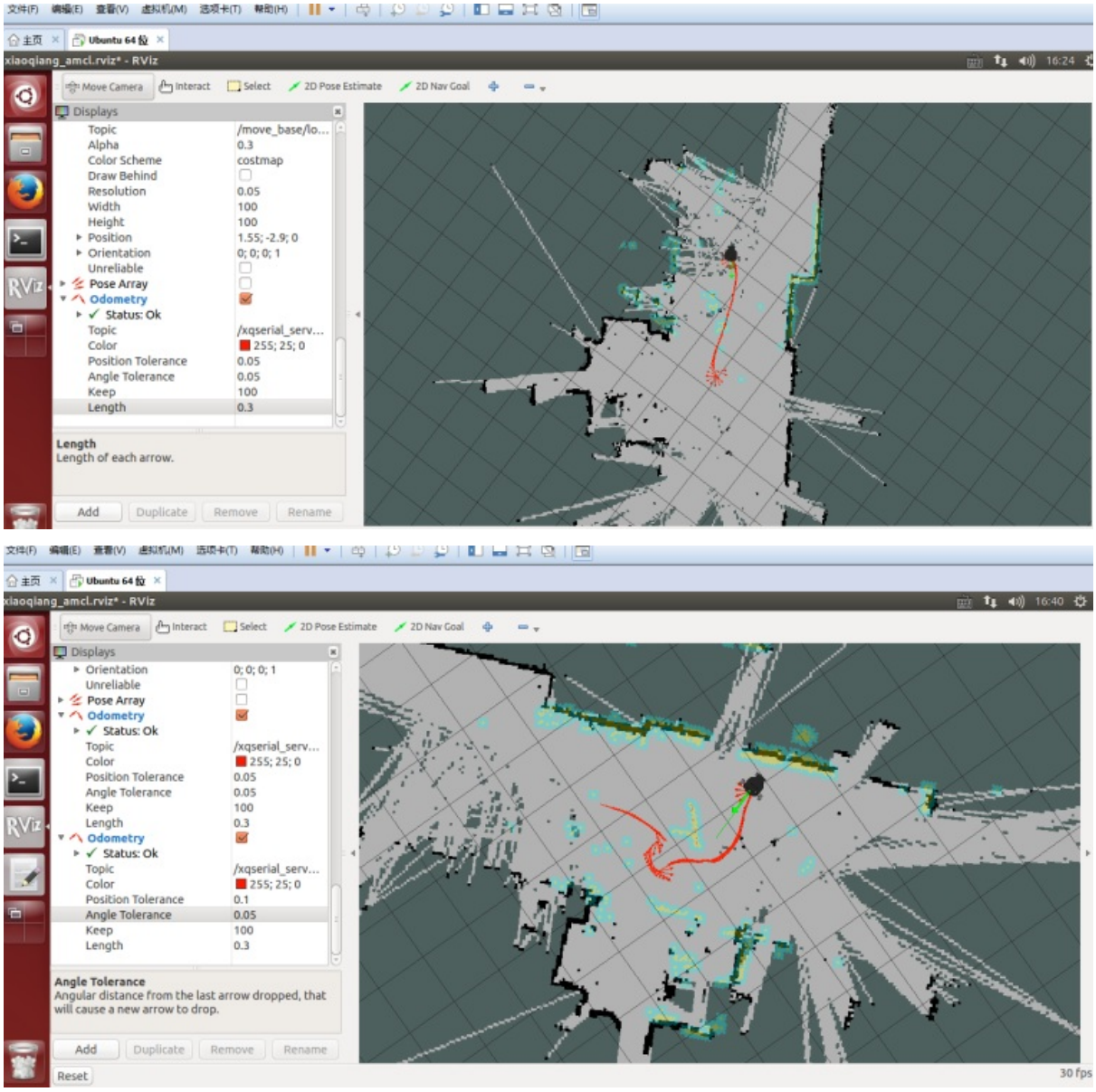
4.2 Using 2D Nav Goal in rviz to release targets to Xiaoqiang



4.3 Xiaoqiang began to move autonomously to the designated location



5. Set up Xiaoqiang's 2D Nav Goal and observe the movement of Xiaoqiang.



Xiaoqiang Homepage Back To Index

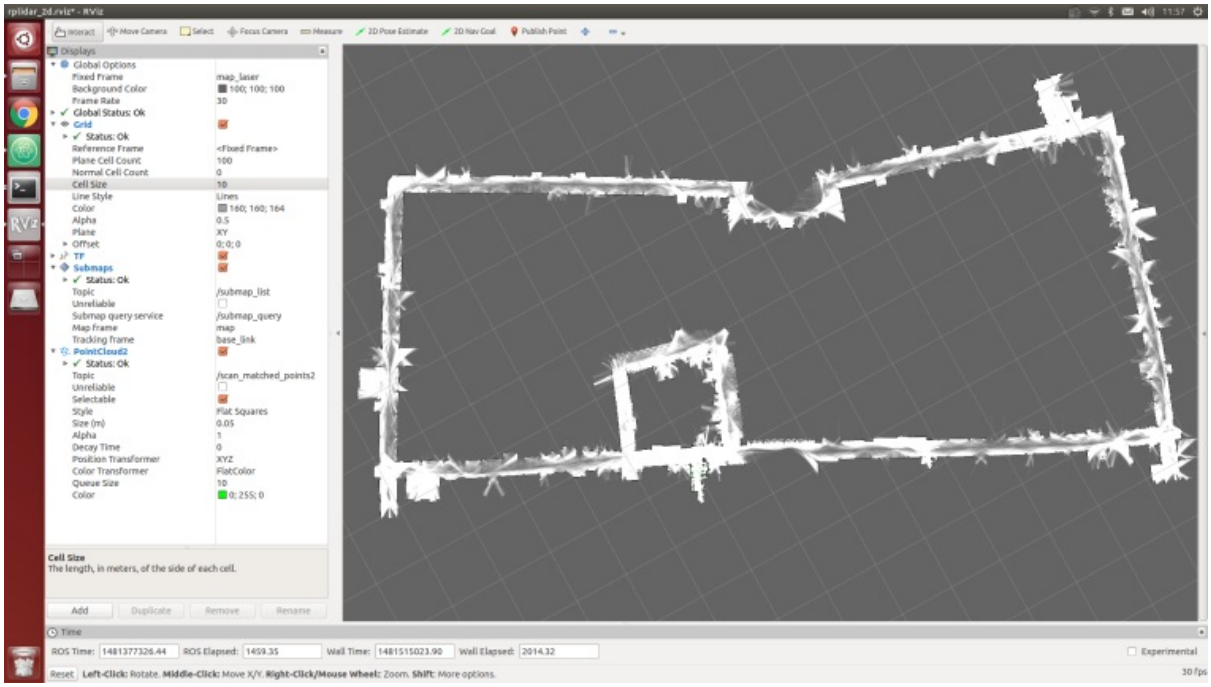
xiaoqiang tutorial (16) large-scale lidar slam and real-time loop closure test

Xiaoqiang Homepage

Large-scale lidar slam and real-time loop closure test

With Google's Cartographer and slamtec's lidar, we can try to create a floor plan for a large building. Take a look at our demo and click to watch the video.

In this demo, Xiaoqiang actually operates in a 5,000-square-meter office building corridor. There are a large number of glass walls on both sides of the corridor. There is a large area of open space in the center of the building. With rplidar's range of only 6 meters, so the following figure The final result is still relatively good (only use lidar, IMU and odometer are not turned on, the large loop path is still closed successfully)



The idea of this article: Because it is a large-scale mapping, wifi network coverage is a problem, so we use the Bluetooth joystick to remotely control the robot movement. During the remote control, the lidar data was recorded through the rosbag. The joystick controlled robot ran a circle within the area and finally play the bag for map creation.

Note: All the following operations are completed on Xiaoqiang host ubuntu

Preparation：

1.Installing rplidar driver

If you are using xiaoqiang system image, then the driver was already installed, you can skip this step.

For the instructions to install rplidar driver, please refer to this post

2.Install PS3 handle driver

If you are using xiaoqiang system image, then the driver was already installed, you can skip this step.

For the instructions to install joystick driver, please refer to this post

3.Install cartographer_ros

Please refer to this installation tutorial

Steps:

1.Open a new window to start rplidar

```
roslaunch rplidar_ros rplidar.launch
```

2.Open two windows to start PS3 controller remote control program, press the handle connection key to connect the platform.

First window

```
sudo bash
rosrun ps3joy ps3joyfake_node.py
```

The second window

```
roslaunch turtlebot_teleop ps3fakexiaoqiang_teleop.launch
```

3.Opens a new window to start the rosbag recording process and starts recording lidar data/scan

```
rosbag record /scan
```

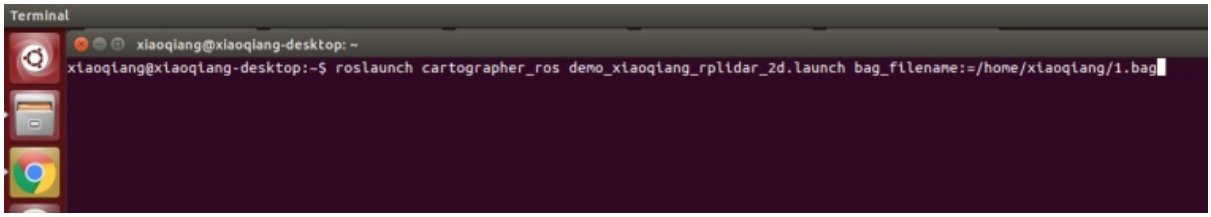
4.Use the handle to remotely control the movement of the platform, circle around the building area, and it can also be used for multiple rotations.

5.Bag recording is complete, close the above 1,2,3 window

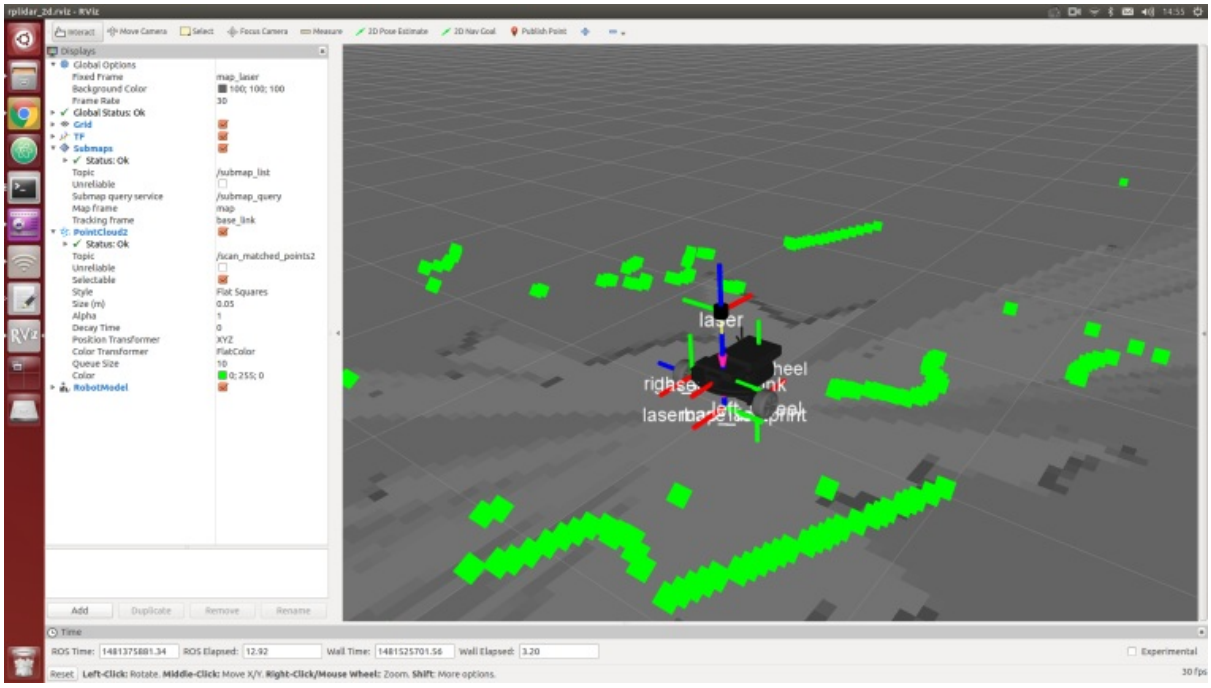
The newly recorded point bag file is in the home directory of Xiaoqiang, rename it to 1.bag

6.Start platformtographer_ros start bag playback build

```
roslaunch platformtographer_ros demo_xiaoqiang_rplidar_2d.launch bag_filename:=/home/xiaoq
iang/1.bag
```



7.If everything is normal, you can now see a similar effect in the picture below, waiting for the bag to be played.



8 .Save the map, this article ends

```
rosservice call /finish_trajectory "stem: 'rplidar_test'"
```

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (17) using ORB_SLAM2 to create a three-dimensional model of the environment

Xiaoqiang Homepage

Using ORB_SLAM2 to create a three-dimensional model of the environment

To achieve visual navigation, a three-dimensional model of space is required. ORB_SLAM2 is a very effective algorithm for building spatial models. This algorithm is based on the recognition of ORB feature points, with high accuracy and high operating efficiency. We have modified the original algorithm, added the map's save and load functions, making it more applicable to the actual application scenario. The following describes the specific use.

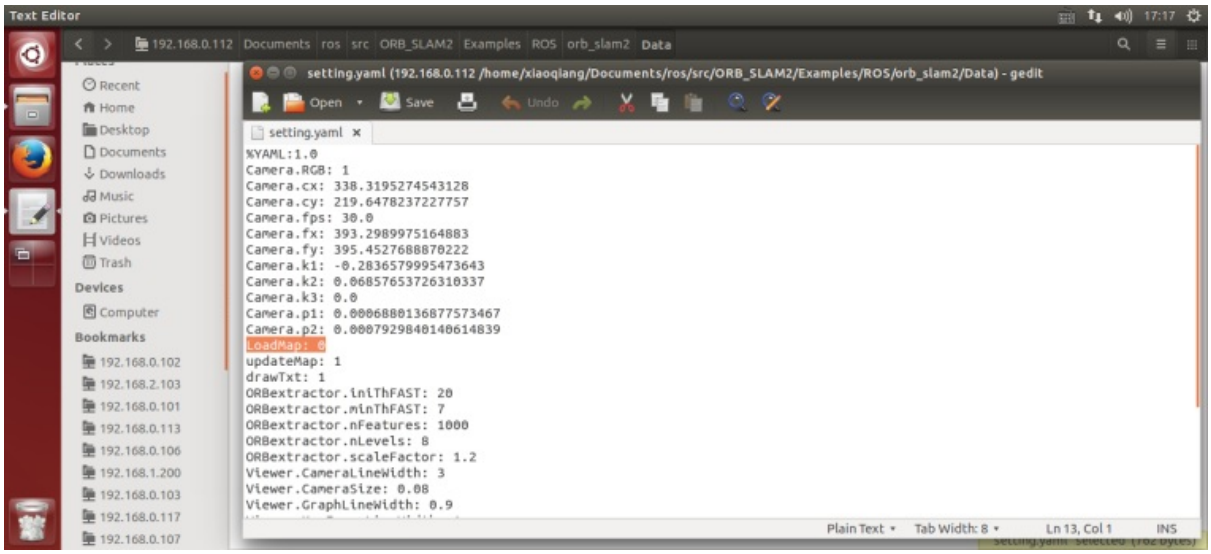
```
 Note: Since the ORB_SLAM2 version of xiaoqiang has been upgraded to the Galileo version, the runtime detects if a valid certificate is available. Xiaoqiang is configured with a valid certificate. If you do not have a certificate by default, and you can contact customer service to get a cert for free. If you are not a xiaoqiang user, then the following tutorial cannot be performed.
```

Prepared work

Before starting ORB_SLAM2, please confirm that Xiaoqiang's camera is working properly. When building map with ORB_SLAM2, xiaoqiang has to move around, it is inconvenient to display the ORB_SLAM2 status at the same time (ssh remote operation is not smooth, and it is impossible to drag the monitor while running), please install Xiaoqiang map remote control windows client to get a better experience.

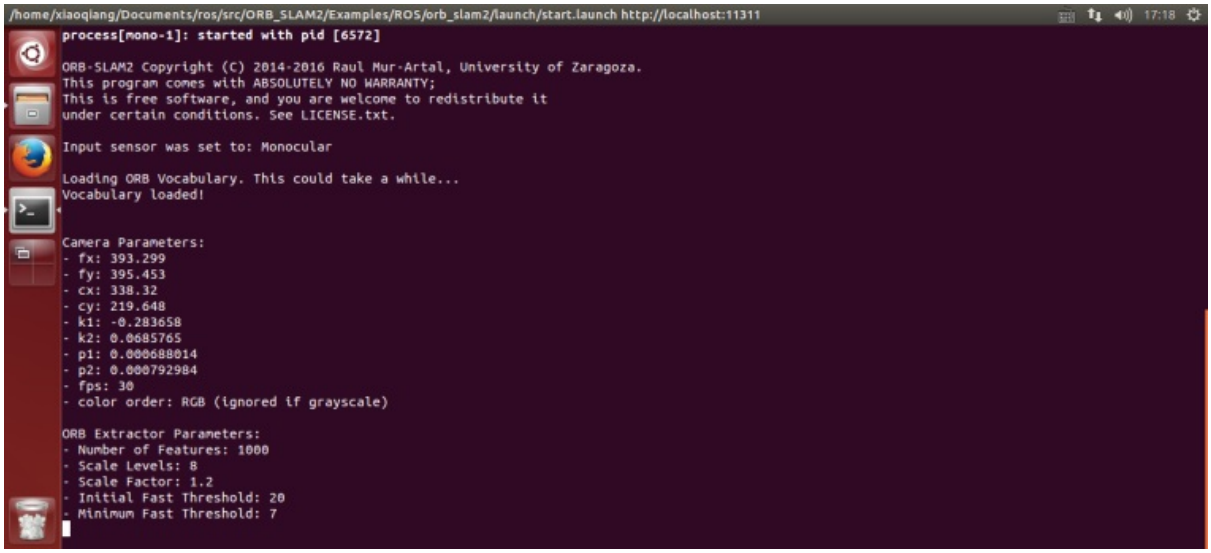
Start ORB_SLAM2

Change the configuration file. The configuration file for ORB_SLAM2 is located in the `/home/xiaoqiang/Documents/ros/workspace/src/ORB_SLAM2/Examples/ROS/ORB_SLAM2/Data` folder. Change the value of `LoadMap` in the `setting4.yaml` and set it to 0. When set to 1, the program automatically loads map data from the `/home/xiaoqiang/slamdb` folder after startup. When set to 0, map data will not be loaded. Since we want to create a map, LoadMap needs to be set to 0.



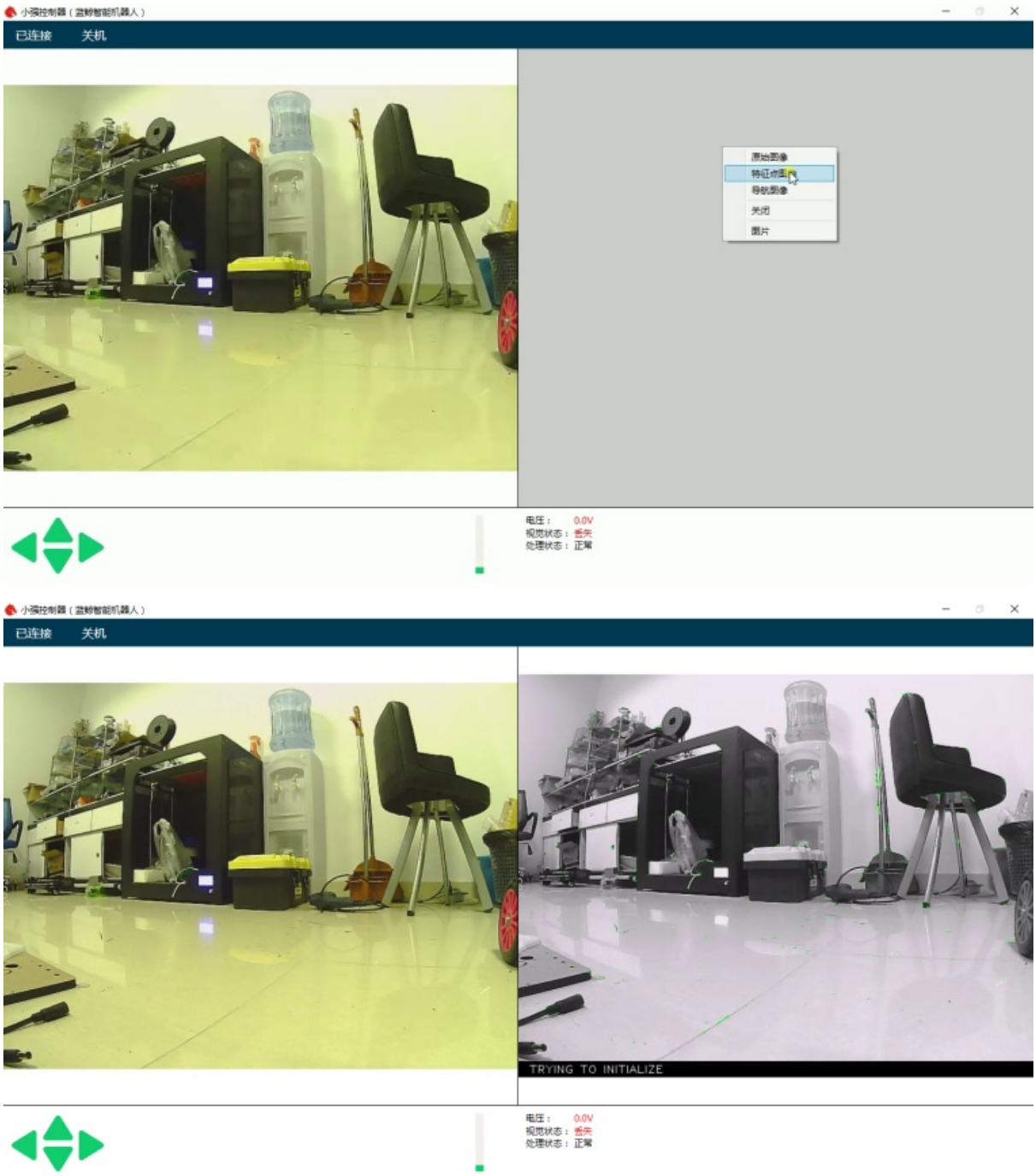
Use ssh to enter Xiaoqiang and execute the following command

```
ssh -X xiaoqiang@192.168.xxx.xxx
roslaunch ORB_SLAM2 map.launch
```



Began to create an environmental 3D model

Start Xiaoqiang remote control windows client, click on the "Not connected" button to connect Xiaoqiang. Right-click in the image window to open the "original image" and "ORB_SLAM2's feature point image"



In the figure above, the left image is the camera's original color image, and the right side is the ORB_SLAM2 processed black and white image. ORB_SLAM2 has not been initialized successfully in the image, so the black and white image has no feature points. Hold down the "w" key to start the remote control Xiaoqiang, slowly move forward, so that ORB_SLAM2 initialized successfully, that is, black and white images began to appear red and green features.

It is now possible to remote control of Xiaoqiang, and create a map of the surrounding environment. During the remote control process, it is necessary to ensure that the black-and-white image always has red and green feature points. If it does not exist, it means that the visual had lost, and it is necessary to remotely control Xiaoqiang to return to the place where the last missed lost position.

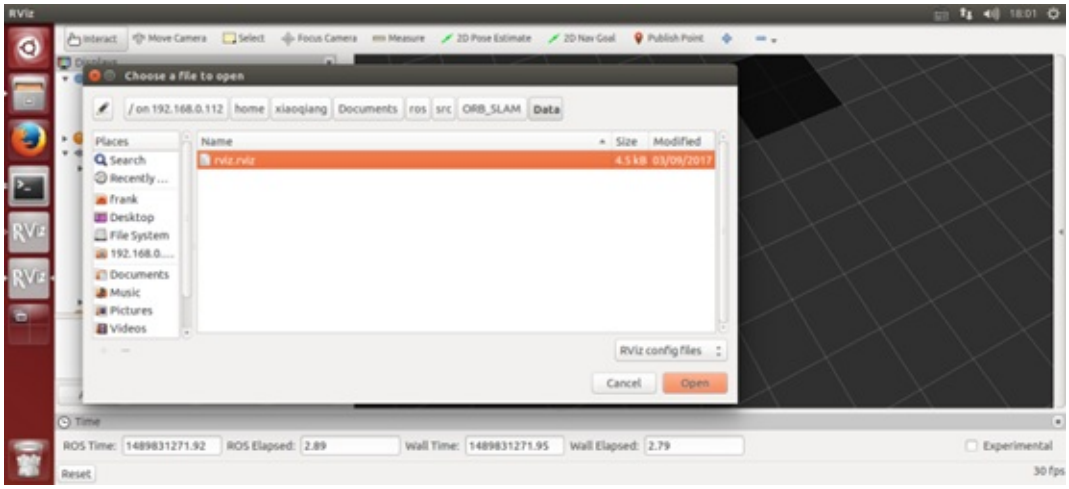
00:00 / 00:00

Use rviz to view the map result

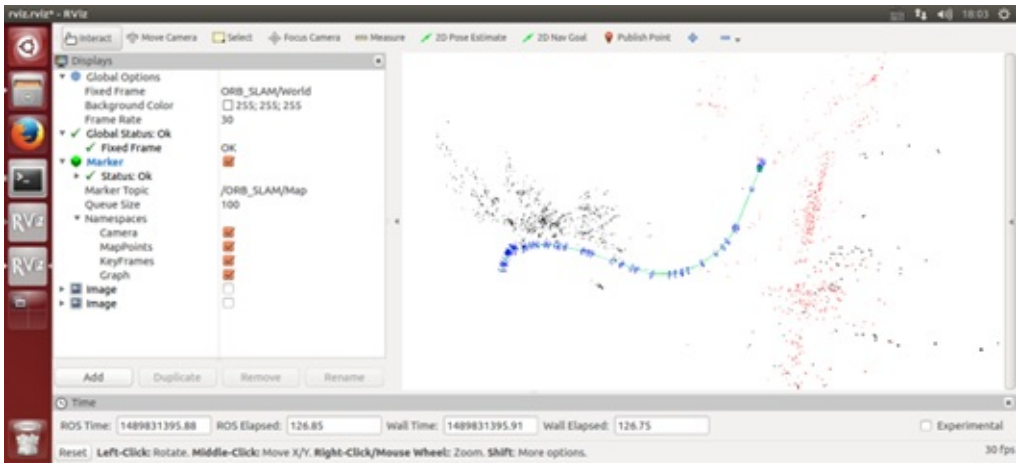
Add Xiaoqiang IP address in the local virtual machine's hosts file, then open a new terminal to open rviz.

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
rviz
```

Open the `/home/xiaoqiang/Documents/ros/src/ORB_SLAM/Data/rivz.rviz` configuration file. Some systems may not be able to open this file remotely. You can copy the file locally and open it locally.



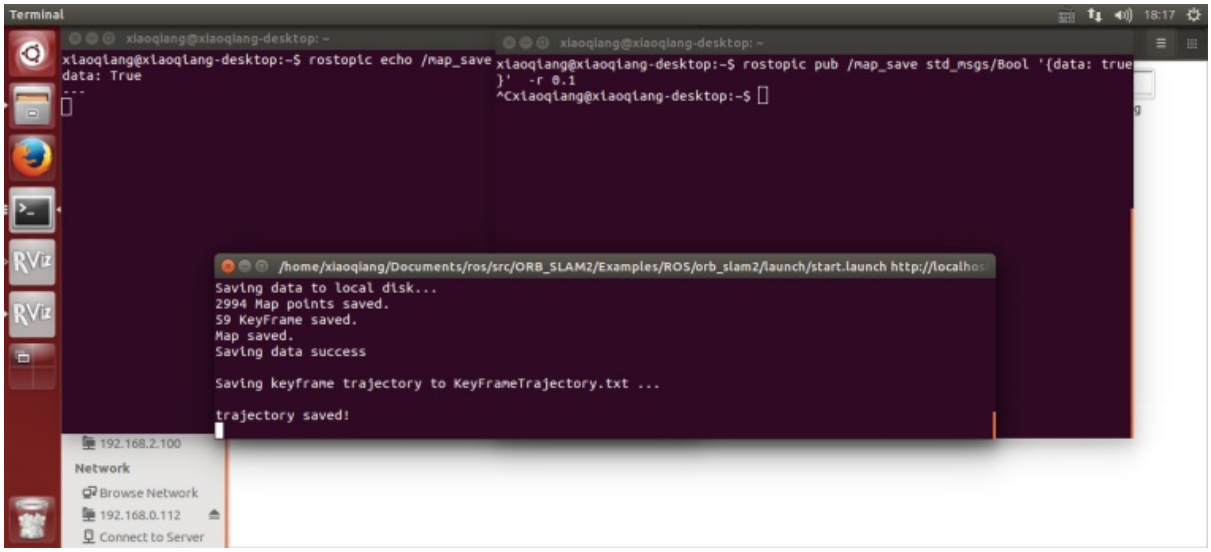
As shown in the figure below, the red and black points are three-dimensional models (sparse feature point clouds) created, and the blue boxes are keyframes that can represent the tracks of Xiaoqiang.



Save the map

After the map has been created to meet the requirements, start a new terminal in the VM and enter the following command to save the map:

```
ssh -X xiaoqiang@192.168.xxx.xxx
rostopic pub /map_save std_msgs/Bool '{data: true}'  -1
```



The map file will be created in `~/home/slamdb` .

Loading of maps

You can load the map into ORB_SLAM2 again after saving the map. After the map is loaded, the program can quickly locate the location of the camera. The way to load the map is also very simple.

```
roslaunch ORB_SLAM2 run.launch
```

The `Loadmap` was set to 1 by the launch file actually .

Post processing of maps

After creating the map, you may want to use this map for navigation, you need to do further operations on the map file. For example, to create a navigation path, and so on. This section can be found in the article Visual Navigation Path Editor Tutorial.

For xiaoqiang users, you can use Galileo navigation client, for more detail, please refer to Galileo navigation user manual

ORB_SLAM2 parameter explanation

The following is an ORB_SLAM2 setting file. The specific meaning of the parameter can refer to the comment.

```
%YAML:1.0
Camera.RGB: 1
# Camera calibration parameters, the parameters has moved to usb_cam after 2018.6
Camera.cx: 325.0466266836216
Camera.cy: 238.9974356449355
Camera.fps: 30.0
Camera.fx: 395.6779619478691
Camera.fy: 397.4934332366201
Camera.k1: -0.2805598785308578
Camera.k2: 0.06685114307459132
```

```
Camera.k3: 0.0
Camera.p1: -0.0009688764167839786
Camera.p2: -0.0002636873513136712
LoadMap: 0 # whether to load map, 1 load and 0 not load
updateMap: 1 # whether to update map while running, 1 update and 0 not update.
drawTxt: 1 # whether to display text in processed video
# ORB_SLAM2 slam algorithm-related parameters
ORBextractor.iniThFAST: 20
ORBextractor.minThFAST: 7
ORBextractor.nFeatures: 2000
ORBextractor.nLevels: 8
ORBextractor.scaleFactor: 1.2
# ORB_SLAM2 display-related parameters
Viewer.CameraLineWidth: 3
Viewer.CameraSize: 0.08
Viewer.GraphLineWidth: 0.9
Viewer.KeyFrameLineWidth: 1
Viewer.KeyFrameSize: 0.05
Viewer.PointSize: 1000
Viewer.ViewpointF: 500
Viewer.ViewpointX: 0
Viewer.ViewpointY: -0.7
Viewer.ViewpointZ: -1.8
UseImu: 1 # whether to use IMU, 1 use and 0 not use.
updateScale: 1 # Whether update scale while running, if set 1, the visual scale will be up
dated according to the data from odom
DealyCount: 5
# tf between camera and base_link
TbaMatrix: !!opencv-matrix
   rows: 4
   cols: 4
   dt: f
   data: [ 0., 0.03818382, 0.99927073, 0.06, -1., 0., 0., 0., 0., -0.99927073, 0.03818382,
0.0, 0., 0., 0., 1.]
#   data: [ 0., 0.55176688, 0.83399839, 0., -1., 0., 0., 0., 0., -0.83399839, 0.55176688,
0., 0., 0., 0., 1.]
EnableGBA: 1 # whether to enable Global Bundle Adjustment
dropRate: 2 # frame skip rate, skip frames to improve performance
minInsertDistance: 0.3 # min distance between frames, prevent keyframes from being too den
se. Insert only one frame at this distance.
EnableGC: 0 # Whether to enable memory recycling, 0 is disable, 1 is enable. Enable memory
 recycling can make more efficient use of memory, and the relative computational efficienc
y will decrease
```

FAQ

Q: Can I create map without the client?
A: Yes, you can. The client is mainly for remote control and video streaming. You can use command line remote control instead. But the client is recommended for better experience.

Q: Can I choose not to use IMU
A: The ORB_SLAM2 is an edited version with additional IMU support. If you don't want to use it, you can set UseImu to 0 in setting.yaml.

Q: Where is xiaoqiang's camera calibration file?
A:the camera calibration file located at `usb_cam/launch/ov2610.yaml`

Q: The camera's image is not clear
A:It may be that the camera's lens has been touched, causing it no focus. You can turn the camera lens and adjust the image to a clear position. Note that the camera parameters need to be re-calibrated after adjustment. Calibration methods can be found in how to calibrate camera

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (18) 3D modeling using DSO_SLAM

Xiaoqiang Homepage

3D modeling using DSO_SLAM

Direct Sparse Odometry (DSO) was developed by Jakob Engel with better measured performance and accuracy than lsd_slam. DSO was open sourced to github by the author. At the same time, the author has also open sourced the usage code dso_ros of DSO in the ros system. This tutorial will demonstrate how to install DSO and dso_ros on the Xiaoqiang development platform, use the camera on Xiaoqiang platform to run DSO in real time to perform 3D modeling, Click to view the video.

1． DSO installation

`Note: Since the Xiaoqiang development platform has already installed a lot of DSO-needed dependencies in advance, the following will skip the installation of these packages. Readers of other development platforms should refer to the complete installation tutorial on github for installation.`

1.a Installation Dependency Package

```
sudo apt-get install libsuitesparse-dev libeigen3-dev libboost-dev
sudo apt-get install libopencv-dev
```

1.b download source code

```
cd ~/Documents/
git clone https://github.com/JakobEngel/dso.git
```

1.c continue to configure dependencies

```
sudo apt-get install zlib1g-dev
cd ~/Documents/dso/thirdparty
tar -zxvf libzip-1.1.1.tar.gz
cd libzip-1.1.1/
./configure
make
sudo make install
sudo cp lib/zipconf.h /usr/local/include/zipconf.h
```

1.d compile and install

```
cd ~/Documents/dso/
mkdir build
cd build
cmake ..
make -j
```

2. Installation of dso_ros

`Note: The source code provided by the original author has two branches. The master branch corresponds to the rosbuild version, and the catkin branch corresponds to the catkin version. For modern ROS versions, the catkin version is recommended for easier installation and use. However, the author's catkin branch has a code defect and cannot be installed and used. Therefore, the following will install the dso_ros version of our Bwbot modification.`

```
cd ~/Documents/ros/src
git clone https://github.com/BlueWhaleRobot/dso_ros.git
cd ..
export DSO_PATH=/home/xiaoqiang/Documents/dso
catkin_make
```

3.Start using

`Note: The camera calibration files of the Xiaoqiang development platform are the same, so you can directly run the following commands. Readers of other development platforms should modify the contents of the camera.txt file (note that there should be no spaces at the end of each line) and Image topic name in commands.`

```
rosrun dso_ros dso_live image:=/camera_node/image_raw calib=/home/xiaoqiang/Documents/ros/
src/dso_ros/camera.txt mode=1
```

Now move the camera and start modeling the surroundings in 3D, avoiding sharp turns and strenuous movements. For Xiaoqiang users, first control the Xiaoqiang movement and use the rosbag to record the `image/camera_node/image_raw` image topic data, and then replay. This can achieve a wide range of

modeling. Before the rosbag is replayed, it is necessary to stop the camera node. `sudo service startup stop` , otherwise there will be image publishing conflicts.

Xiaoqiang Homepage Back To Index

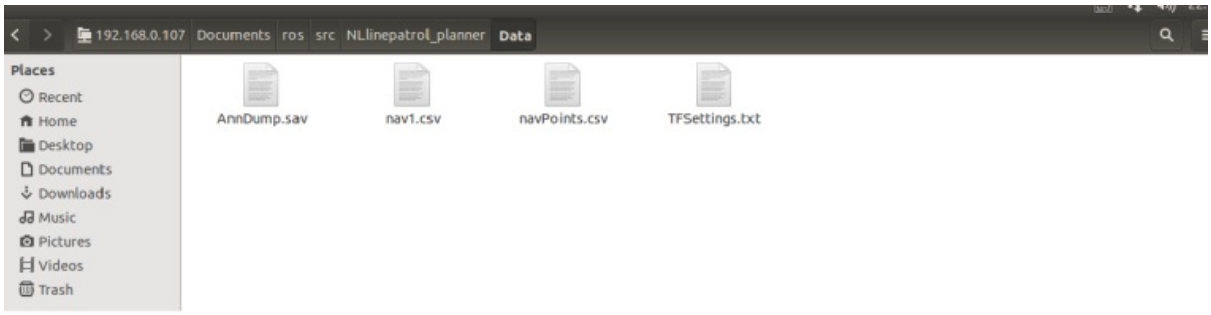
Xiaoqiang tutorial (19) usage of NLlinepatrol_planner

Xiaoqiang Homepage

The `NLlinepatrol_planner` included with Xiaoqiang's host is a global path planner for visual navigation. According to Xiaoqiang's output visual trajectory (for visual trajectory files, please refer to this post), it can output a global path link to Xiaoqiang's current position and destination target point. It will be demonstrated below using a simulation example. The main idea is: a python script publishes virtual visual odometers and related tf trees. Another python script publishes target points to the `move_base` node. Finally, the `move_base` node obtains a global path by calling `NLlinepatrol_planner` and displays it in rviz.

1. Configure NLlinepatrol_planner

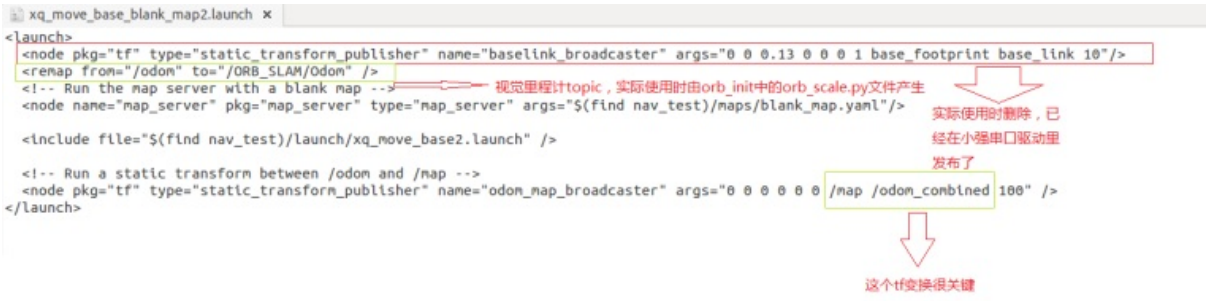
To use `NLlinepatrol_planner` , you need to provide visual trajectory file that `NLlinepatrol_planner` will read and (transformation parameters) file that is required for the coordinate transformation of the track, both files should be placed in the data folder under `NLlinepatrol_planner` , the file name is arbitrary, by configuring the related parameters in `move_base` You can specify the file that `NLlinepatrol_planner` reads, as explained below.



In the figure above, nav1.csv is the visual trajectory file and TFSettings.txt is the transformation parameter file (the first row is the 9 elements of the rotation matrix, the array elements are arranged in the row of the c language, and the second row is the xyz of the translation vector. Components, the third one is the scale factor)

2.Make a move_base launch file

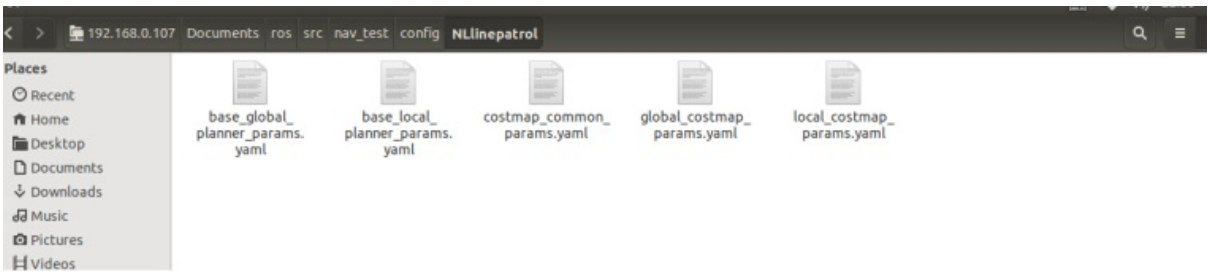
In this tutorial, we have provided the relevant launch file in the launch folder of the `nav_test` package. The file name is `xq_move_base_blank_map2.launch` . This launch file can be used as a template during actual use. Please pay attention to the following figure.



The launch file will call the `xq_move_base2.launch` file. The `xq_move_base2.launch` file is also in the current directory. The contents are as follows:

```
<launch>
    <node pkg="move_base" type="move_base" respawn="false" name="move_base" output="screen"
>
    <param name="base_global_planner" value="NLlinepatrol_planner/NLlinepatrolPlanner"/>
    <rosparam file="$(find nav_test)/config/NLlinepatrol/costmap_common_params.yaml" comma
nd="load" ns="global_costmap" />
    <rosparam file="$(find nav_test)/config/NLlinepatrol/costmap_common_params.yaml" comma
nd="load" ns="local_costmap" />
    <rosparam file="$(find nav_test)/config/NLlinepatrol/local_costmap_params.yaml" command
="load" />
    <rosparam file="$(find nav_test)/config/NLlinepatrol/global_costmap_params.yaml" comma
nd="load" />
    <rosparam file="$(find nav_test)/config/NLlinepatrol/base_local_planner_params.yaml" c
ommand="load" />
    <rosparam file="$(find nav_test)/config/NLlinepatrol/base_global_planner_params.yaml"
command="load" />
  </node>
</launch>
```

Through the above, it is found that by setting the value of the `base_global_planner` parameter to specify the global path planner as `NLlinepatrol_planner`, it can also be seen that the other parameter configuration files of move_base are stored in the `config/NLlinepatrol` path in the nav_test package.



For the above image, the file we need to change is `base_global_planner_params.yaml`, because the contents of this file correspond to the parameters actually loaded by the `NLlinepatrol_planner` runtime. The default content is as follows:

```
NLlinepatrolPlanner:
    DumpFileName: AnnDump.sav
    strTFParsFile: TFSettings.txt
    TxtFileName: nav1.csv
    ANN_Dump_Bool: false
```

```
    connect_distance: 0.3
```

TxtFileName specifies the name of the loaded visual track file, strTFParsFile specifies the name of the loaded transformation parameter file, and connect_distance sets the maximum distance between the connected points in the visual track file. (The distance between two points after the coordinate transformation is smaller than the value is considered as There is no obstacle between the two points, you can directly connect), ANN_Dump_Bool value is false to load the trajectory and transformation parameters from the txt file, if it is true then load from the dump file specified by the DumpFileName parameter (When using the same visual track file multiple times , start from the dump file after the second time can be accelerated)

3. Start using after configuration

A. Because we are virtual running this time, some of the published topics are of no practical significance but conflict with Xiaoqiang's default ROS driver. So now we need to stop all ROS running instances.

```
sudo service startup stop
roscore
```

B. Start virtual topic and Xiaoqiang model files

```
rosrun orb_init temp.py // Publish odom
roslaunch xiaoqiang_udrf xiaoqiang_udrf.launch // Start the model
```

C. Launch the xq_move_base_blank_map2.launch file produced above

```
roslaunch nav_test xq_move_base_blank_map2.launch
```

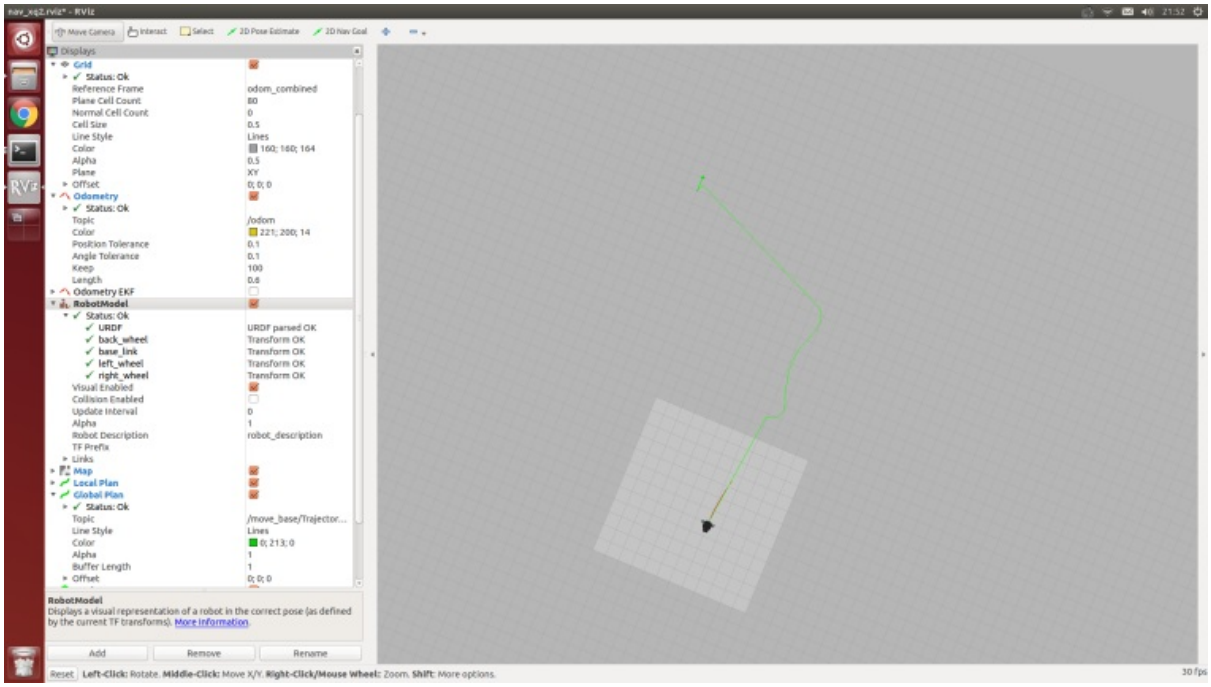
D. Start rviz and open the ros/src/nav_test/config/nav_xq2.rviz configuration file

```
rviz
```

E. Launch virtual goal publishing node (based on squre.py modification in inertial navigation)

```
rosrun nav_test NLlinepatrol.py
```

4. Now that the target global path trajectory (green line) has appeared in rviz and you want to test other goal targets, modify the code in NLlinepatrol.py.



Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (20) get vision odometer and display the xiaoqiang track in the rviz

Xiaoqiang Homepage

1.Local ssh preparation section (Xiaoqiang host is the controlled end, local refers to remote control end)

ssh remote login Xiaoqiang host, the following operation is entered in this ssh window if without special statement

```
ssh xiaoqiang@xxx.xxx.xxx.xxx
# Please replace xxx.xxx.xxx.xxx with Xiaoqiang's current actual ip address
# Start multi-window manager
screen
```

Screen usage please refer to this tutorial

Check if the `orb_init` package has installed

```
rospack find orb_init
```

Delete if it exists

```
cd ~/Documents/ros/src
rm -r orb_init
```

Download the latest version of orb_init from the Bluewhale Open Source Software Store and install it

```
cd ~/Documents/ros/src
git clone https://github.com/BlueWhaleRobot/orb_init.git
```

Check whether startup task is running

```
sudo service startup status
```

If runing is displayed, it means normal. If stopped is displayed, then restart it

```
sudo service startup start
# If you want to close this task, you can use this command
sudo service startup stop
```

Check system status

```
rostopic echo /system_monitor/report
```

If it is normal, the display is as follows

```
imageStatus: True
odomStatus: True
orbStartStatus: False
orbInitStatus: False
orbScaleStatus: False
brightness: 0
power: 12.34432
```

If it is abnormal, restart the startup task.

```
sudo service startup restart
```

Start ORB_SLAM in another command window in screen

```
roslaunch ORB_SLAM ov2610.launch
```

Return to the previous screen window and wait for ORB_SLAM to start

```
rostopic echo /system_monitor/report
# If ORB_SLAM is started, the following is displayed
orbStartStatus: True
```

2.Native local operation section

This machine has been installed ros jade version of the robot system, the computer operating system is ubuntu14.04, ros can be installed to refer to this tutorial.

Add this machine to Xiaoqiang's ros network, open a command line terminal locally, and add Xiaoqiang's ip in the local hosts file.

```
sudo gedit /etc/hosts
Add to
xxx.xxx.xxx.xxx xiaoqiang-desktop
Save and exit
Please replace xxx.xxx.xxx.xxx with Xiaoqiang's current actual ip address
```

Join ros LAN

```
export ROS_MASTER_URI=http://xiaoqiang-desktop:11311
rostopic list
```

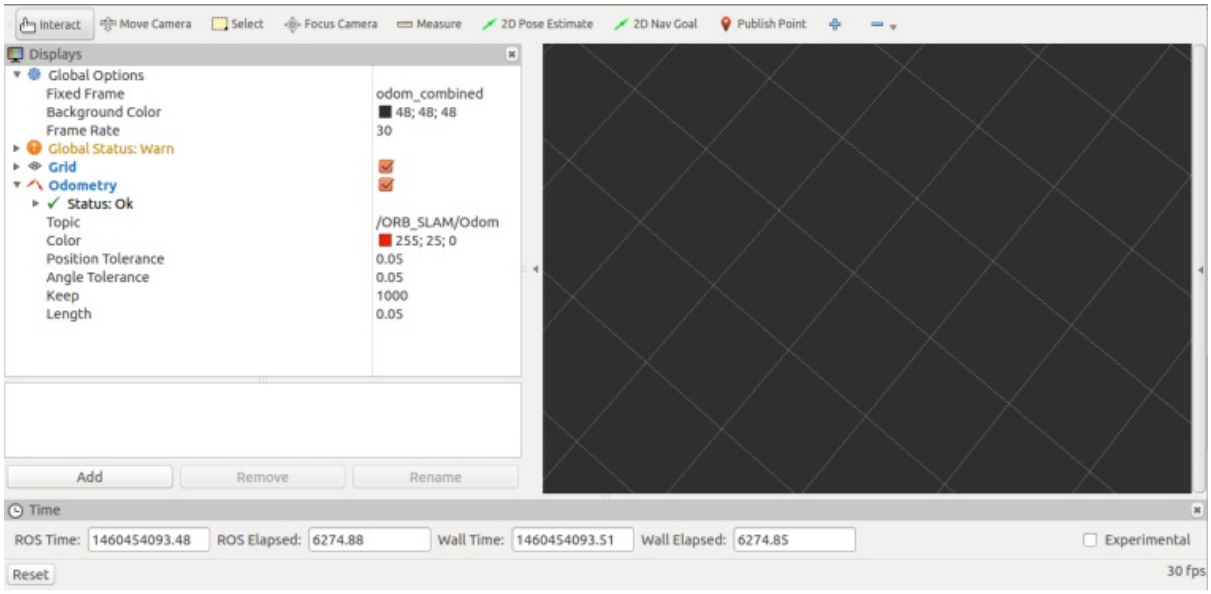
If the join is successful, the command line will output the topic on Xiaoqiang's host. For more information about setting up multiple ros machines online, please refer here.

Download the rviz configuration file. This configuration file can also be copied directly from the orb_init package on Xiaoqiang's host to view the output path of the Xiaoqiang vision system.

Enter in local command line terminal

```
rviz
```

When the window opens, click on file->open in the upper left corner and select the above downloaded configuration file. At this time the interface should appear as shown below



3.In ssh in the screen to open a new window, used to start orb_init Xiaoqiang host, before the start to ensure Xiaoqiang around two square meters of free space, Xiaoqiang will move for some time

```
rosrun orb_init orb_scale.py
```

After orb_init initialization is completed, orb_init cannot be closed. It will continue to output the visual odometer topic. This topic is the content that the local rviz needs to display. At this time, a new window is opened to check the system status.

```
rostopic echo /system_monitor/report
```

If it is normal, the display is as follows

```
imageStatus: True
odomStatus: True
orbStartStatus: True
orbInitStatus: True
orbScaleStatus: True
brightness: 0
power: 12.34432
```

At this point we have already acquired Xiaoqiang’s visual odometer

4.In ssh in the screen to open a new window, used to control Xiaoqiang move

```
rosrun nav_test control.py
```

Use the arrow keys to control the movement of Xiaoqiang. Spacebar is stopped. Ctrl + C exits the program.

5.As Xiaoqiang moves, the rviz interface on the local machine will be updated to show Xiaoqiang's trajectory in real time. Our own test video is here. For more information on how to use rviz, see here.

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (21) get USB camera 30fps 1080p image stream and 120fps VGA resolution image stream

Xiaoqiang Homepage

Xiaoqiang's default USB camera node publishes a 30fps VGA (640*480) image stream that can satisfy most visual tasks. The USB camera hardware can actually output 120fps VGA image stream and up to 30fps 1080p image stream. This article will introduce how to obtain these two type of the image.

1.Upgrade usb_cam node source code

Taking into account the USB2.0 bandwidth, output 120fps VGA video and 30fps 1080p video, need to use mjpeg format. For Xiaoqiang's own USB camera ROS driver package usb_cam, it can not read Xiaoqiang usb camera in mjpeg way, so we need to upgrade usb_cam first. For the upgrade method, please refer to this post

2.Test 120fps VGA video output

First please turn off Xiaoqiang's startup task

```
sudo service startup stop
```

Modify the contents of the `ov2610mjpg.launch` file in the usb_cam package as shown below

```
<launch>
  <node name="camera_node" pkg="usb_cam" type="usb_cam_node">
    <param name="video_device" value="/dev/video0" />
    <param name="image_width" value="640" />
    <param name="image_height" value="480" />
    <param name="framerate" value="120" />
    <param name="pixel_format" value="mjpeg" />
    <param name="camera_frame_id" value="ov2610" />
    <param name="io_method" value="mmap"/>
  </node>
</launch>
```

Launch the above launch file

```
roslaunch usb_cam ov2610mjpg.launch
```

Open a new window to print the published image topic frame rate

```
rostopic hz /camera_node/image_raw
```

Normal output similar to the following figure

```
subscribed to [/camera_node/image_raw]
average rate: 99.497
    min: 0.004s max: 0.016s std dev: 0.00246s window: 98
average rate: 99.324
    min: 0.004s max: 0.016s std dev: 0.00240s window: 198
average rate: 99.385
    min: 0.004s max: 0.016s std dev: 0.00236s window: 297
average rate: 99.247
    min: 0.004s max: 0.016s std dev: 0.00236s window: 396
average rate: 99.302
    min: 0.004s max: 0.016s std dev: 0.00232s window: 495
average rate: 99.296
    min: 0.004s max: 0.016s std dev: 0.00231s window: 595
average rate: 99.249
    min: 0.004s max: 0.016s std dev: 0.00230s window: 694
```

The above output shows that the camera frame rate is about 99fps and does not reach 120fps. This is due to the influence of ambient light, which can reach 120 frames if the ambient light is sufficient.

2.Test 1080p video output at 30fps

First please stop Xiaoqiang's startup service

`sudo service startup stop`

Modify the contents of the `ov2610mjpg.launch` file in the usb_cam package as shown below.

```
<launch>
  <node name="camera_node" pkg="usb_cam" type="usb_cam_node">
    <param name="video_device" value="/dev/video0" />
    <param name="image_width" value="1920" />
    <param name="image_height" value="1080" />
    <param name="framerate" value="30" />
    <param name="pixel_format" value="mjpeg" />
    <param name="camera_frame_id" value="ov2610" />
    <param name="io_method" value="mmap"/>
  </node>
</launch>
```

Launch the above launch file

```
roslaunch usb_cam ov2610mjpg.launch
```

Open a new window to print the published image topic frame rate.

```
rostopic hz /camera_node/image_raw
```

Normal output similar to the following figure.

```
xiaoqiang@xiaoqiang-desktop:~$ rostopic hz /camera_node/image_raw
subscribed to [/camera_node/image_raw]
average rate: 29.986
    min: 0.028s max: 0.039s std dev: 0.00318s window: 30
average rate: 29.917
    min: 0.028s max: 0.039s std dev: 0.00296s window: 59
average rate: 29.912
    min: 0.028s max: 0.039s std dev: 0.00292s window: 89
average rate: 29.853
    min: 0.027s max: 0.042s std dev: 0.00308s window: 119
average rate: 29.874
    min: 0.027s max: 0.042s std dev: 0.00283s window: 149
average rate: 29.839
    min: 0.027s max: 0.042s std dev: 0.00282s window: 179
average rate: 29.849
    min: 0.027s max: 0.042s std dev: 0.00282s window: 202
```

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (22) Operating 6 DOF robotic arm

Xiaoqiang Homepage

6 degrees of freedom robot arm resources. Please read the serial communication protocol of the secondary development part in the resources. Although the following is the usb hid communication method, the command format is the same.

The following will operate the 6-DOF arm to complete the 3 sets of actions stored on the main control board.

Control principle: Xiaoqiang host uses the usb to connect the robot master control board, user sends a topic named `robot_arm/cmdstring` , this topic content is the control command, and the robot_arm node is responsible for sending the topic content to the master control board of the robot arm via USB protocol.

1. Run the robot_arm node

```
rosrun robot_arm move.py
```

If the result is normal, the robot arm will perform action 0 (the default state), and the command window will show the following

```
xiaoqiang@xiaoqiang-desktop:~/Documents/ros$ rosrun robot_arm move.py
Opening robot arm device
Manufacturer: MyUSB_HID
Product: LOBOT
Serial No: 8D9823654852
Run the zero group action
```

2. Construct robot_arm/cmdstring topic

`robot_arm/cmdstring` This topic type is `std_msg/String` . According to the secondary development data of the robot arm provided above, we can know that the 6-DOF control protocol is represented by an unsigned byte array. Therefore, we slightly modify it here to directly convert the hex value of this array into a string. Packaged into the topic command. The transformation method uses the byte array representation of python to string together the hex encodings of each element in the array, and then replace 0x with \x

```
# E.g: [0x55,0x55,0x05,0x06,0x00,0x01,0x00] This control command array, converted to robot
_arm/cmdstring content is '\x55\x55\x05\x06\x00\x01\x00'
# Tip: If you don't understand it, you can use Python's map function to help convert it.
map(ord,'\x55\x55\x05\x06\x00\x01\x00')
```

We want to control the robot arm to complete 3 actions. The contents of these three strings are as follows:

```
'\x55\x55\x05\x06\x00\x01\x00'

'\x55\x55\x05\x06\x01\x01\x00'

'\x55\x55\x05\x06\x02\x01\x00'
```

3. Publish motion commands

Open a new terminal, because it is a demonstration, so we directly using the pub function of rostopic, the above string command packaged into a topic sent to the robot_arm node

```
# Action 1:
rostopic pub robot_arm/cmdstring std_msgs/String '\x55\x55\x05\x06\x00\x01\x00'
# Action 2:
rostopic pub robot_arm/cmdstring std_msgs/String '\x55\x55\x05\x06\x01\x01\x00'
# Action 3:
rostopic pub robot_arm/cmdstring std_msgs/String '\x55\x55\x05\x06\x02\x01\x00'
```

4. There is no video for the sport result, you need to operate it yourself. If you feel unsatisfactory with the movement, please refer to our servo control posts: 电机控制与缓动函数

Xiaoqiang Homepage Back To Index

xiaoqiang tutorial (23) ROS introductions

Xiaoqiang Homepage

Learning ROS for Robotics Programming - Second Edition.pdf

This tutorial is very basic, although the book uses hydro as an example, but also fully compatible with the kinetic version. Just replace the hydro string in the code example in the book with kinetic. After completing the Xiaoqiang tutorial (1), if you are not familiar with ROS, please read Chapters 2 and 3 of this book.

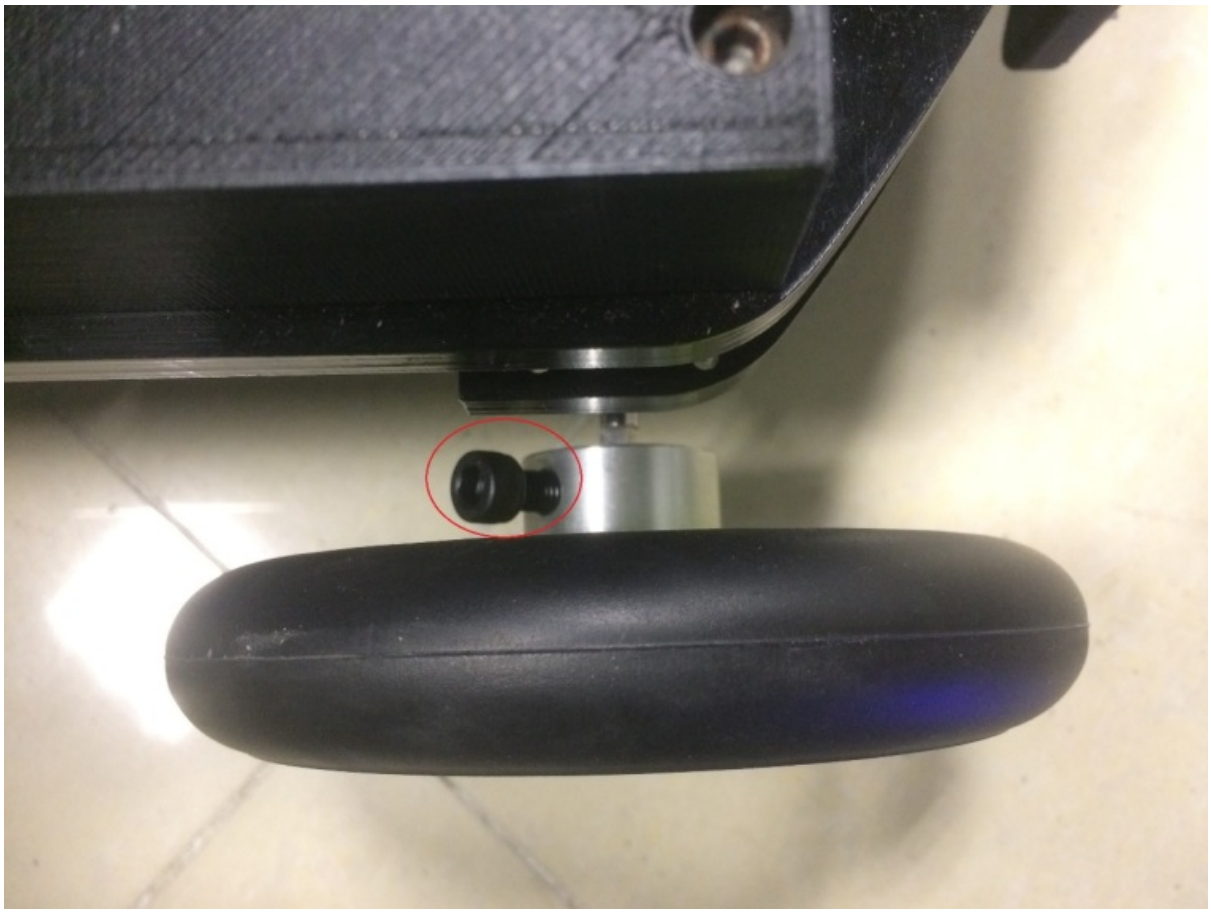
Xiaoqiang Homepage Back To Index

Daily maintenance instructions

Charging instructions

After disconnecting the battery from the chassis, charge it with the dedicated battery charger. It takes about 5 hours to fully charge the battery, and the indicator will change from red to blue when full. The two output wires of the battery are connected in parallel, so both heads can be used for charging and discharging (the charger has only one male), and the battery supports simultaneous charge and discharge

Wheel loosening solution



Solution: Re-tighten the screws in the figure above

Xiaoqiang Bottom Driver Firmware Download and Upgrade Methods

Users received Xiaoqiang after March 11, 2017. Please refer to this post to upgrade the firmware. If you cannot upgrade, please ask for customer service before using the following method. Manually upgrade risk, please consult customer service before operation.

Xiaoqiang v4_3.hex ,Right click "Save As..." and download it as xiaoqiang.hex

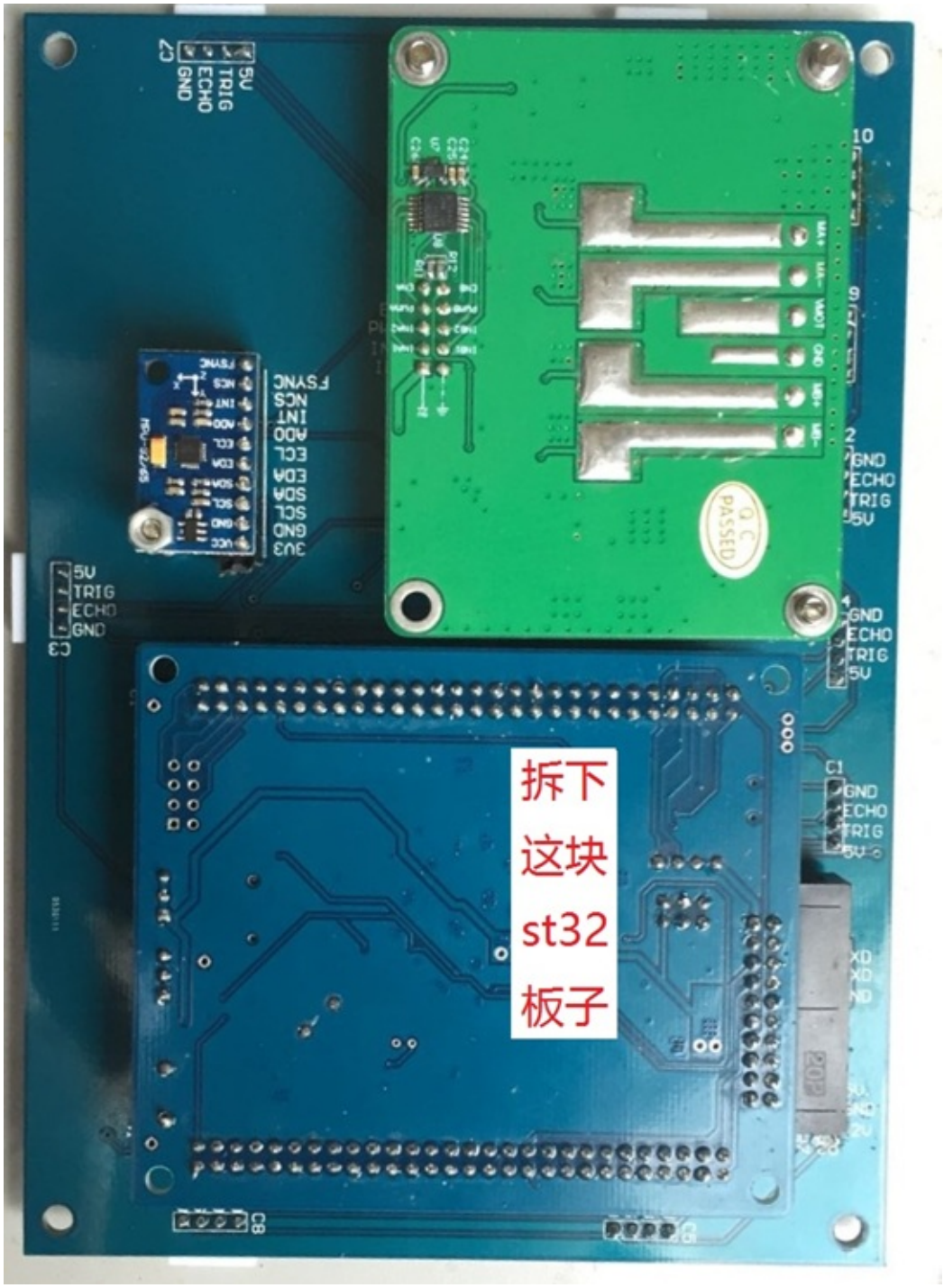
The firmware is an ordinary hex file and supports any stm32 downloader. After stm32 is burned, please complete the host computer update operation according to the upgrade chassis ros driver package xqserial_server. Finally recalibrate the chassis IMU according to this tutorial.

The following describes the use of Xiaoqiang's own method of using USB to serial port to write stm32. After this upgrade, you can use the simple upgrade method in this post.

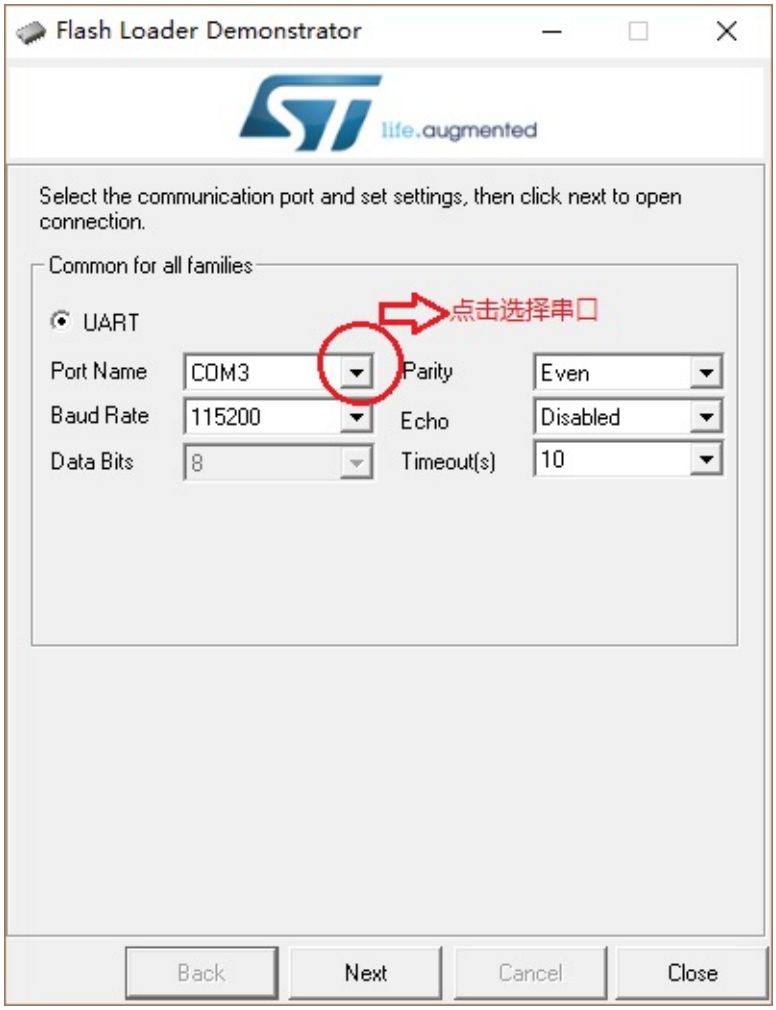
1. Find a Windows computer, download and install this stm32flash software

flash_loader_demo_v2.8.0.exe , right click "Save as..." to start download

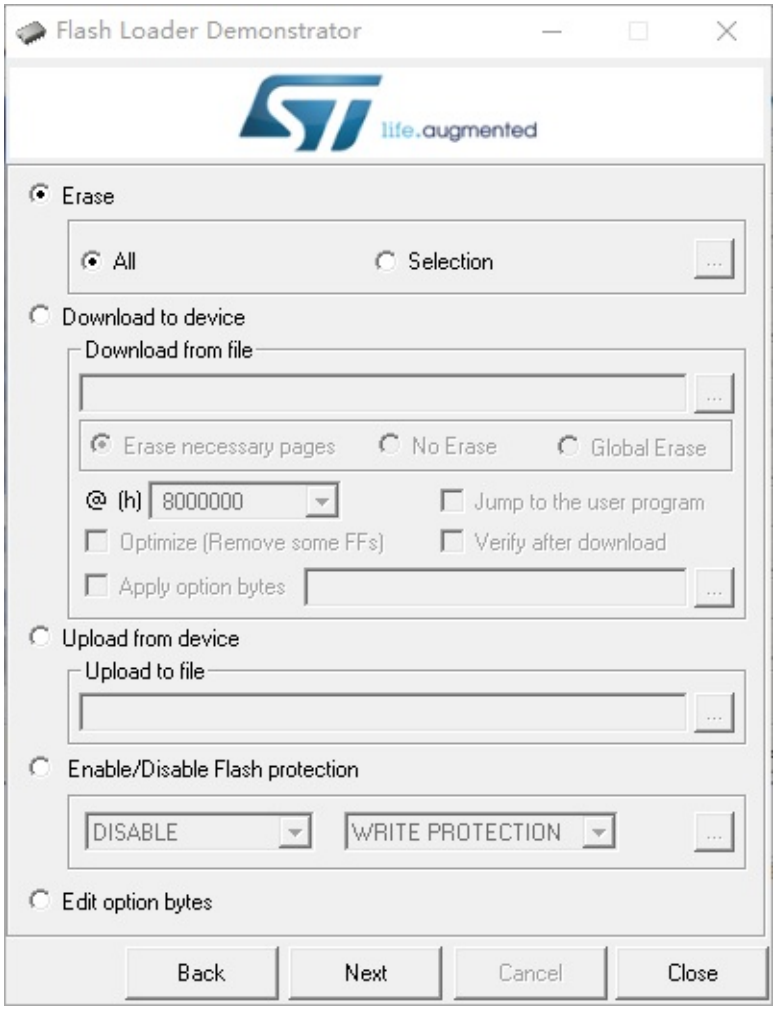
1. After power off the chassis, remove the VMOT GND wire on the middle of the green motor driver board, slowly pull out the stm32 core board on the chassis, and then adjust the two short caps on the board according to the following figure.


拆下
这块
st32
板子

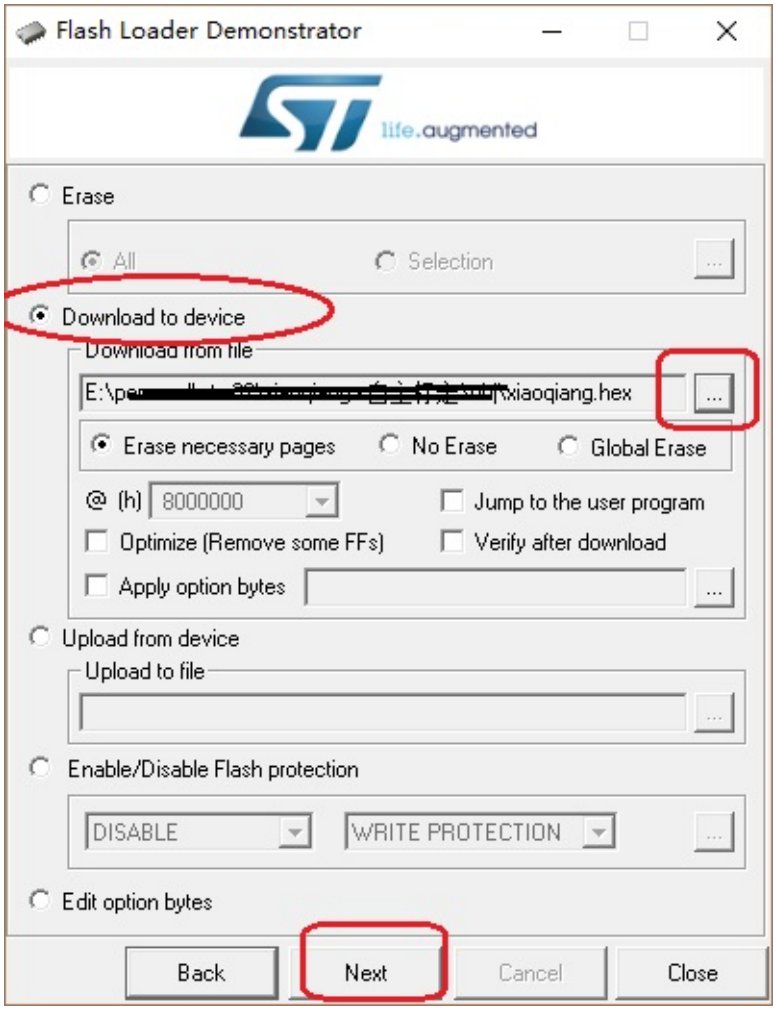
1. Insert the stm32 board after adjustment in the second step into the chassis. Note that the pins need to be fully aligned with the chassis, and then the chassis is powered on.
2. Unplug the usb head of the USB to serial port module on Xiaoqiang from the host computer and insert it into the windows computer. Open the Flash Loader Demo program from the Start Programs menu. All Programs->STMicroelectronics->Demonstrator GUI, the following interface appears.



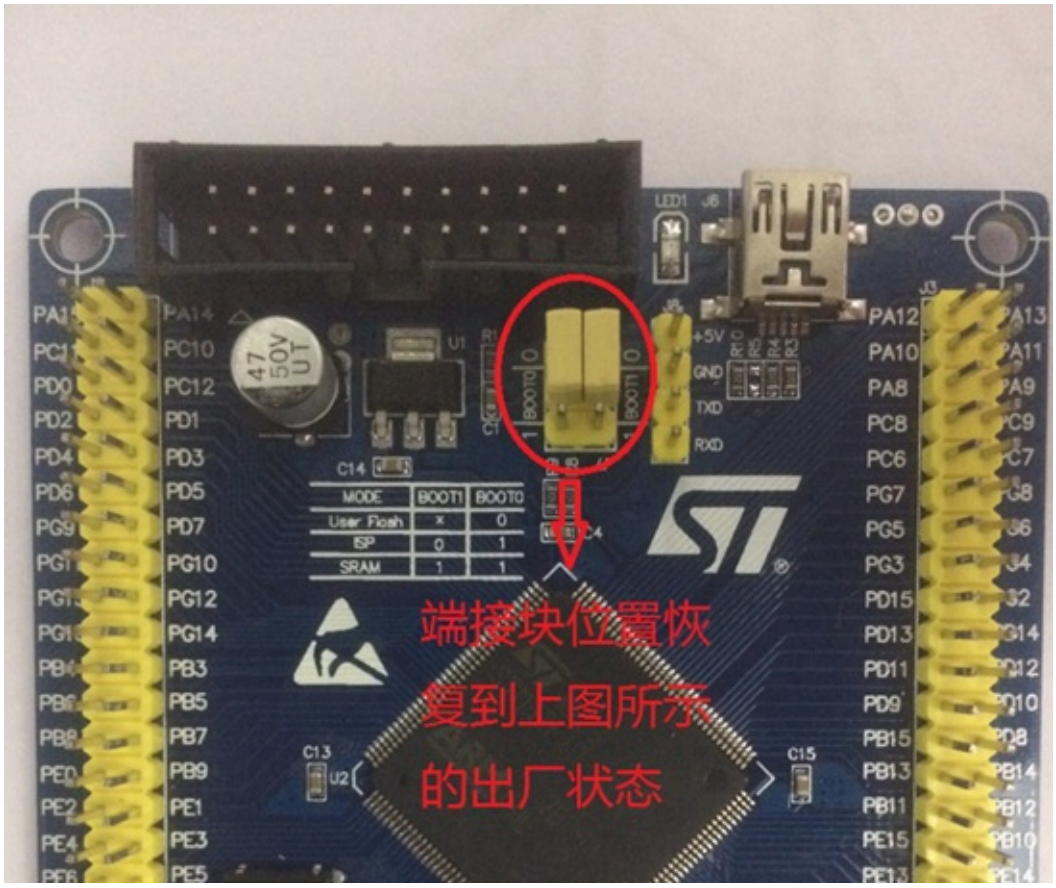
1. Select the default settings, always point next (If you click next failure, re-power the chassis and try again), the following interface appears：



1. Select Download to device, select the hex file provided above, click Next to start the download.


Flash Loader Demonstrator
life.augmented
Erase
All
Selection
Download to device
Download from file
xiaoqiang.hex
Erase necessary pages
No Erase
Global Erase
@ (h)
8000000
Jump to the user program
Optimize (Remove some FFs)
Verify after download
Apply option bytes
Upload from device
Upload to file
Enable/Disable Flash protection
DISABLE
WRITE PROTECTION
Edit option bytes
Back
Next
Cancel
Close

1. After the burning is completed, please close the software, power off the chassis, and insert USB to serial port back to Xiaoqiang's host computer.
2. Slowly unplug the stm32 core board on the chassis again, adjust the two shorting caps on the board back to the initial state, insert it back into the chassis (pins need to be fully aligned with the insertion base), the green motor driver board The middle "VMOT GND" wiring is plugged in, stm32 upgrade is completed!



1. Chassis re-powered, according to the tips at the beginning of the article to complete the upgrade of the host computer.

Upgrade chassis ros driver package xqserial_server

1.ssh login Xiaoqiang host, enter Xiaoqiang ros working directory

```
ssh xiaoqiang@192.168.xxx.xxx   #请将xxx.xxx换成实际ip
cd Documents/ros/src/
```

1. Enter ros driver package xqserial_server, update software

```
cd xqserial_server/
git stash
git pull
cd ..
cd ..
catkin_make
```

1. Restart ros node, update completed

```
sudo service startup stop
sudo service startup start
```

Recalibrate the chassis IMU

Sorry: This tutorial is for users who purchased after September 2016

Applicable situation:

Before shipment, each chassis IMU has been calibrated, and theoretically normal use does not require recalibration. If after a long period of use of the chassis, it is found that the odom angle at the output of the chassis begins to have a serious flow, follow the steps below to recalibrate the chassis IMU.

Steps:

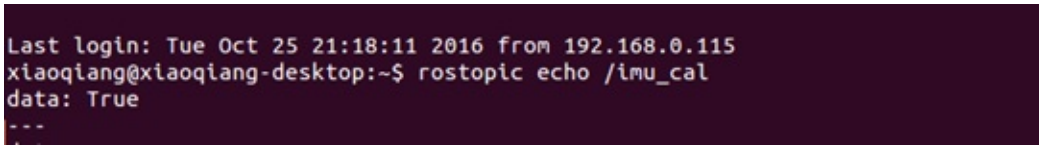
1. Place the chassis horizontally stationary, the following calibration process can not move or hit the chassis.
2. In the local virtual machine ssh login, enter the following command.

```
ssh xiaoqiang@192.168.0.xxx   -X
rostopic echo /imu_cal
```

1. Open a new window in the local virtual machine and login to the host again. Enter the following command:

```
ssh xiaoqiang@192.168.0.xxx   -X
rostopic pub /imu_cal std_msgs/Bool '{data: true}' -1
```

1. Wait 10 seconds. When the window in step 1 shows the following figure, it indicates that the calibration procedure has been started. Please terminate the topic issue command in step 2.



1. Wait 2 minutes, IMU re-calibration is completed, now you can continue normal use without restart.

Bluewhale ROS system image released

This article lists all published Bluewhale ROS system images, users can choose according to their needs. The Bluewhale ROS system image is the image of the ROS system created by Bluewhale Robot based on Ubuntu ROS. It contains the ROS system and some common ROS packages. Ideal for ROS learning and developers. After the installation of the system is complete, you do not need to install and configure ROS. You can use it directly. The Bluewhale ROS image is also the system image of Xiaoqiang and can be installed directly on Xiaoqiang.

`Note: It's recommended to use` Vmware Player

System configuration requirements

Minimum memory 1.5G recommended 2G, storage space at least 30G.

Latest Kinetic Image

`xq_os_v2.0.8-2018-09-11.iso` (kinetic version) can be used on Xiaoqiang Pro and your own computer.
Download Address
md5: 0a2d98bbf93d9556163df26fe42a072c

`xq_os_lungu_v2.0.5_2018-7-8` (kinetic version) can be used on Xiaoqiang XQ5 and can your own computer.
Download address
md5: 6e4dda157e2b96bf271f5f4e33e181e2

`xq_os_v2.0.6_mini_2018-07-19` (kinetic version) can be used on Xiaoqiang mini and your own computer.
Download Address
md5: 8696d1e74a10123568db0dab2c6e1e01

Latest Jade Image

`xq_os_v1.0.3_2017-10-31` Can be used on Xiaoqiang Pro and your own computer
Download Address
md5: afbf1c8026733c4f8063778846c84e9b

`xq_os_v1.0.4_mini_2017-11-17` can only be used on Xiaoqiang mini
Download Address md5: e874c78088211dff3feabd92f86275e7

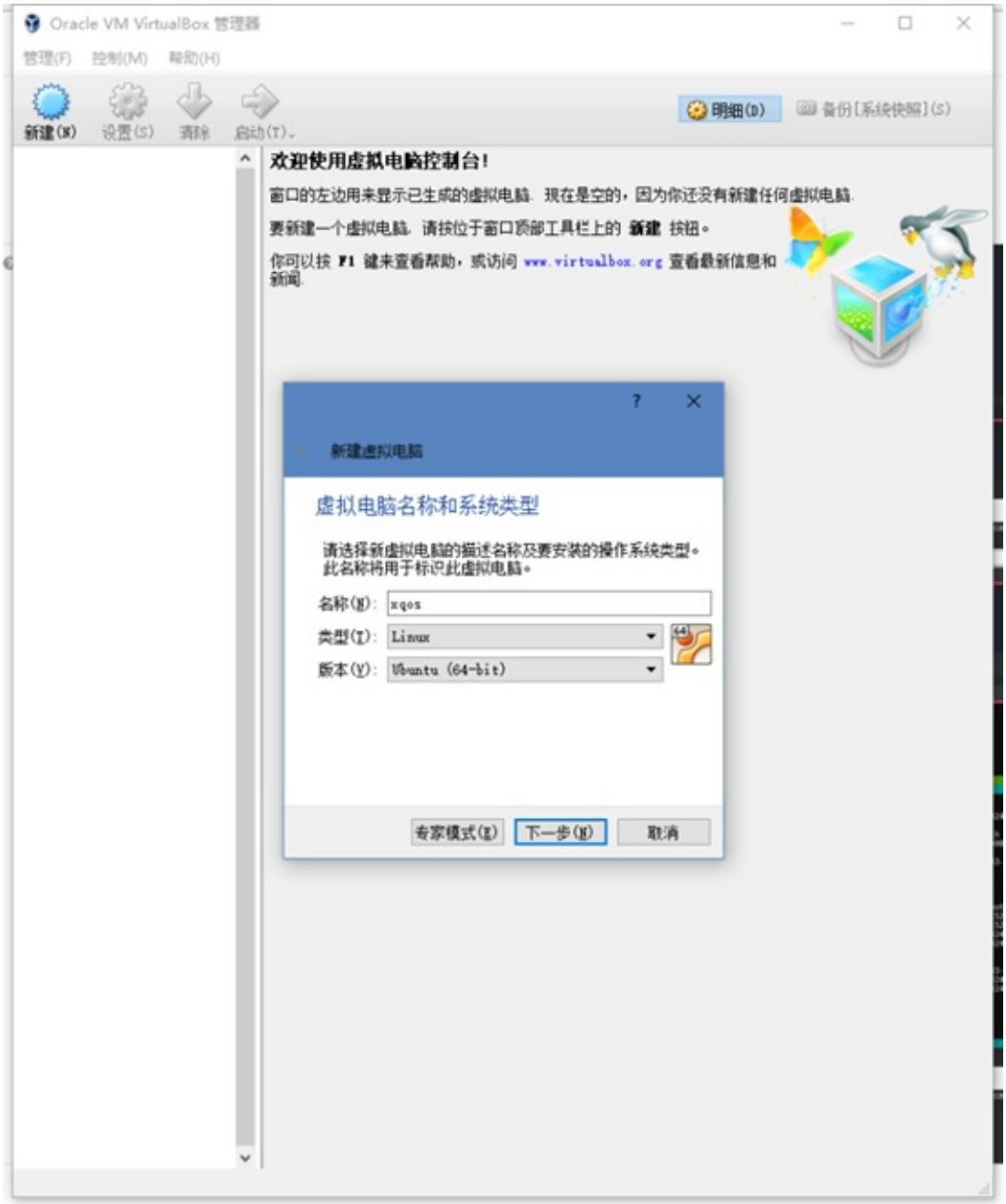
Precautions:

After the download is completed, you must check md5 to confirm the integrity of the file. Note that when installing the image, the user name can only be `xiaoqiang` , otherwise there will be problems.

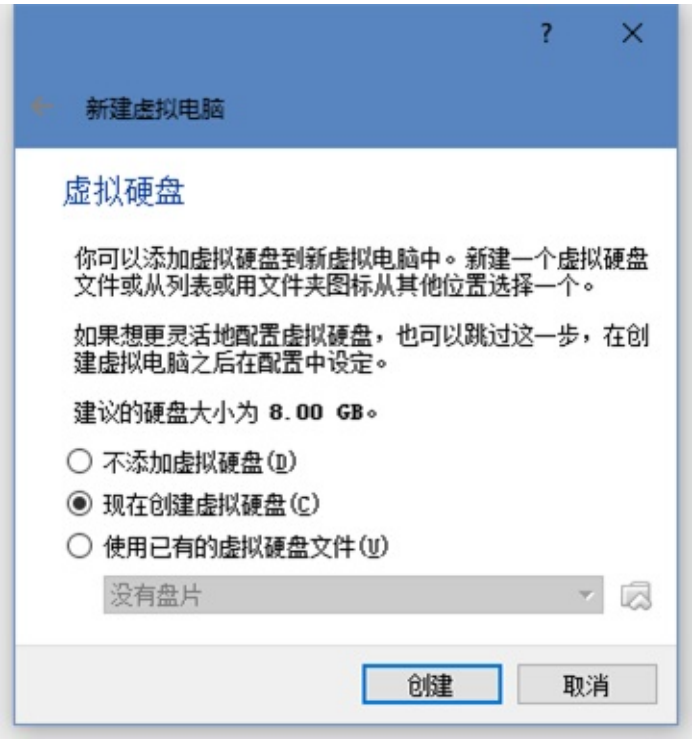
Image installation method

Install in a virtual machine

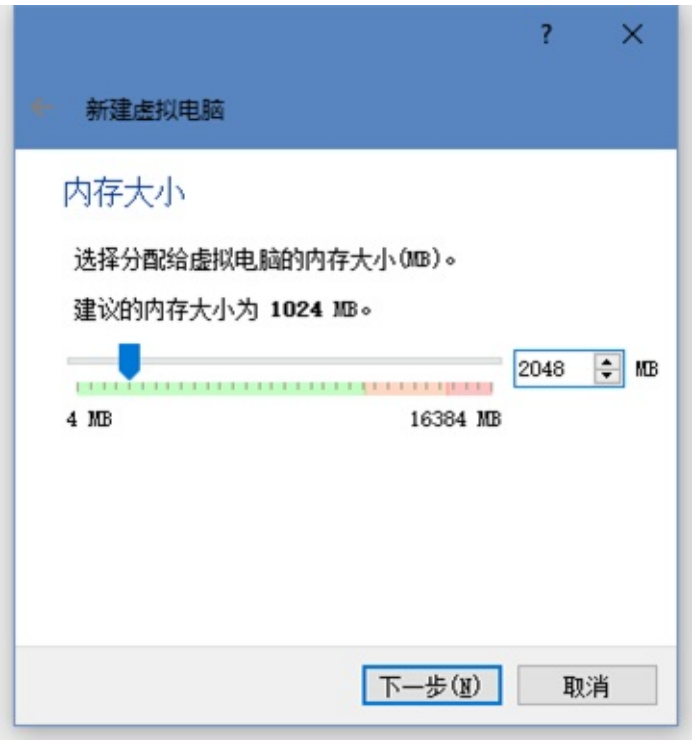
Open the virtual machine software. Download link Click the create button to start creating a virtual machine. Note: please select `Ubuntu 64` when select system.

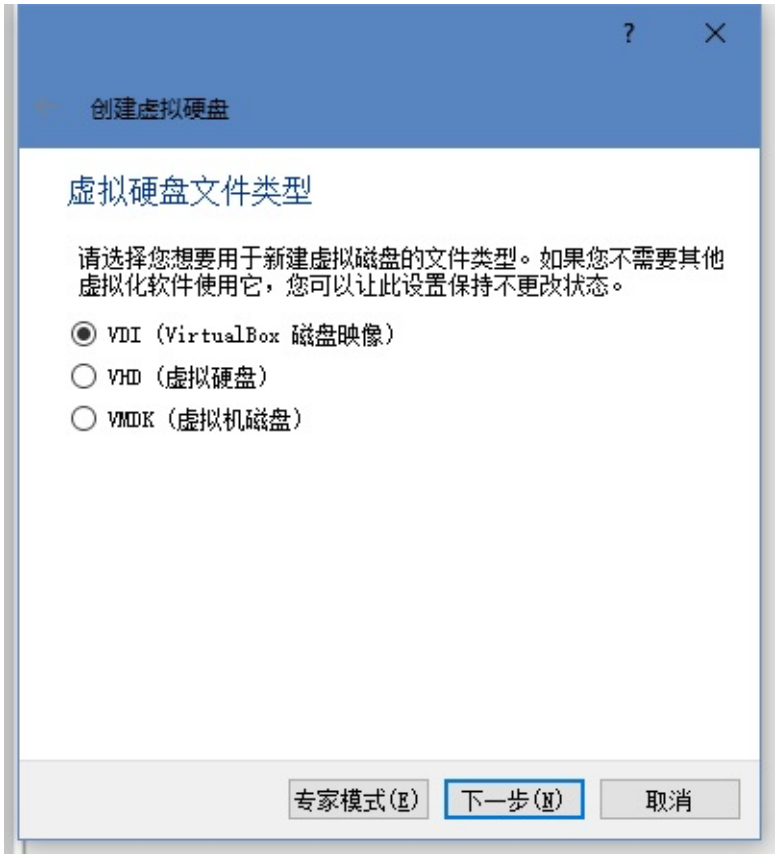


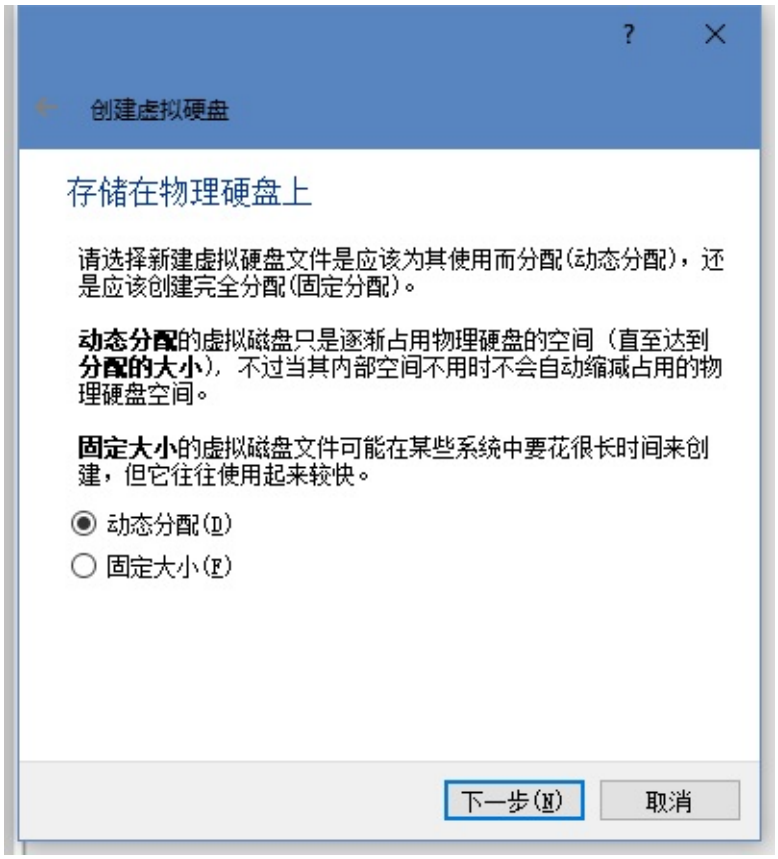
According to the settings on the image, click Next when finished.



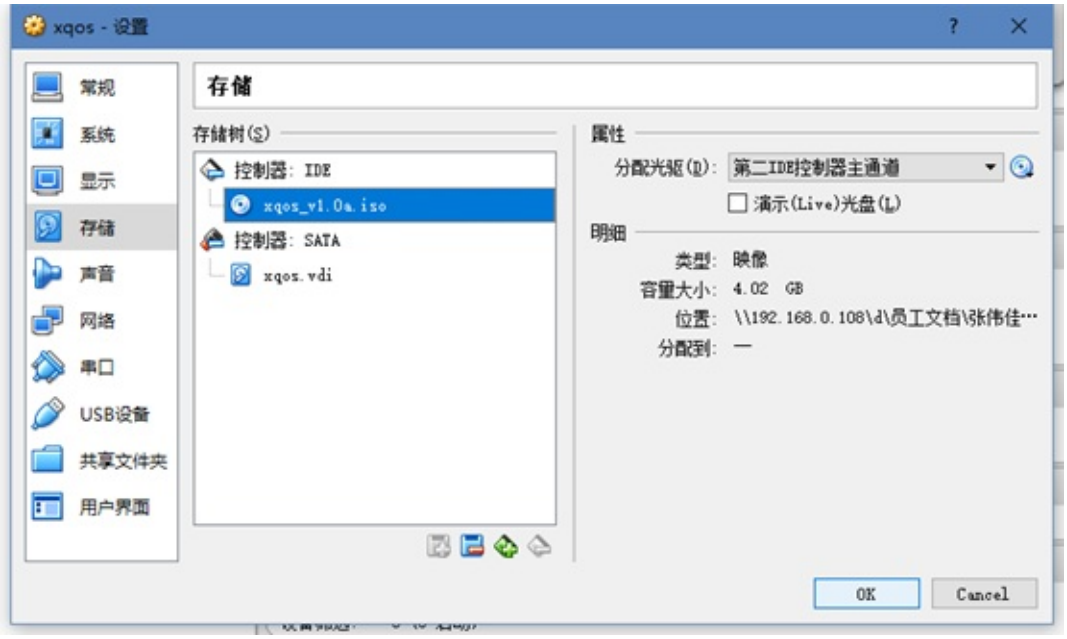
Memory is recommended to be set to 2G, if memory is too small, system may not able to start.



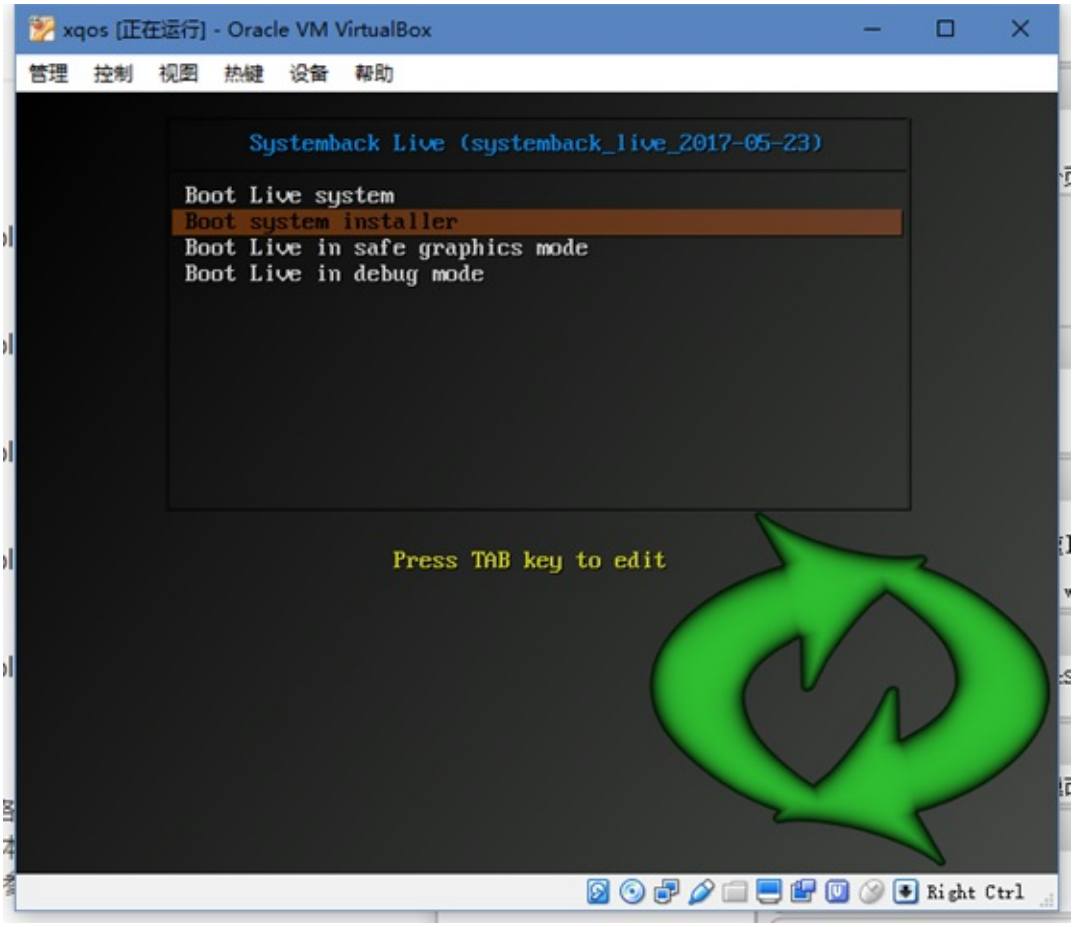

创建虚拟硬盘
虚拟硬盘文件类型
请选择您想要用于新建虚拟磁盘的文件类型。如果您不需要其他虚拟化软件使用它，您可以让此设置保持不更改状态。
VDI (VirtualBox 磁盘映像)
VHD (虚拟硬盘)
VMDK (虚拟机磁盘)
专家模式(E)
下一步(N)
取消


创建虚拟硬盘
存储在物理硬盘上
请选择新建虚拟硬盘文件是应该为其使用而分配(动态分配)，还是应该创建完全分配(固定分配)。
动态分配的虚拟磁盘只是逐渐占用物理硬盘的空间（直至达到分配的大小），不过当其内部空间不用时不会自动缩减占用的物理硬盘空间。
固定大小的虚拟磁盘文件可能在某些系统中要花很长时间来创建，但它往往使用起来较快。
动态分配(D)
固定大小(F)
下一步(N)
取消

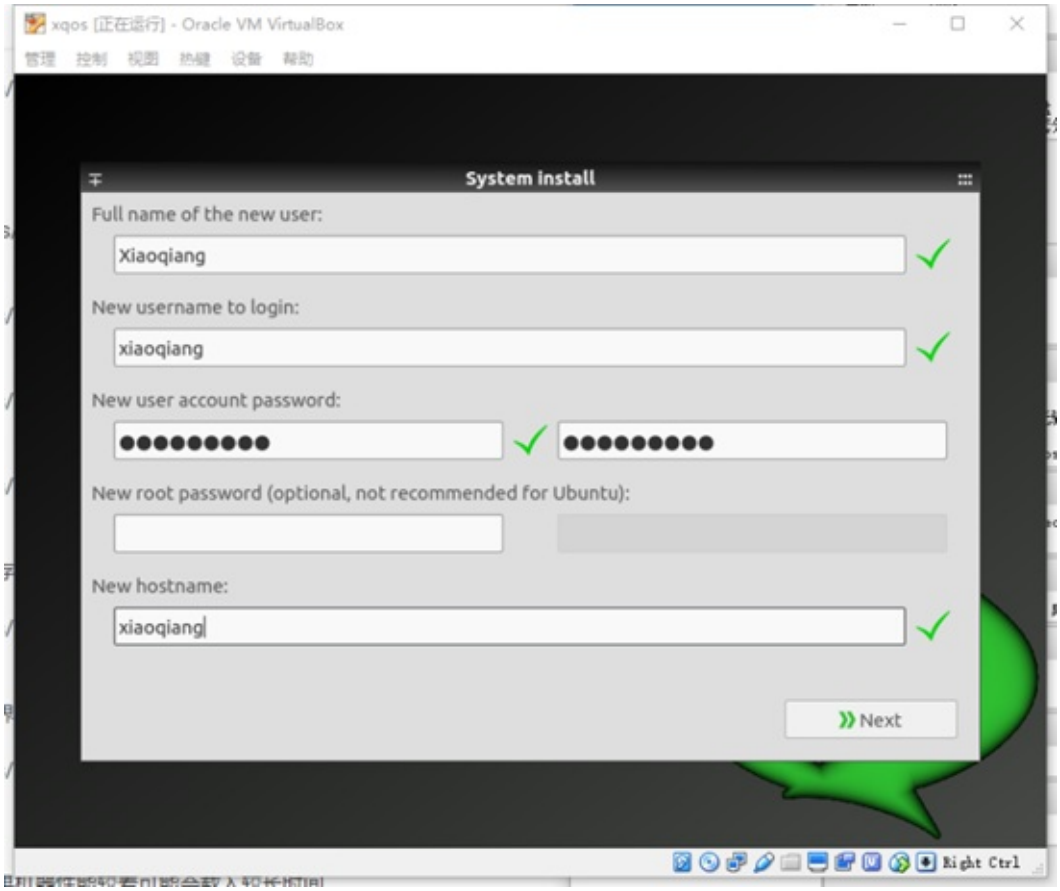
After setting is complete, click the Settings button above. In the popup dialog, select Storage. Then click the CD icon on the right of the storage interface to set the image file.



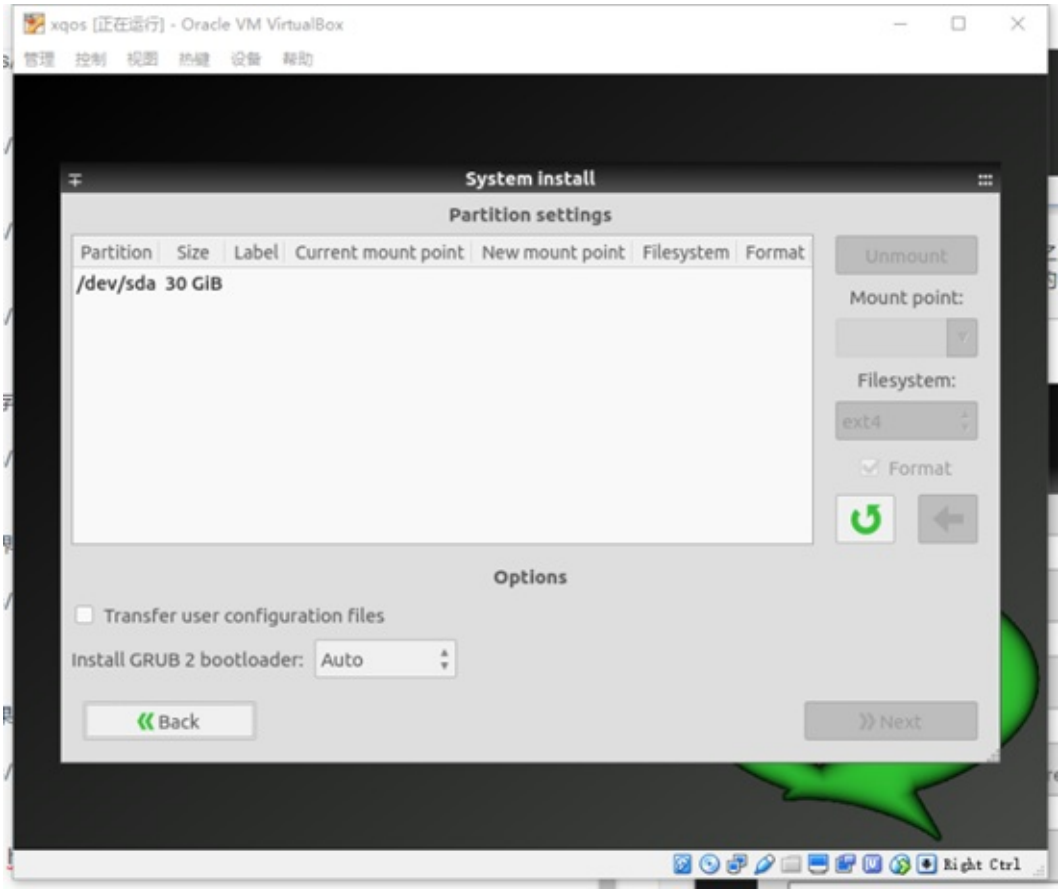
After the setting is completed, click the start button on the main screen. Waiting to load the system's selection interface.



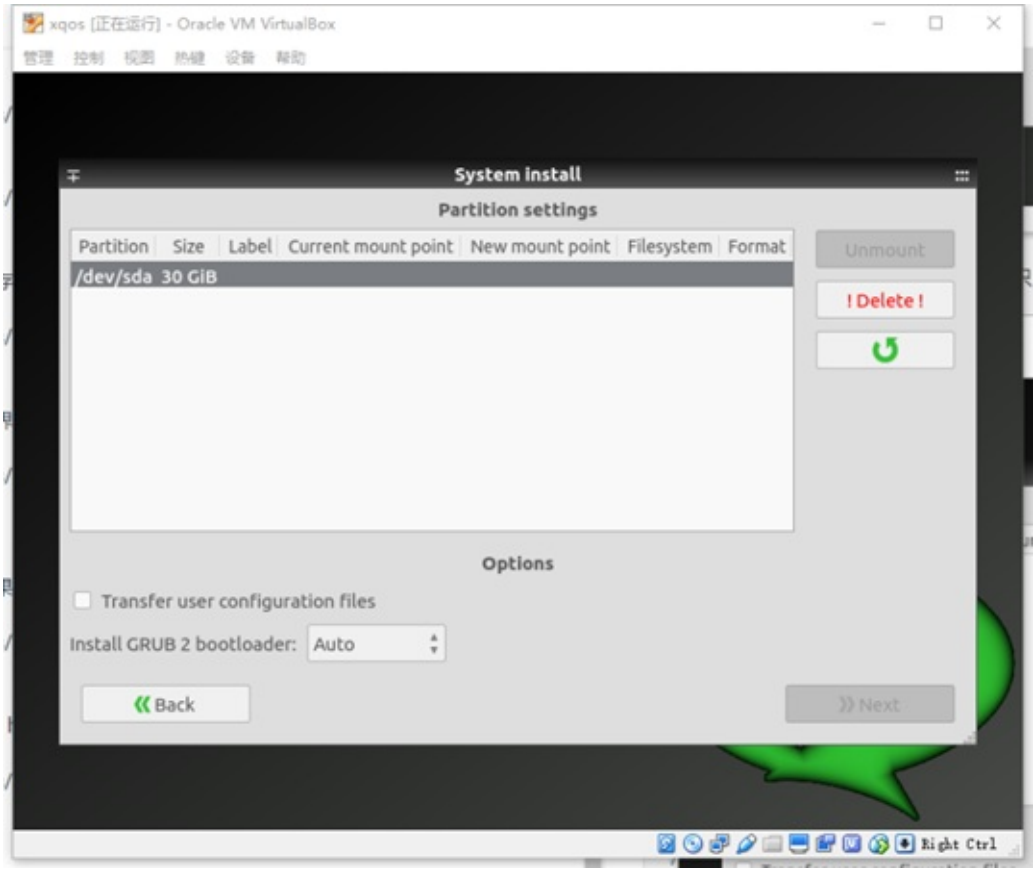
If you want to install the system, select the second option, then press Enter to confirm. Wait for the system installer to load. This process is related to your machine's performance. If the machine's performance is poor, it may take longer to load.



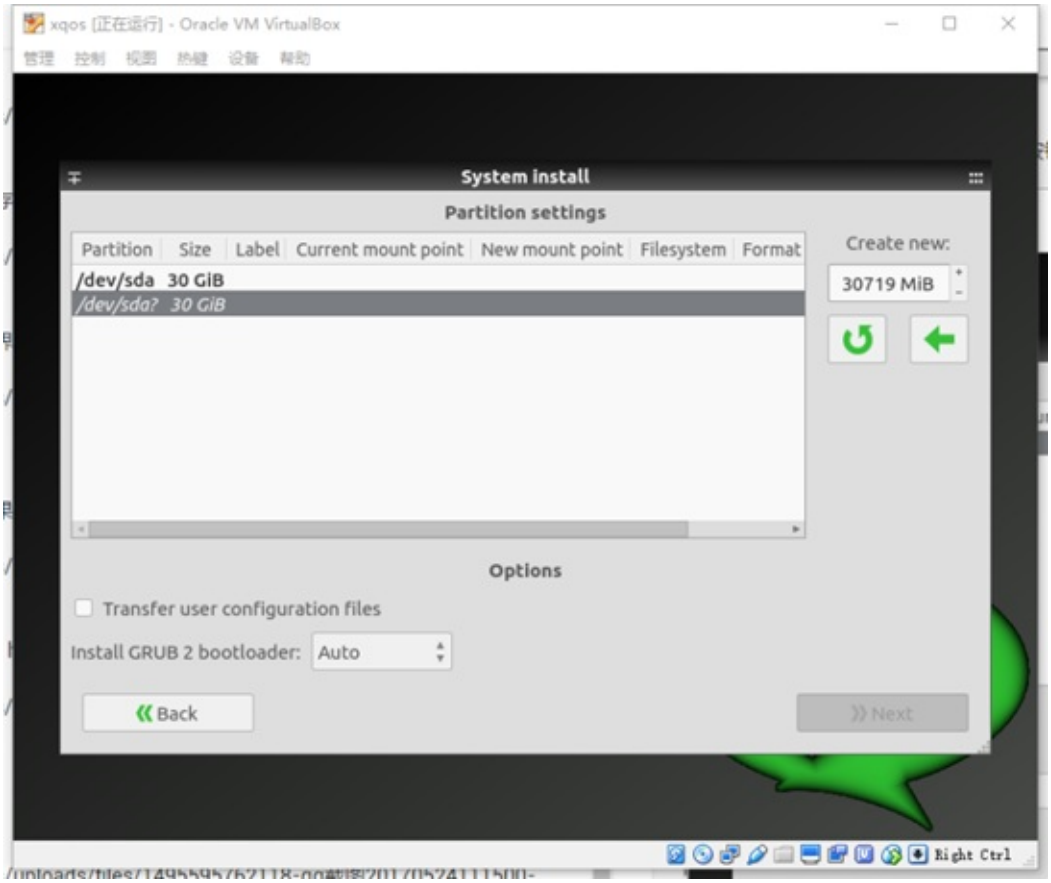
After the loading is complete, set the user information, note that the username can only be xiaoqiang, hostname can be set at will.



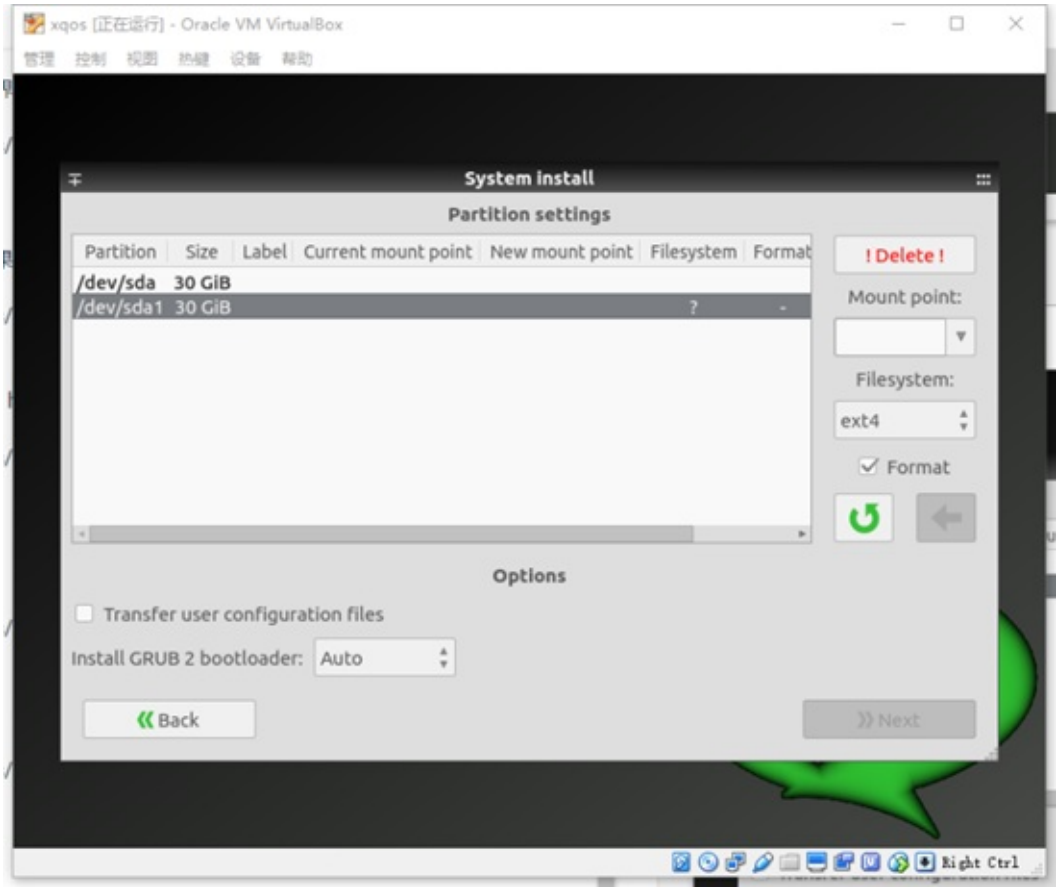
Click Next to enter the partition interface. Select the hard disk you want to install and click the Delete button.



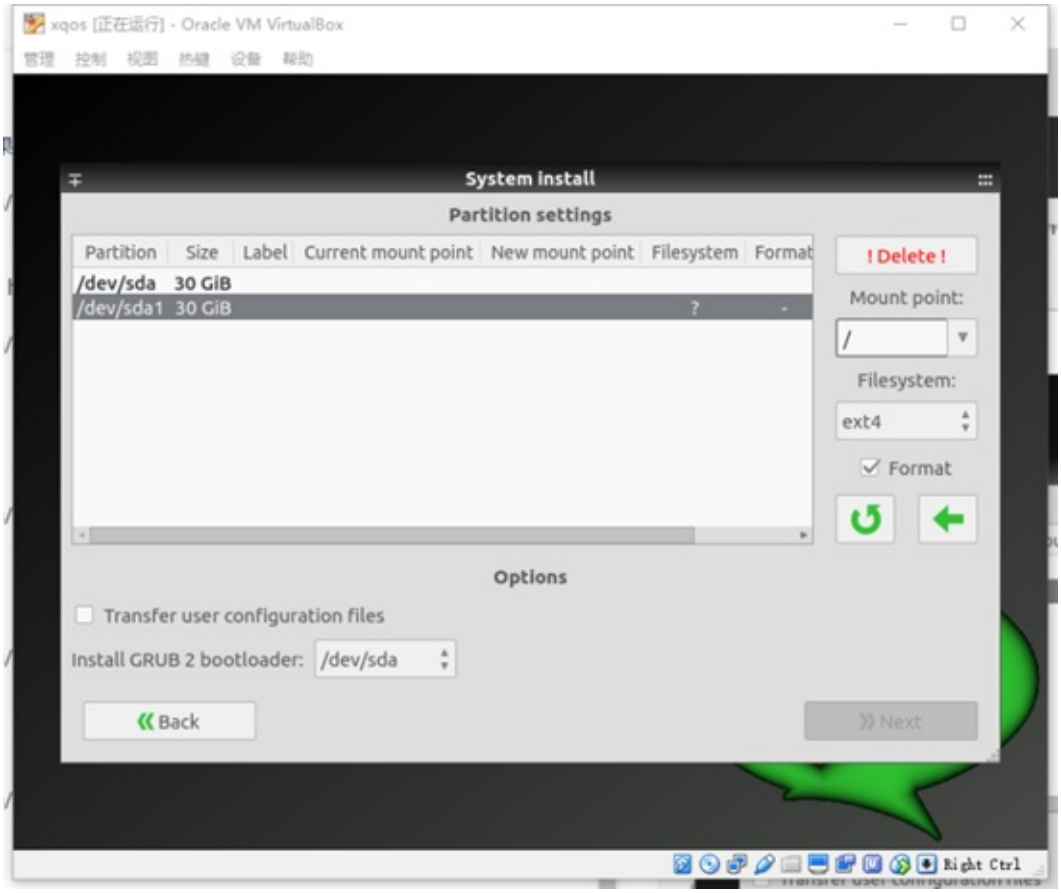
Select the new partition in the hard disk again.



Click the arrow to go to the next.

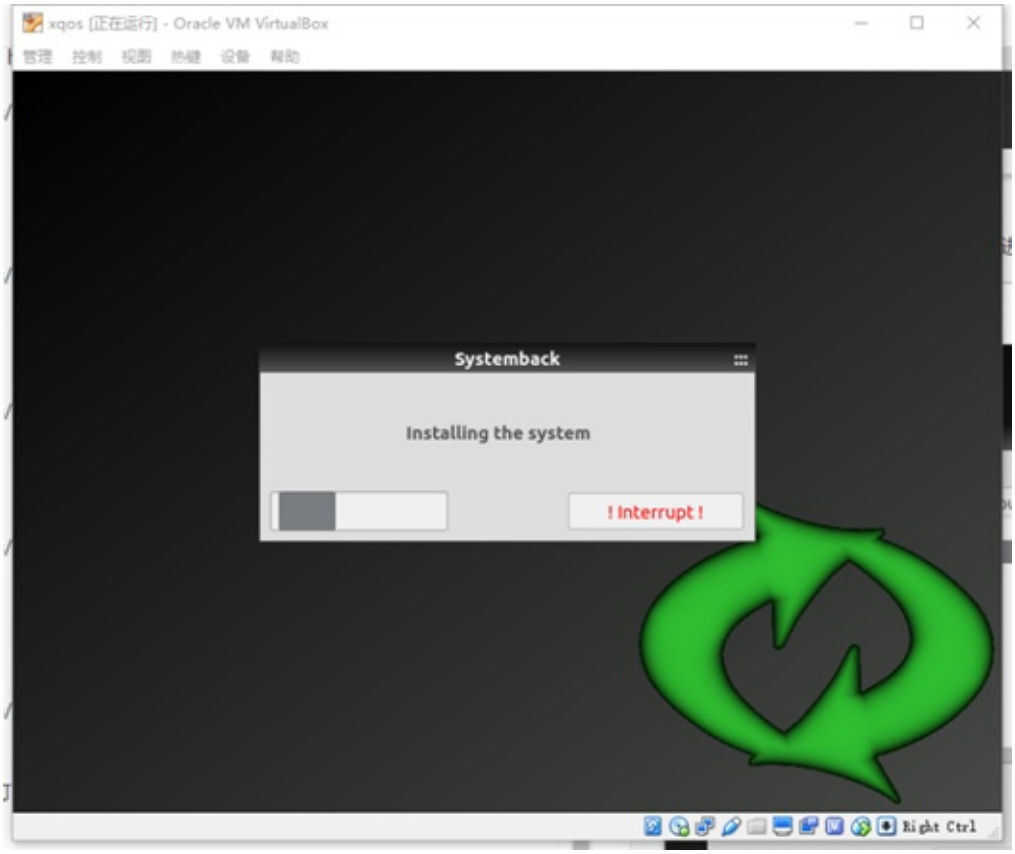


Select the newly created partition again, set the mount point on the right, click the arrow again to enter the next step.




```
Note: please check transfer user configuration files
```

Click on the next lower right corner to continue. If you still want to set up other partitions, follow the above steps.



Wait for the system to restart after the installation is complete.

Install on actual computer

The installation process is generally the same as the installation of Ubuntu. Here's how to use USB disk to install the system. First you need to prepare a blank partition on your hard disk to install the system. Then download `ultroiso` . Download address. Insert your USB disk into your computer. Open iso file with software. In the menu bar, select Start -> Write Disk Image, the popup interface is as follows.

Click Write and wait for the write to complete.

After writing, insert the USB disk into the computer where you want to install the system. Enter the BIOS option at startup and select Boot from USB drive. The subsequent installation process is basically the same.

`Note that in the partition, set boot as a separate partition, and then select the grub installation location. Otherwise, the system cannot be started after the installation is complete. There are also differences between partitions for different boot modes. Start with grub to give /boot a separate partition, boot with uefi to give /boot/efi a separate partition`

Download The Virtual Machine

How Ubuntu sets static IP

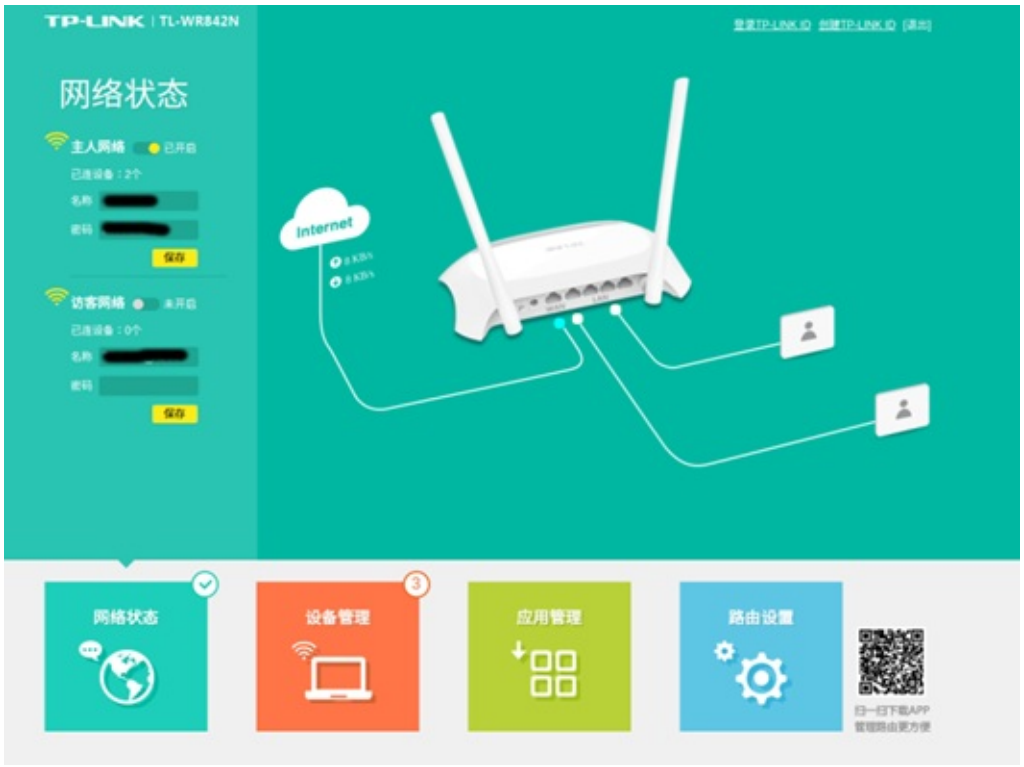
When searching for "Set Static IP" on the network, the results appear are set by modifying the file. This way it is easy to make the computer's network unusable. It is recommended to use the following method to modify.

The basic way of IP allocation

The way IP is allocated is generally determined by the router. The router has two modes: DHCP mode and static IP. DHCP is a dynamic way of assigning IP. The default router is this mode. In this mode, the computer can also set its own static IP. Of course, there is no guarantee that it will succeed. For example, the IP set by yourself may be occupied by others. It is also possible that the router will not assign you the IP you set because of the confusion. Let's talk about the various methods of setting static IP.

Several ways to set static IP

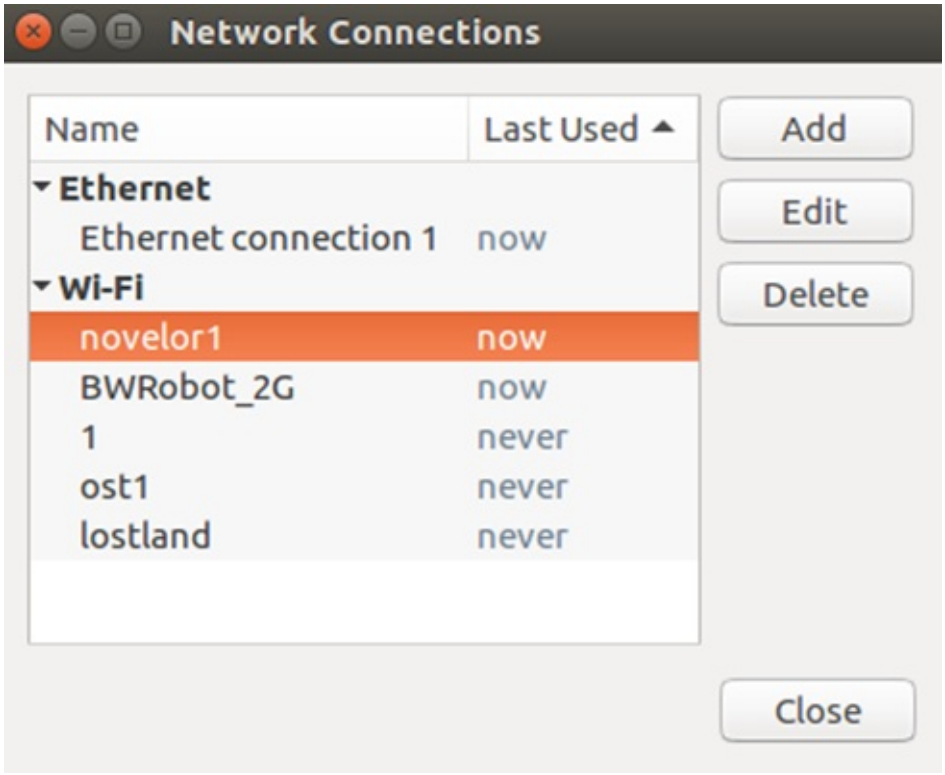
1. For router settings, setting up a static IP through a router is the easiest way. However, the premise is that you must have the management rights of the router, and the router should also support this setting function. First enter the address of the route in the browser and enter the management interface of the router.

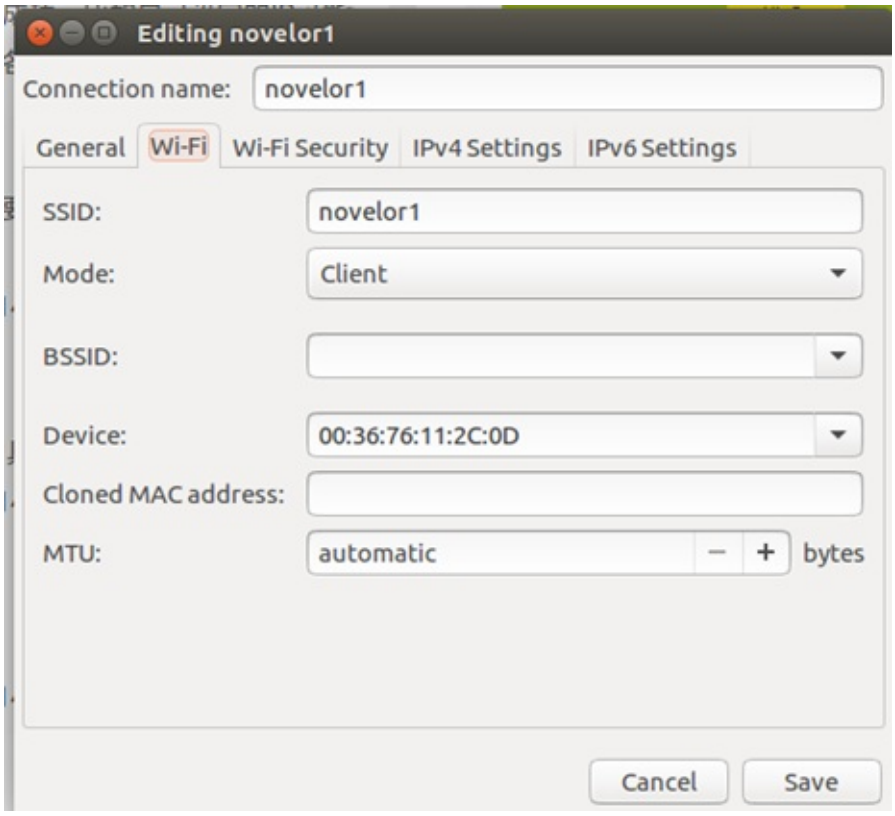


There are IP and MAC binding options in application management. Different router settings interface is different, you can find the specific location of this function.

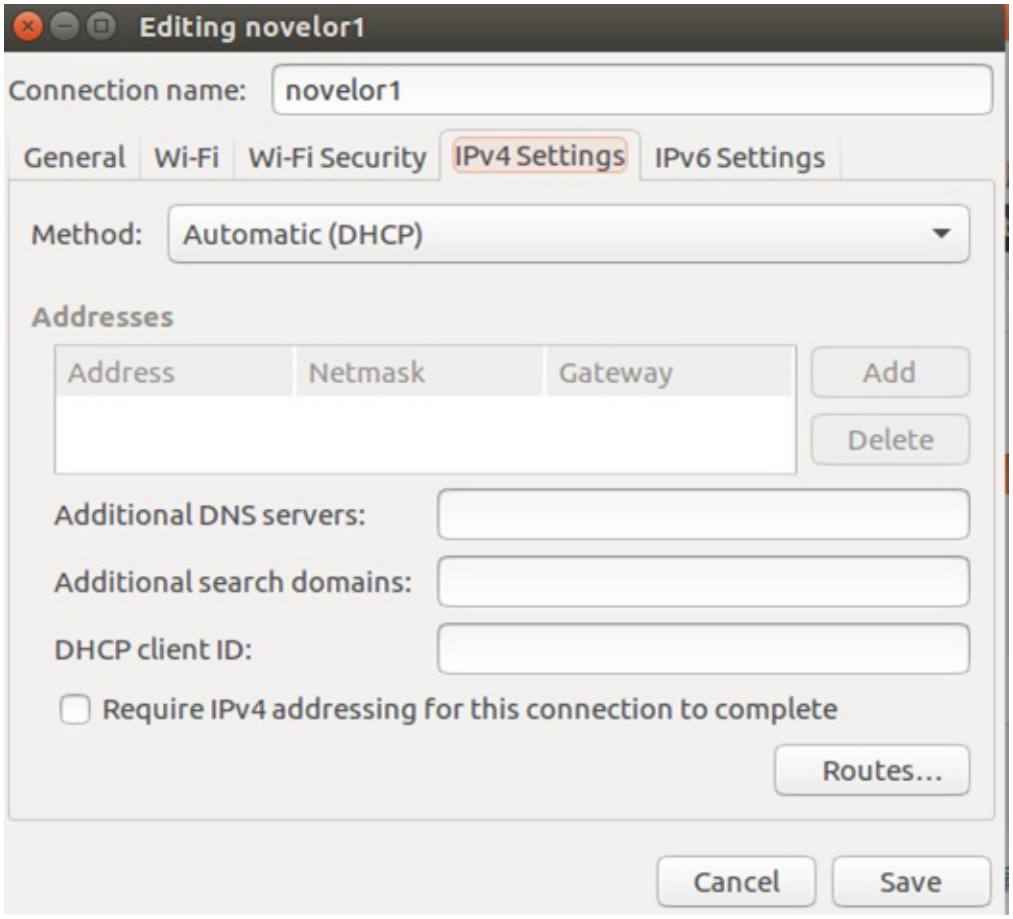
Here you can set up a static IP.

1. Make settings on the computer After the computer is connected to the network, open the computer's network manager and select your current network link, select Edit.

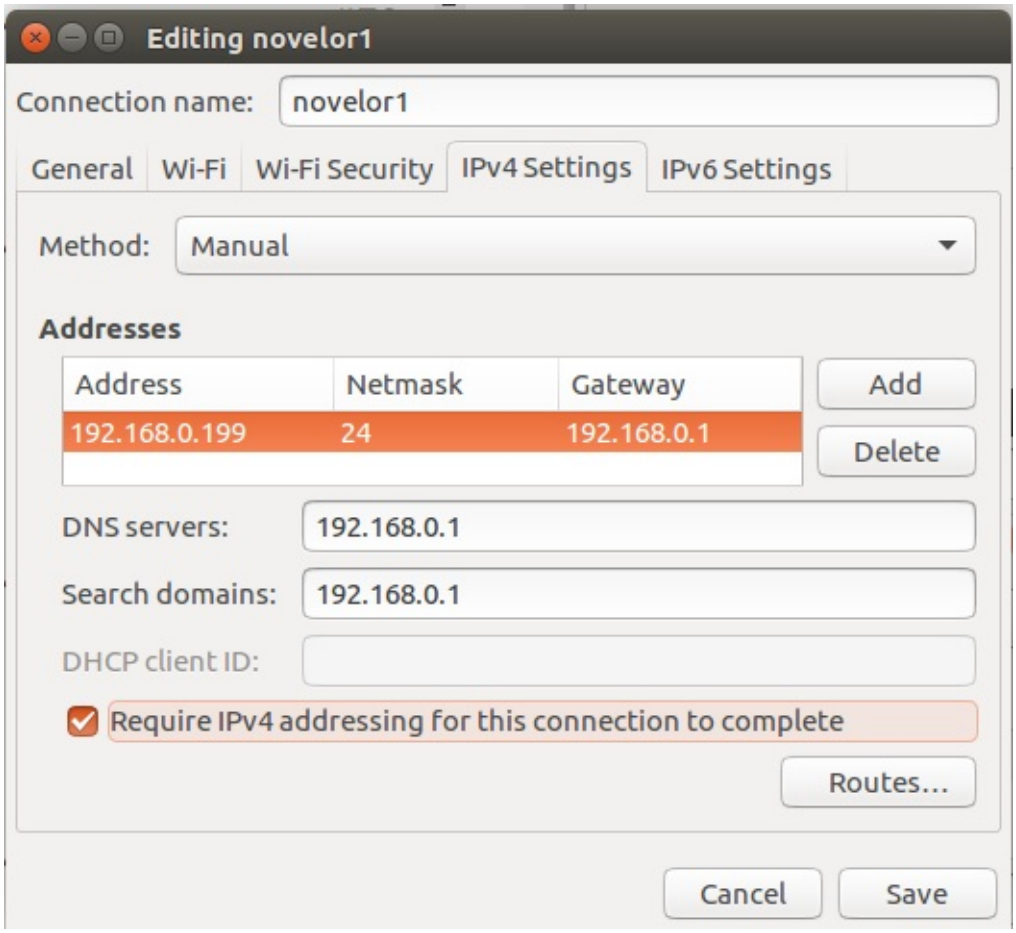




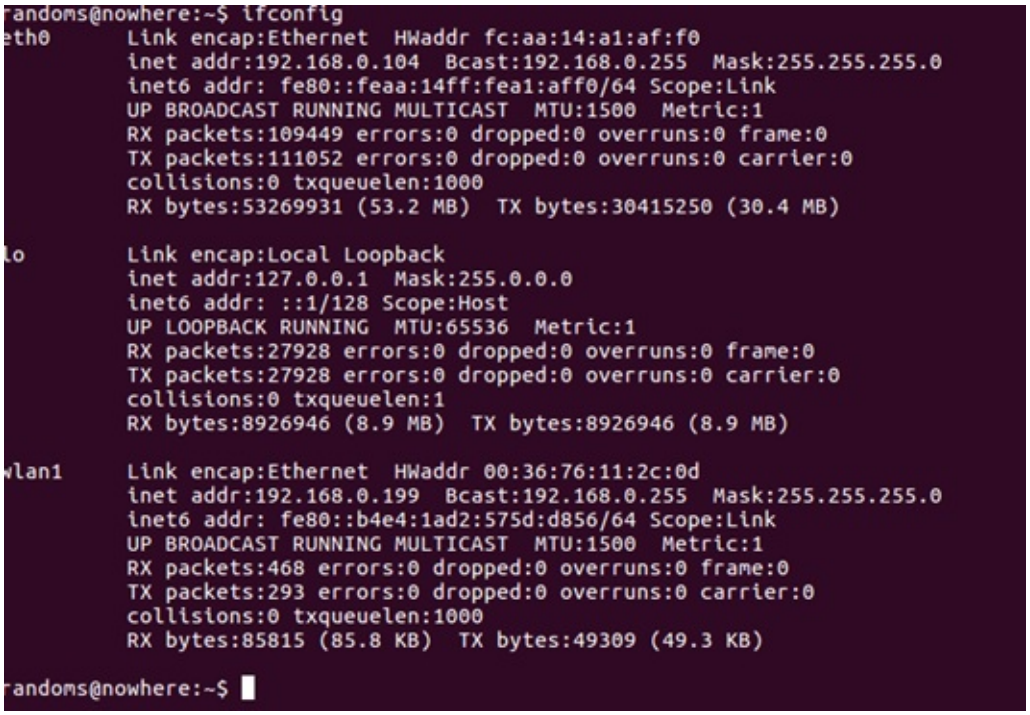
Click on IPv4 settings



Set up as shown below



192.168.0.199 is the local IP you want to set, so you can't repeat it with other IPs on the LAN. 192.168.0.1 is the address of the router. This should be adjusted according to your own network conditions. After the setting is completed, click Save to open, then disconnect the network and reconnect. It will take effect only after reconnecting.



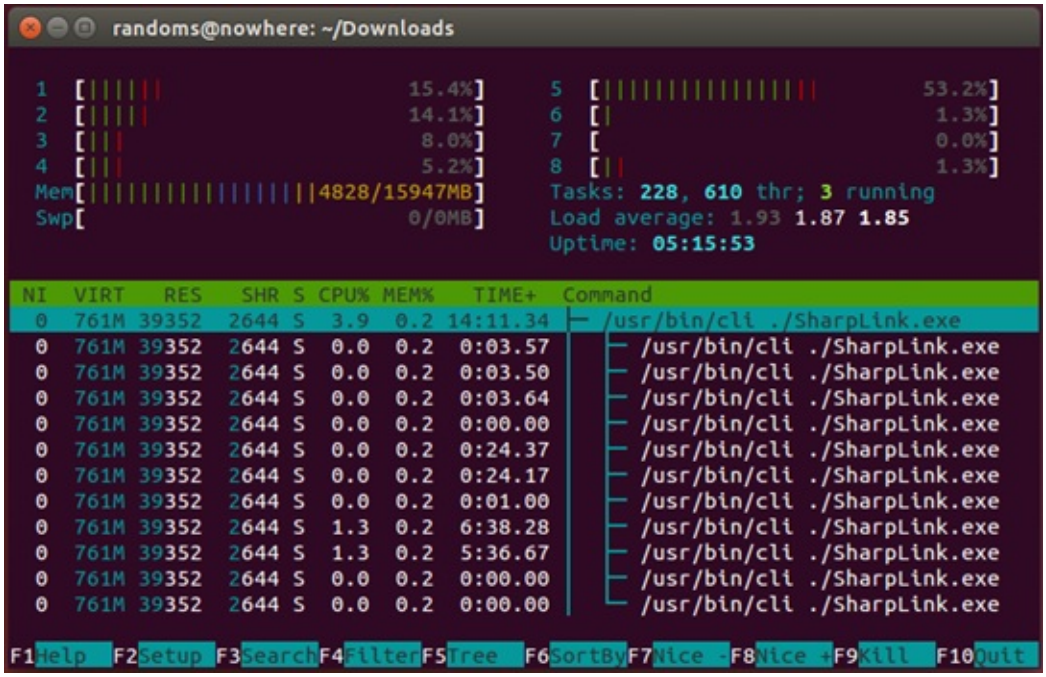
Enter ifconfig to view the current network information, you can find that my wireless network has been set to the IP just now.

Xiaoqiang's remote assistance function

In order to provide you with better service, Xiaoqiang, which was released after June 2016, has remote assistance software installed by default. Through this software our technicians can connect directly to your Xiaoqiang to solve technical problems for you. Of course, you can also use your remote assistance to control your own Xiaoqiang more conveniently. The following describes the specific use of Xiaoqiang's remote assistance function.

Confirm if remote assistance has been activated

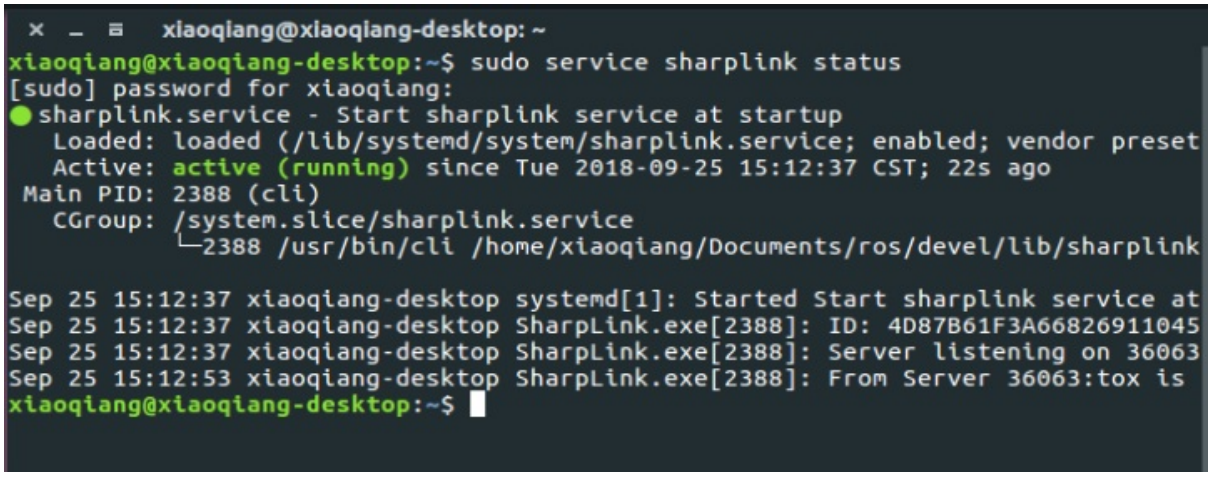
Execute `htop` at the terminal



If you can see that the thread called `SharpLink` is running, then the remote assistance has already started. You can also confirm the status of the program and execute the instructions in a simpler way.

```
sudo service sharplink status
```

If the terminal displays:



This indicates that the program has been executed normally.

Remote connect to Xiaoqiang

Check your ID `Each xiaoqiang has an unique ID, please don't tell others. Because if you don't change the default password and someone knows your ID, then he can easily manipulate your xiaoqiang.`

The method of viewing the ID is also very simple, in the terminal execution

```
sudo service sharplink restart
bwgetid
```

and the output would be

```
D70101972AB9B7E674290A25485B3752EDA236F65EF2C4AC7E738390DA61903565E68B8C431B
```

This very long string is your ID.

If you would like us to provide remote assistance, just send this ID to our staff.

Remote connect to your xiaoqiang

After remembering your own ID, as long as your xiaoqiang has connected to the Internet, you can control it anywhere at any time, not by the LAN restrictions.

First install Sharplink on your PC, which is cross-platform, both Linux and Windows can be installed. The specific method of installation is in the introduction of the project.

After the installation is complete, the terminal executes

```
./SharpLink.exe 9999 [Your ID] 127.0.0.1 22
```

This command maps the local 9999 port to the 22 port of xiaoqiang. Just connect to the local 9999 port and you'll be connected to xiaoqiang's 22 port. Of course you can also change 9999 to your preferred port.

Now enter the following commands on local computer

```
ssh -p 9990 xiaoqiang@127.0.0.1
```

Wait for the connection to complete, then you can control the xiaoqiang.

Enable and disable remote assistance

If you want to disable remote assistance

```
sudo systemctl disable sharplink
```

if you want to enable remote assistance

```
sudo systemctl enable sharplink
```

Google lidar slam algorithm Cartographer installation and bag package demo test

Cartographer is a set of laser radar slam algorithm that was open sourced by Google in September 2016. Its precision and effect are among the best in the industry. This article will demonstrate how to use the ROS JADE version. First go to the tutorial demo video click to watch

Steps:

1. Installation dependency package

```
# Install the required libraries that are available as debs.
sudo apt-get update
sudo apt-get install -y \
    cmake \
    g++ \
    git \
    google-mock \
    libboost-all-dev \
    libcairo2-dev \
    libeigen3-dev \
    libgflags-dev \
    libgoogle-glog-dev \
    liblua5.2-dev \
    libprotobuf-dev \
    libsuitesparse-dev \
    libwebp-dev \
    ninja-build \
    protobuf-compiler \
    python-sphinx
```

2. Install ceres solver

```
cd  ~/Documents
git clone https://github.com/BlueWhaleRobot/ceres-solver.git
cd ceres-solver
mkdir build
cd build
cmake ..
make -j
sudo make install
```

3．Install cartographer

```
cd  ~/Documents
git clone https://github.com/BlueWhaleRobot/cartographer.git
cd cartographer
mkdir build
cd build
cmake ..
make -j
sudo make install
```

4．Install cartographer_ros

```
cd ~/Documents/ros/src   # Please modify the path to your own ROS catkin workspace
git clone https://github.com/BlueWhaleRobot/cartographer_ros.git
cd ..
catkin_make
```

5．The installation is complete, start downloading the bag file for testing

Click the link below to download the file and save it to your desktop.

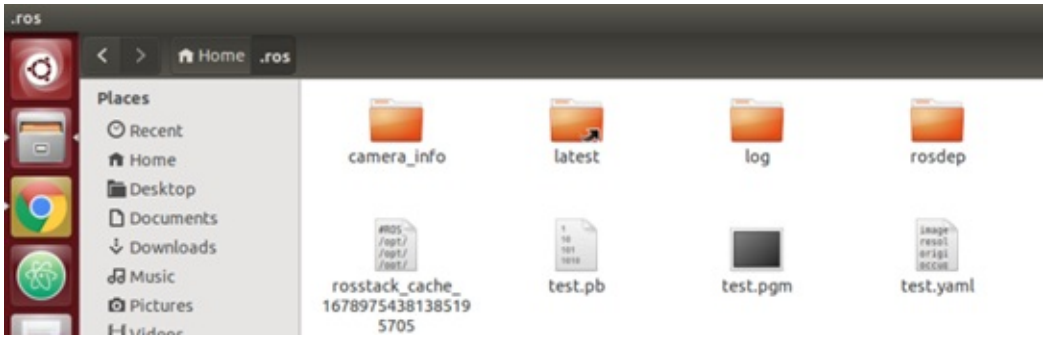
6．Start the demo, you can see rviz start and start to build

According to the computing power of the personal platform, the complete running time of this demo is generally between half an hour and one hour.

```
roslaunch cartographer_ros demo_backpack_2d.launch  bag_filename:=${HOME}/Desktop/cartogra
pher_paper_deutsches_museum.bag
```

7．Save the map and end the test

```
rosservice call /finish_trajectory "stem: 'test'"
```



The created map file will now be generated in the .ros folder in the home directory. These two files (pgm and yaml) can be loaded in the map_server in ros.

Install VNC on Ubuntu

When using Ubuntu often requires Remote Desktop connection, the most common software is VNC. VNC is an open protocol that implements a lot of clients. But after comparing the various implementations, the best is now x11vnc. This program is not only free of charge, open source, but also supports OpenGL programs. For example, rviz and other programs can also open normally.

`The X11VNC is already installed by default in the xiaoqiang system image, and if you use a xiaoqiang host or mirror, you can skip the installation process directly. Just follow the instructions for accessing the service.`

The installation method is described below. The following is an example of Ubuntu 14.04, if it is 16.04 and later version, you need to edit the service configuration file.

Installing X11VNC

```
sudo apt-get install x11vnc -y
```

Set access password

```
sudo x11vnc -storepasswd /etc/x11vnc.pass
```

Create a service file

Under/etc/init, create a x11vnc.conf file with the following file contents

```
description "xiaoqiang vnc server"
start on runlevel [2345]
stop on runlevel [06]

script
    exec /usr/bin/x11vnc -auth guess -capslock -forever -loop -noxdamage -repeat -rfbauth
/etc/x11vnc.pass -rfbport 5900 -shared
end script
```

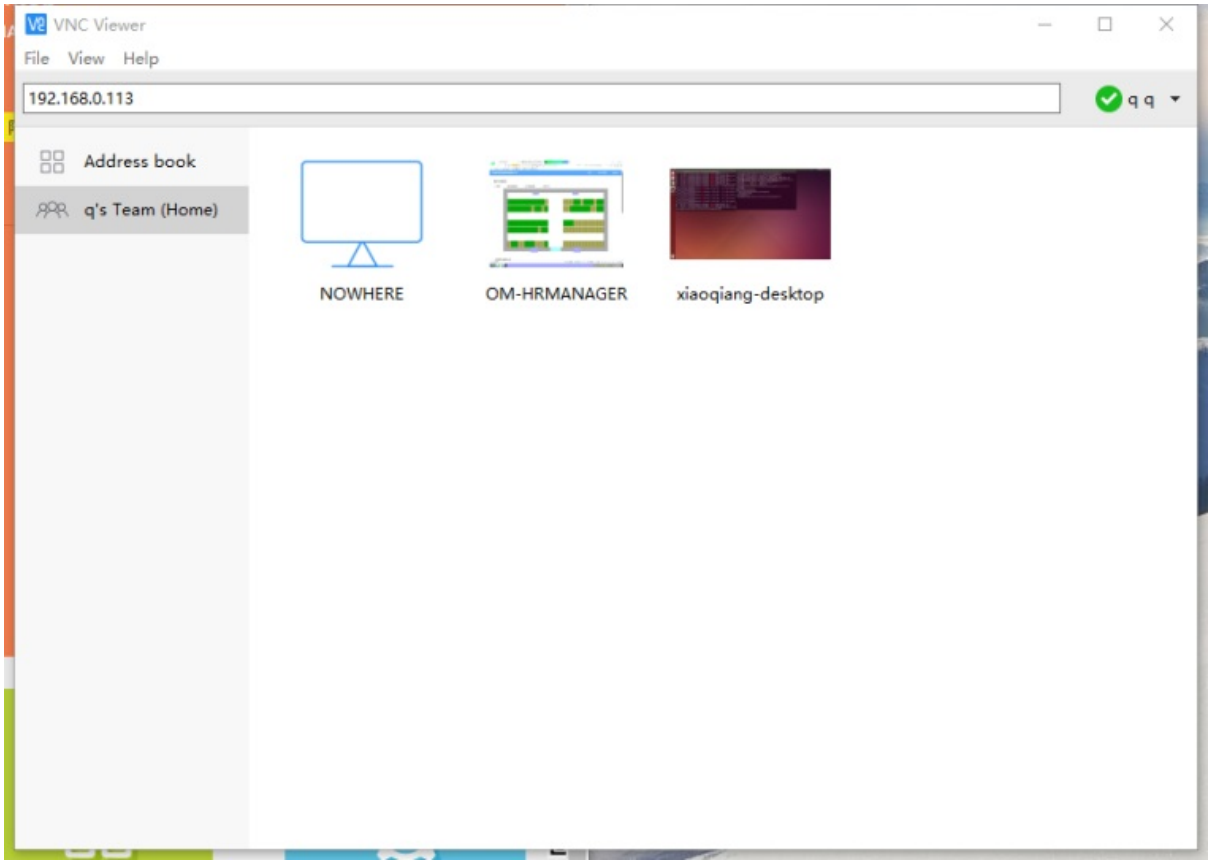
Start the service

```
sudo service x11vnc start
```

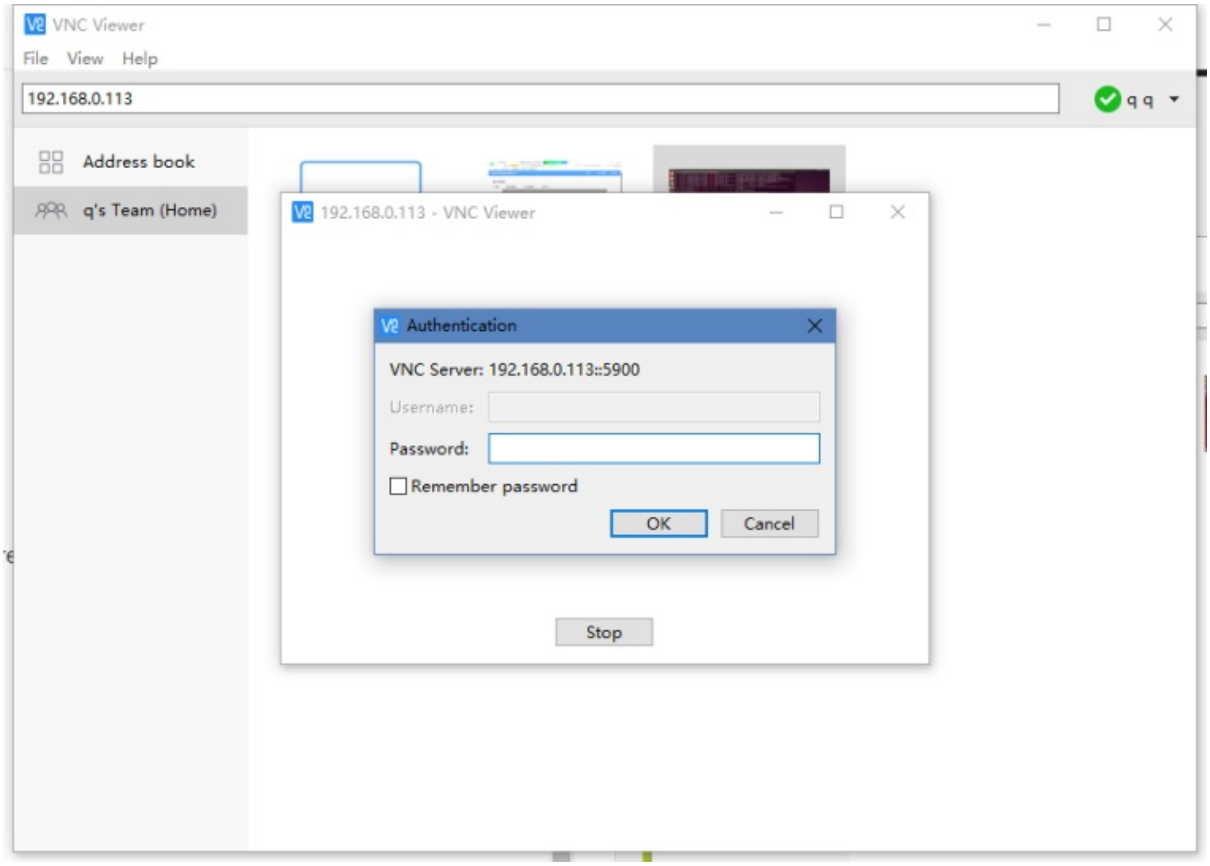
Access the service

Download a VNC client, such as download from here

Start the client, enter target ip address



and then enter access password



Then you can connect normally.

For Ubuntu 16.04 and later, You can configure your service file according to this script

```
Note When the installation is complete, you may still get an error when you use rviz without plugging in the monitor. Just plug in the HDMI to VGA adapter (do not connect the monitor, just the adapter) can be turned on normal use. If you want to adjust the resolution in the same way as normal computer settings, adjust the settings inside system settings
```

PS3 joystick ROS driver

Xiaoqiang Homepage

The ros driver of the ps3 controller is ps3joy in the joystick_drivers package. This driver supports the original Sony handle, but there is a problem with the support of some others ps3 controllers. We have modified on the basis of ps3joy, added a `ps3joyfake_node.py` script as a driver for other joysticks, the package source code address is here. Let's take Xiaoqiang as an example to demonstrate the installation steps and simple usage of this package.

installation steps

ssh enters Xiaoqiang ros workspace, compile after downloading the source code. If you have install xiaoqiang system image, you can skip this step.

```
ssh xiaoqiang@192.168.xxx.xxx
cd Documents/ros/src/
git clone https://github.com/BlueWhaleRobot/joystick_drivers.git
cd ..
catkin_make
If the following error is prompted
error spnav.h no such file
First install the following package, then re-execute catkin_makee
sudo apt-get install libspnav-dev
```

Quick usage

After `ps3joyfake_node.py` starts, it converts the data of the joystick button received by bluetooth into the standard joy msg, and publishes it in ros with `/joy` as the topic, that is, a file of `ps3joyfake_node.py` is equivalent to two files of `ps3joy.py + joy_node` . It is no longer necessary to open the joy_node node in actual use.

1. Bind the joystick to the usb bluetooth adapter, just bind once, skip this step next time.

   Connect the joystick to the host through the usb data cable, and plug the USB bluetooth adapter into the host.

   ```
   sudo bash
   rosrun ps3joy sixpair
   ```

   At this point, you will get an output similar to following. The current and setting mac addresses are the same.

```
Current Bluetooth master: 00:22:b0:d0:5a:09
Setting master bd_addr to 00:22:b0:d0:5a:09

# If the following error occurs
Current Bluetooth master: 00:1b:dc:00:07:3c
Unable to retrieve local bd_addr from `hcitool dev`.
Please enable Bluetooth or specify an address manually.
# Run
hciconfig hci0 reset
# If you run hciconfig hci0 reset error
# Can't init device hci0: Operation not possible due to
# Run
rfkill unblock all
# and run
hciconfig hci0 reset
# rerun
rosrun ps3joy sixpair
```

After the binding setting is completed, disconnect the handle and the usb connection of the host.

Ctrl+D exits root mode

2. Pair the handle with the usb Bluetooth adapter

```
# Make sure the Bluetooth receiver is plugged into the host usb port
sudo bash
rosrun ps3joy ps3joyfake_node.py
```

The following prompt will appear normally.

```
root@xiaoqiang-desktop:~# rosrun ps3joy ps3joyfake_node.py
No inactivity timeout was set. (Run with --help for details.)
Waiting for connection. Disconnect your PS3 joystick from USB and press     the pairi
ng button.
If the following error is prompted
ImportError: No module named bluethooth
Please install the following packages first, then re-run
sudo apt-get install libbluetooth-dev
sudo pip install PyBluez
```

Press the joystick pairing button in the image below

If the pairing is successful, the above window will output a result similar to the following.

```
root@xiaoqiang-desktop:~# rosrun ps3joy ps3joyfake_node.py
No inactivity timeout was set. (Run with --help for details.)
Waiting for connection. Disconnect your PS3 joystick from USB and press the pairing b
utton.
Connection activated
```

3. View handle output

```
# Open a new window and print the button output
rostopic echo /joy
```

Normally the following similar results will appear

```
header:
  seq: 297
  stamp:
    secs: 1488877867
    nsecs: 535818099
  frame_id: ''
axes: [0.0, 0.0, 0.0, 0.0, -1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.
0, 0.0, 0.0, 0.21316899359226227, 0.0]
buttons: [0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
```

As we can see that the fourth button was pressed.

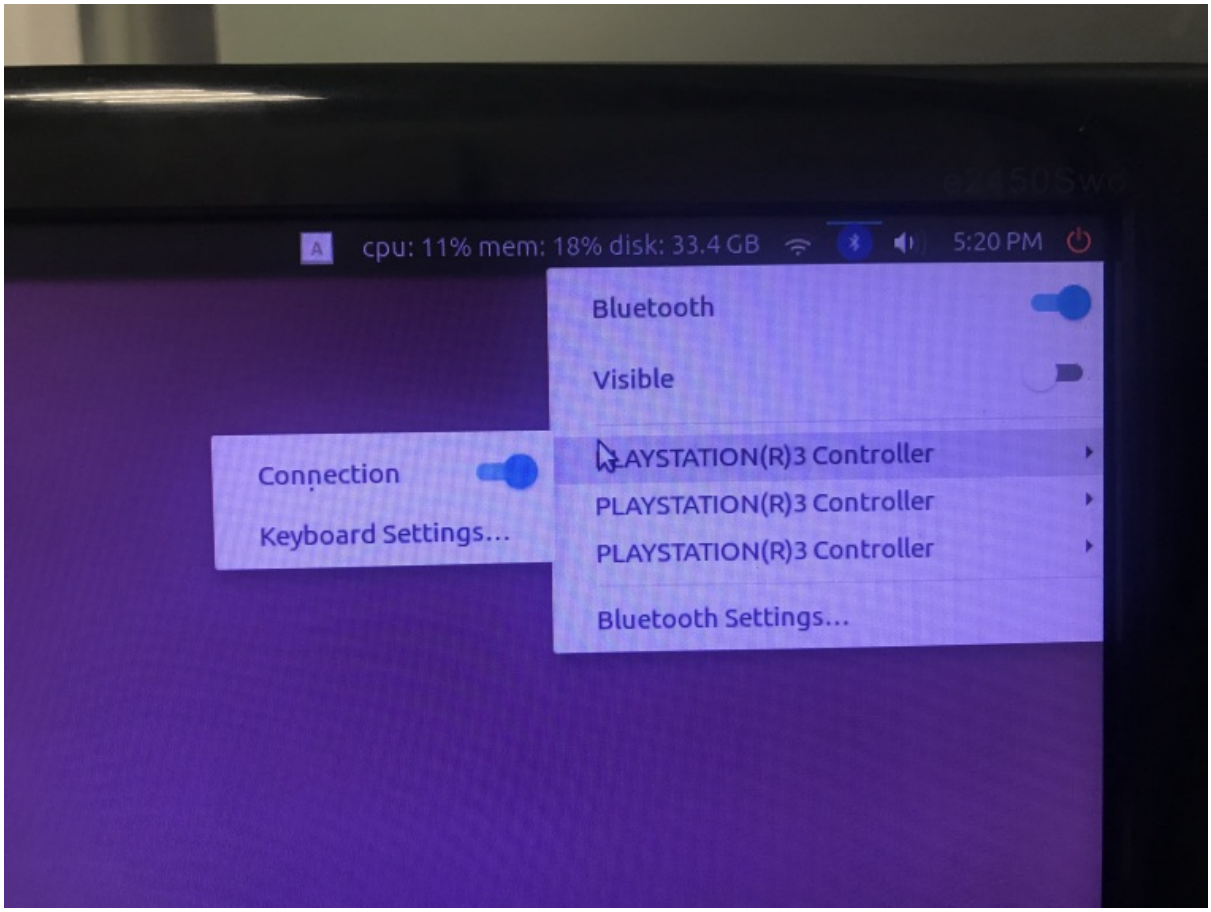
4. Start the relevant joy msg processing node

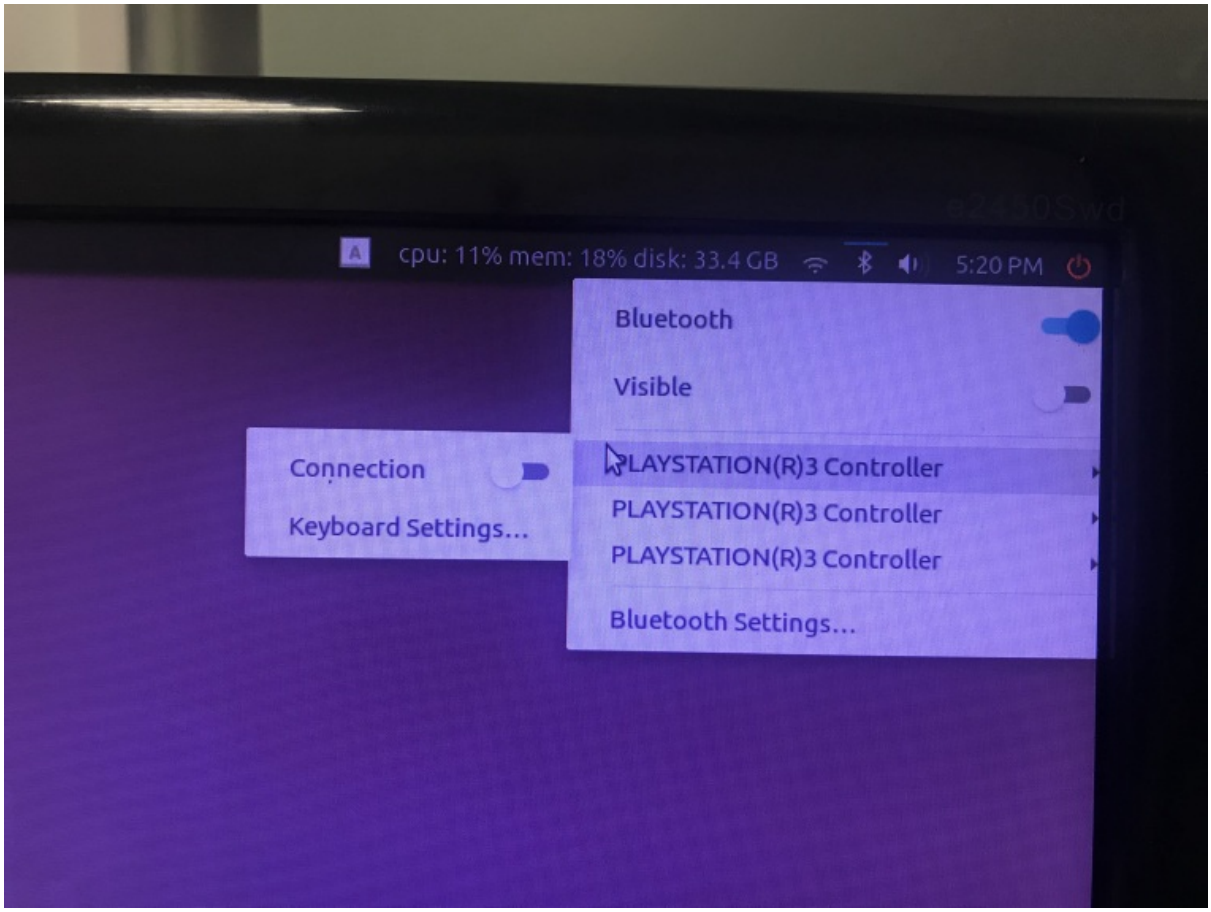
Be careful not to start the joy_node again.

```
# Take Xiaoqiang as an example. After launching the following launch file, you can re
motely move Xiaoqiang.
roslaunch turtlebot_teleop ps3fakexiaoqiang_teleop.launch
```

For xiaoqiang user with a joystick you can also use the joystick according to this tutorial

When step 1 is bound, if the prompt cannot find the handle device and cannot be bound, you can perform the following two steps to solve the problem: 1. Click the Bluetooth icon in the upper right corner of the system desktop to close the connected Bluetooth handle service.





Xiaoqiang Homepage Back To Index

Cartographer install and demo

Xiaoqiang Homepage

Cartographer is a set of laser radar slam algorithm that was open sourced by Google in September 2016. Its precision and effect are among the best in the industry. This article will demonstrate how to use Cartographer in the ROS Kinetic. Click to view the result video.

Steps:

1. Installation dependency package

```
# Install the required libraries that are available as debs.
sudo apt-get update
sudo apt-get install -y \
    cmake \
    g++ \
    git \
    google-mock \
    libboost-all-dev \
    libcairo2-dev \
    libeigen3-dev \
    libgflags-dev \
    libgoogle-glog-dev \
    liblua5.2-dev \
    libprotobuf-dev \
    libsuitesparse-dev \
    libwebp-dev \
    ninja-build \
    protobuf-compiler \
    python-sphinx
```

2. Install ceres solver

```
cd  ~/Documents
git clone https://github.com/BlueWhaleRobot/ceres-solver.git
cd ceres-solver
mkdir build
cd build
```

```
cmake ..
make -j
sudo make install
```

3. Install prtobuf 3.0

```
cd  ~/Documents
git clone https://github.com/google/protobuf.git
cd protobuf
git checkout v3.6.1
mkdir build
cd build
cmake  \
  -DCMAKE_POSITION_INDEPENDENT_CODE=ON \
  -DCMAKE_BUILD_TYPE=Release \
  -Dprotobuf_BUILD_TESTS=OFF \
  ../cmake
make -j 2
sudo make install
```

4. Install cartographer

```
cd  ~/Documents
git clone https://github.com/BlueWhaleRobot/cartographer.git
cd cartographer
mkdir build
cd build
cmake ..
make -j
sudo make install
```

5. Install cartographer_ros

```
cd ~/Documents/ros/src   #请修改路径到自己的ROS catkin工作空间
git clone https://github.com/BlueWhaleRobot/cartographer_ros.git
cd ..
catkin_make
```

6. The installation is complete, start downloading the bag file for testing

   Click the link to download the file and save it to your desktop.

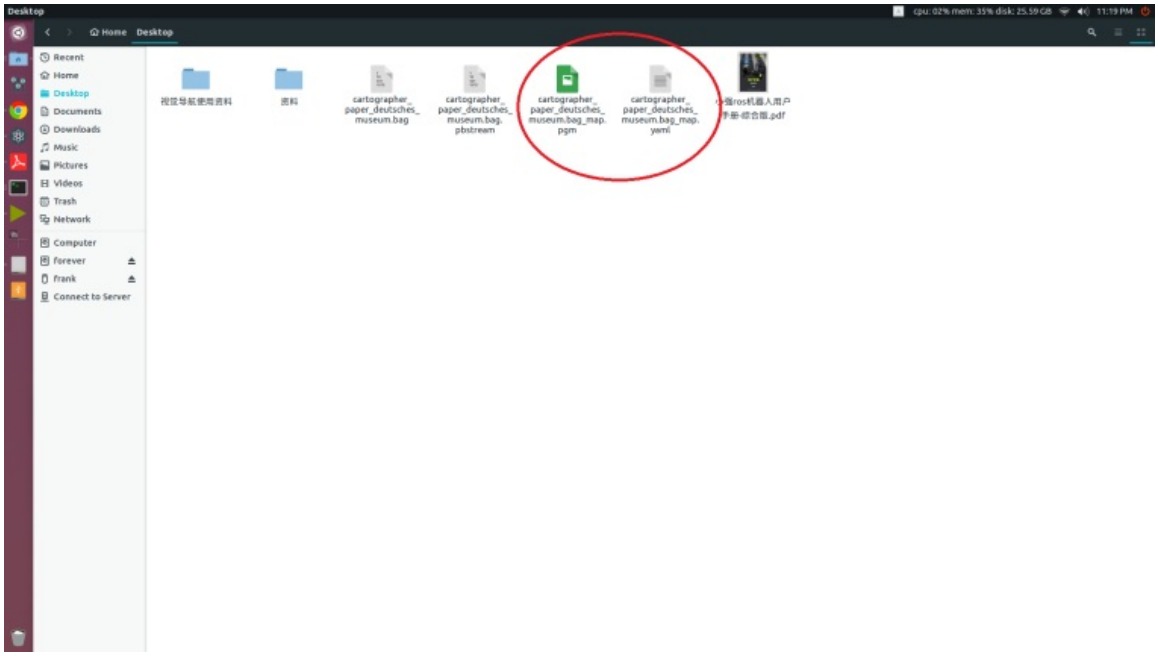
7. Start the demo, you can see rviz start and start to build

   According to the computing power of the personal platform, the complete running time of this demo is generally between half an hour and one hour.

```
 roslaunch cartographer_ros offline_backpack_2d.launch  bag_filenames:=${HOME}/Desktop
/cartographer_paper_deutsches_museum.bag
```

8. Save the map and end the test

```
 roslaunch cartographer_ros assets_writer_ros_map.launch bag_filenames:=${HOME}/Deskto
p/cartographer_paper_deutsches_museum.bag pose_graph_filename:=${HOME}/Desktop/cartogr
apher_paper_deutsches_museum.bag.pbstream
```



The created map file will now be generated in the .ros folder in the home directory. These two files (pgm and yaml) can be loaded in the map_server in ros.

Xiaoqiang Homepage Back To Index

Visual Navigation Path Editor Tutorial

Xiaoqiang Homepage

Using Xiaoqiang can create a three-dimensional map of the surrounding environment, but how to use this map to visual tracking? The Visual Navigation Path Editor was written to implement this feature. With this tool you can mark the trajectory in map. Then export the generated track file to Xiaoqiang, and Xiaoqiang will be able to move according to the track you have drawn. The following describes in detail how to use the software.

Installation

Ubuntu deb installation package can be downloaded here and the source code is here.

After the download is complete, execute the following command to install.

`Note that this path editor is not compatible with the new version of the navigation program. For the new version of the navigation program, please use the` Windows client

```
sudo dpkg -i path-drawer_1.0.0_amd64.deb
```

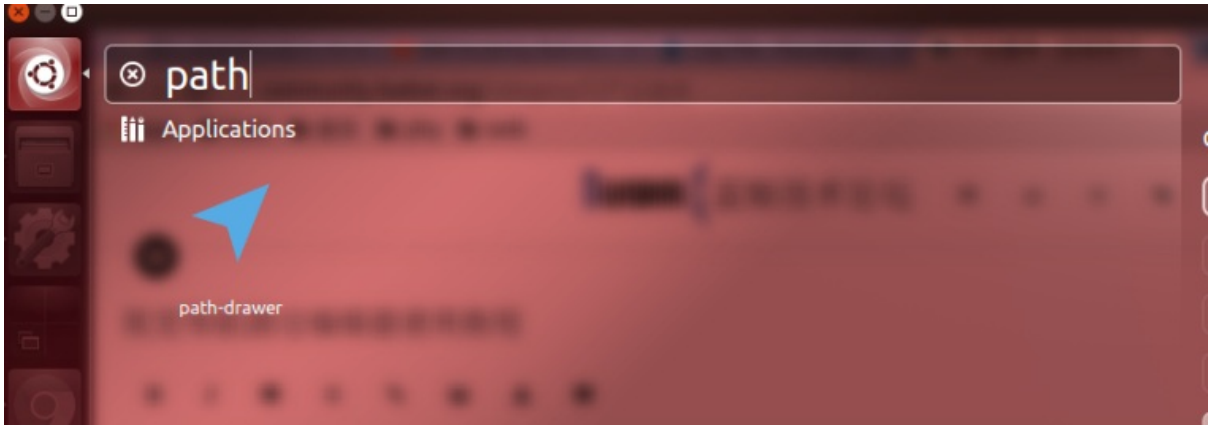
Wait for the installation to complete.

Collecting spatial data

The path editor needs to load the spatial data collected by Xiaoqiang to be able to operate. For detailed operations, please refer to this article. After clicking the Save button, the map information will be saved to the `/home/xiaoqiang/slamdb` folder.

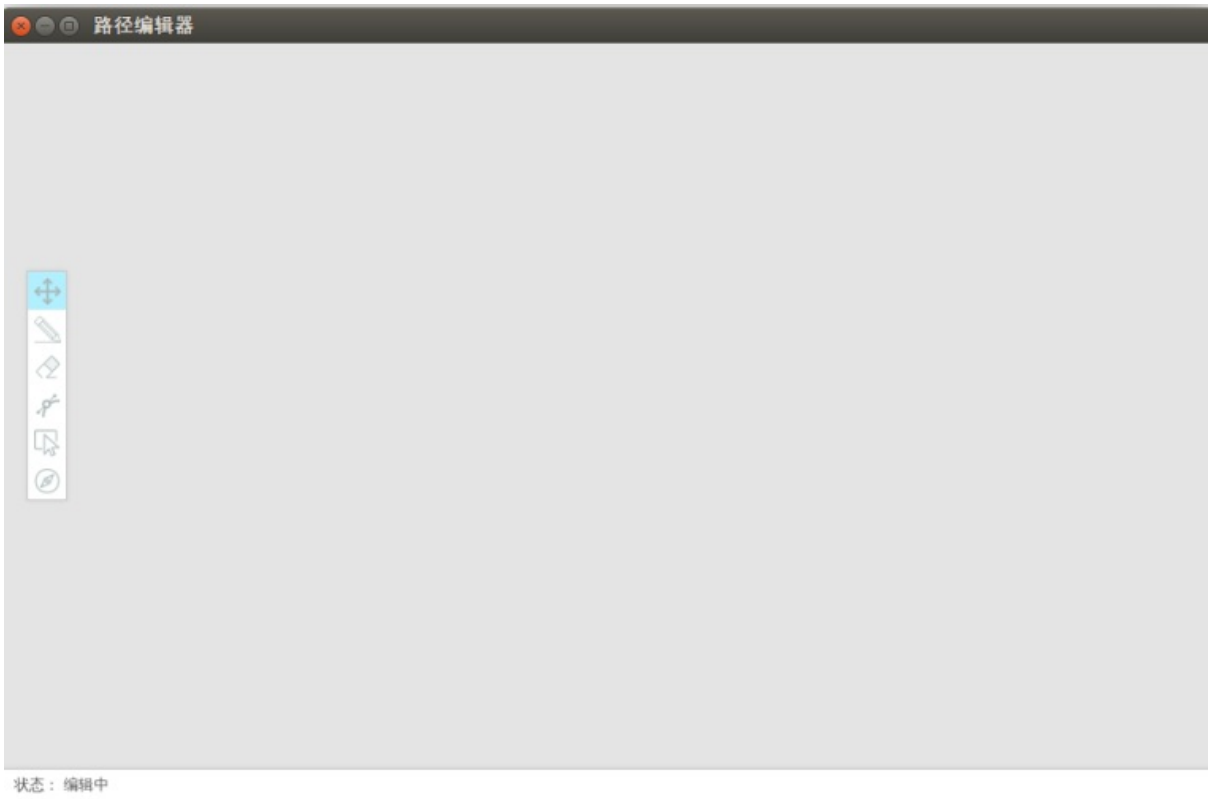
Launch software

After the installation is complete, you can find the program named Path Drawer in the Ubuntu Dash menu, and click on the software icon.

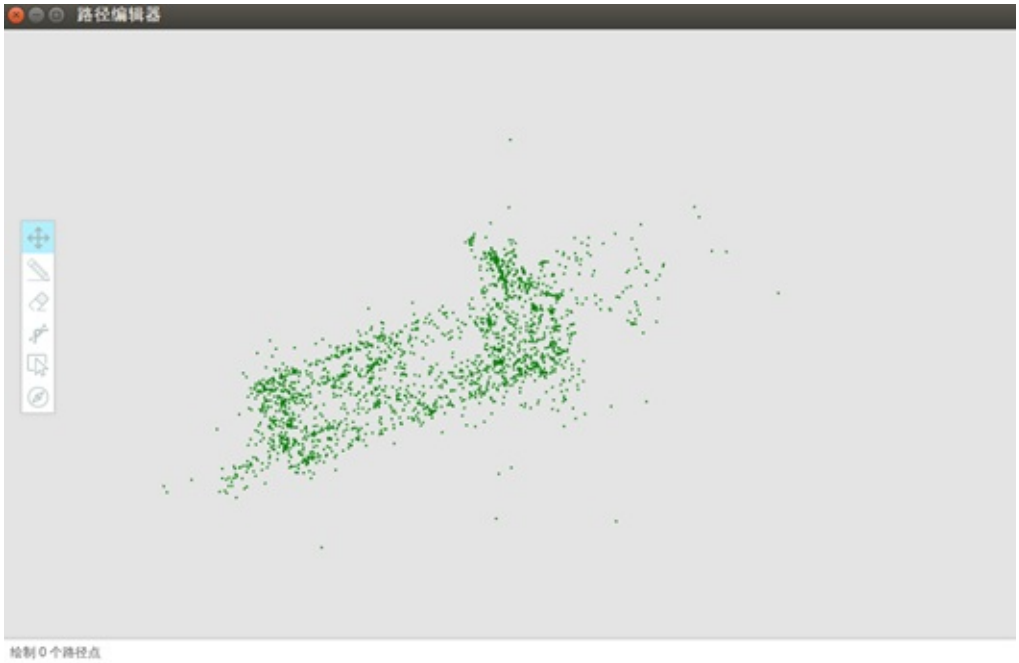


Import Data

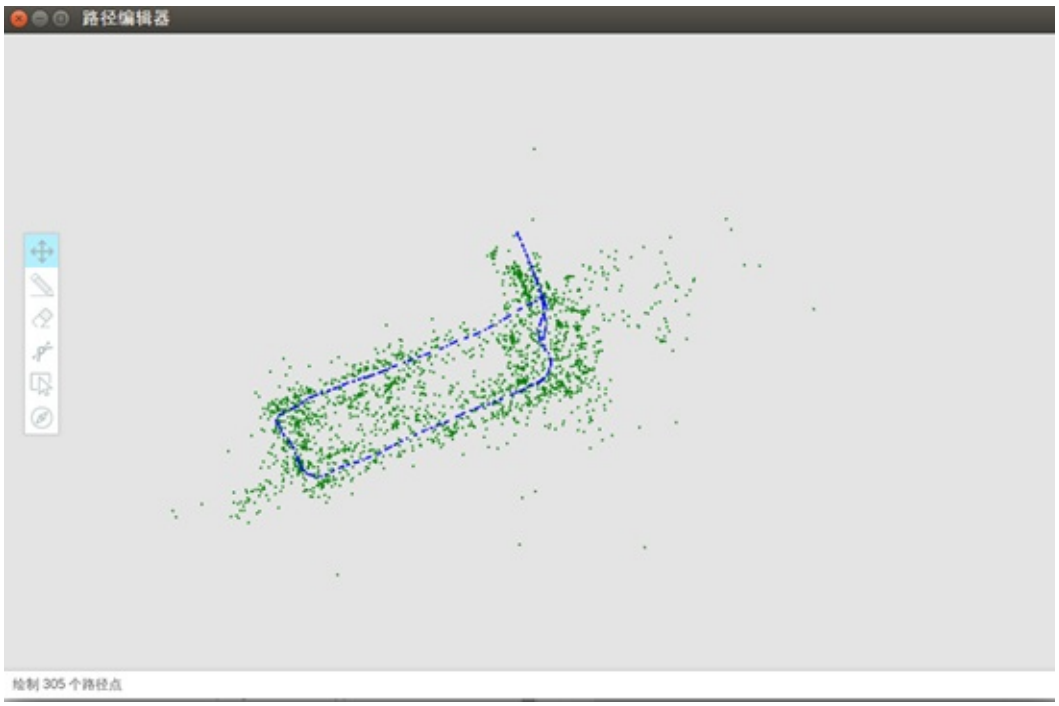
The software interface after startup is shown as below



In the menu at the top left, select File -> Import Map Data. In the file selection dialog that pops up, select the `/home/xiaoqiang/slamdb/mappoints.bson` file. After import succeed, you can see the data of the map points in the software. This is a top view.



Then continue to select the file in the menu in the upper left corner and then import the path file. In the file selection dialog that pops up, select the `/home/xiaoqiang/slamdb/keyframes.bson` file. After import succeed, you can see the path of the previous car walking in the software.

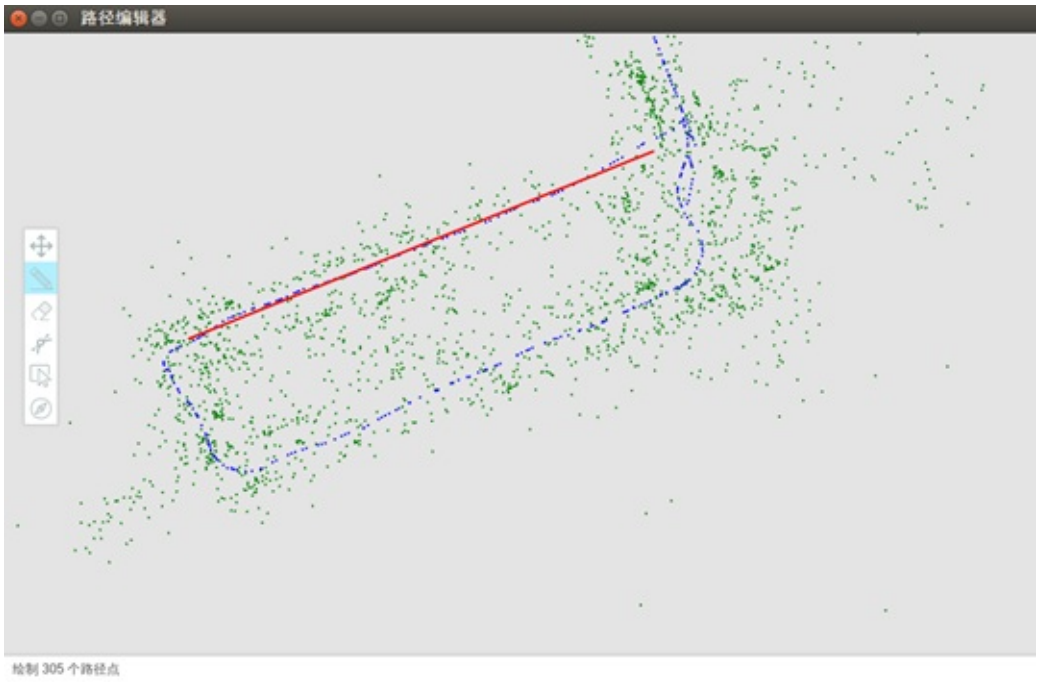


Draw a navigation route

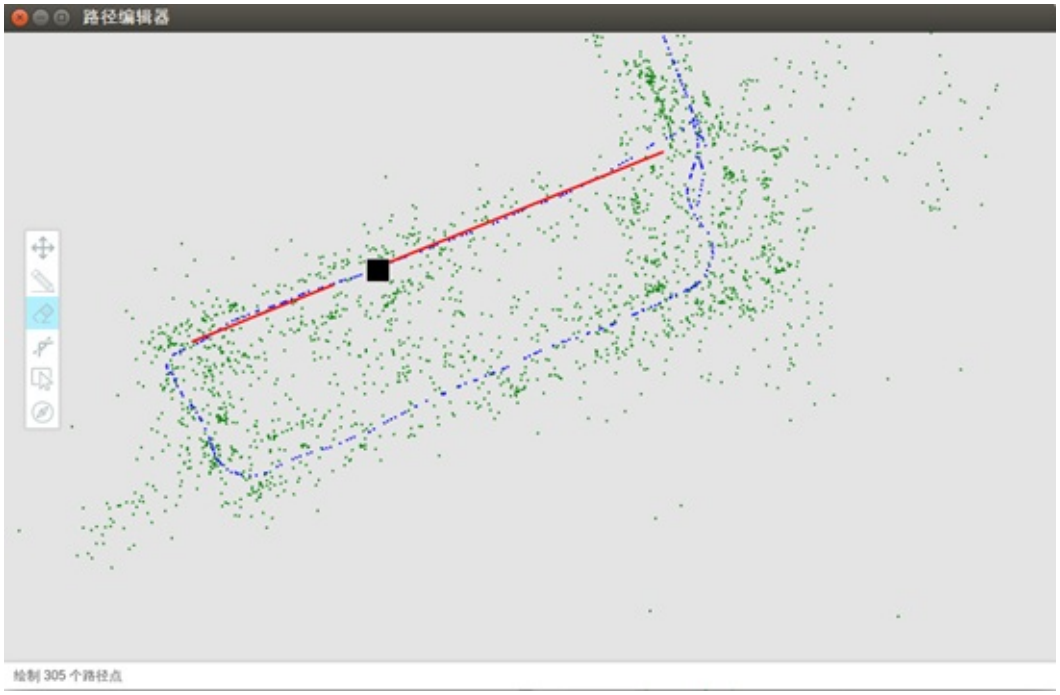
The navigation path is the path you want xiaoqiang to walk. When the data is exported to Xiaoqiang, Xiaoqiang will move according to the path you draw. Here's how to use the path drawing tool.

1. Basic operations Basic operations include panning and zooming. If you drag the map with the left mouse button, you can the translation of the map. The scrolling of the mouse scrolls can zooming of the map, which is very useful in the process of drawing paths. For more detailed requirements on the movement, you can zoom in and draw.

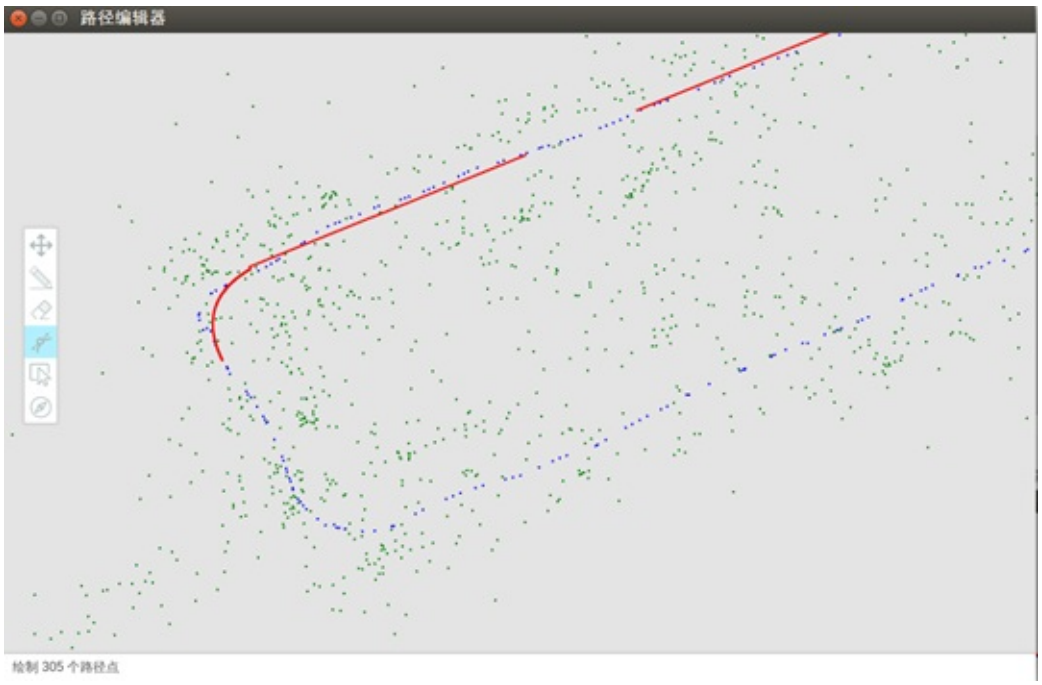
2. The line tool: clicks the pencil-like icon in the left-hand toolbar. This is the line tool. left mouse button click on any point on the graph, and then move the mouse will appear a red line. Move the mouse to the desired end position, click the left mouse button again, a straight line to draw the finished. After you click the left button, you can cancel the drawing by right-clicking.



3. The eraser tool: Click on the Eraser tool in the left-hand toolbar and then presses the left mouse button to drag to erase the previously drawn point



4. Curve tool: Click on the left Curve tool, click the left mouse button at the beginning of the curve, then click the left mouse button again in the middle of the curve, and finally click on the end point of the curve. So a curve is drawn and done.

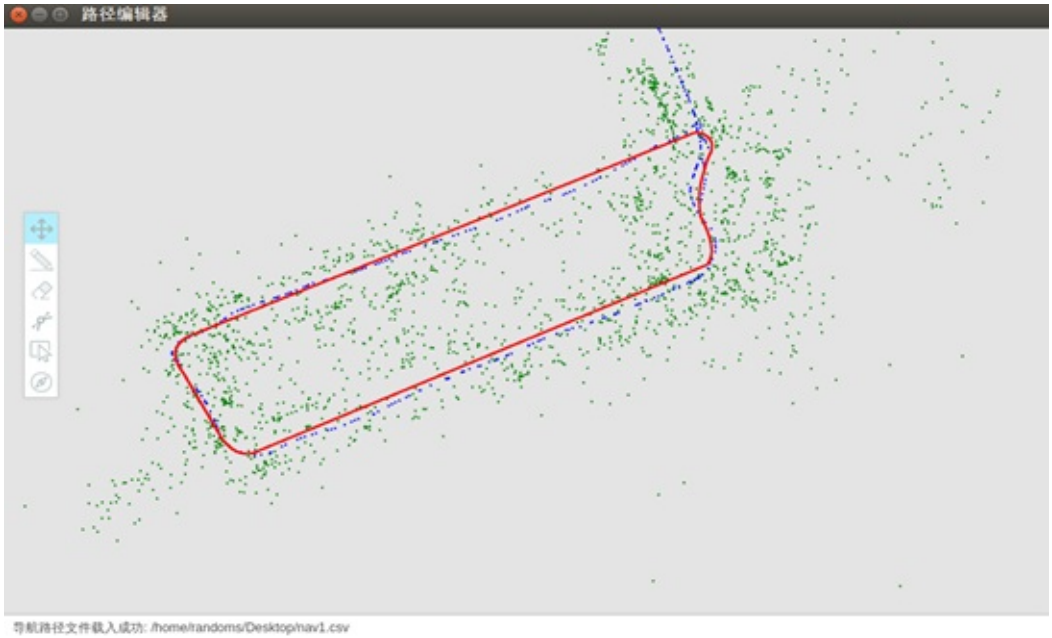


5. Delete tool: if you want to delete a large range of points drawn before, then you can take advantage of this removal tool. Click the Delete tool on the left and click the left mouse button to delete the starting point, you can see in the mouse movement process has a rectangle has been following. Click the left mouse button again to delete the rectangle's selected range. Right-click to cancel the selection.

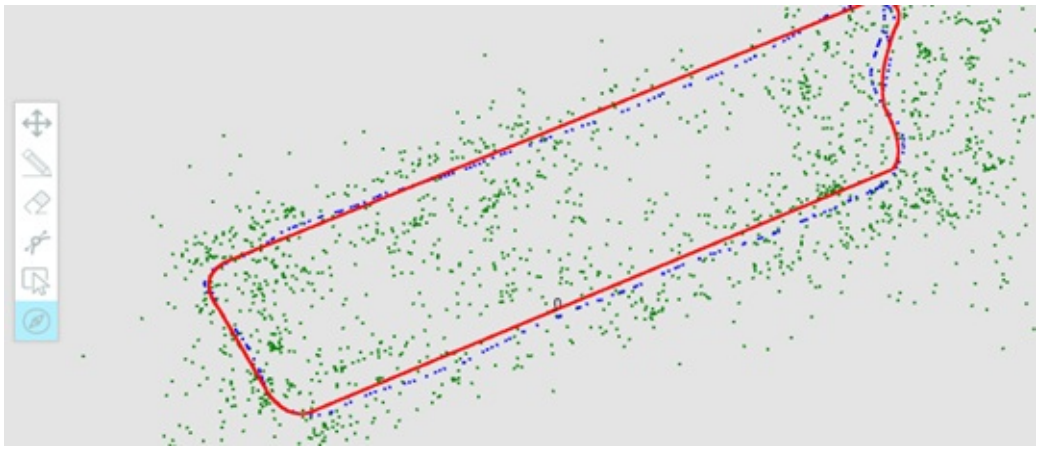
Using these tools, you can draw xiaoiang's navigation path. Be careful to draw the line as far as possible along the original trajectory, so that the path is unobstructed during the movement. From the green map point you can see the terrain, based on the information to draw the points allowed by the range of motion.

Set navigation key points

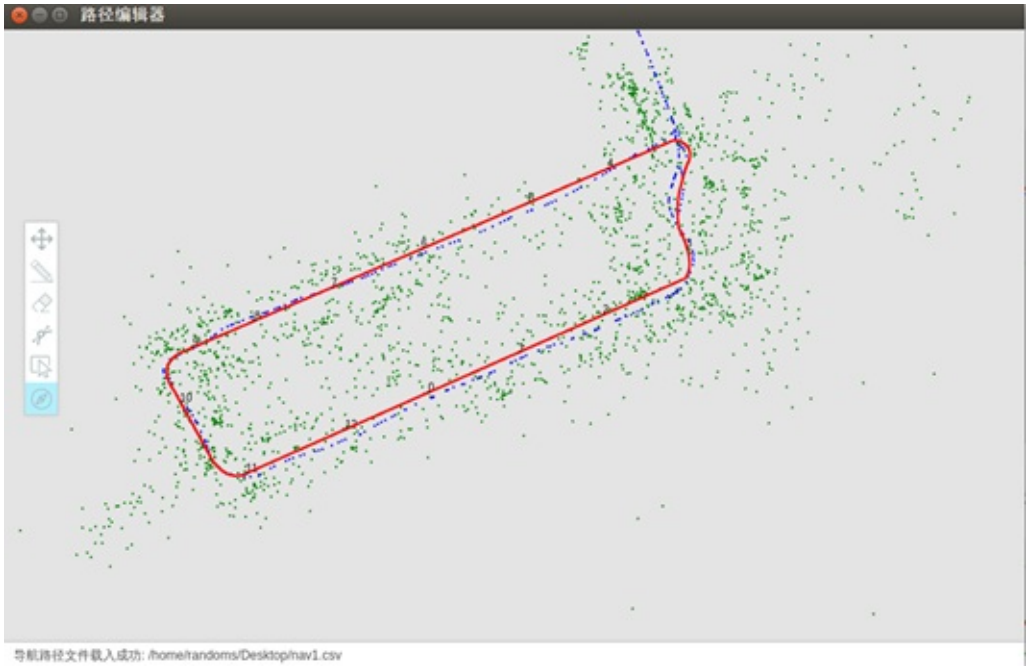
For more complex graphics, there are many ways to move. For example, a figure-eight path, Xiaoqiang may move around one of the circles first, then move around another circle, or two circles may cross each other. Therefore, it is necessary to specify the specific way of the Xiaoqiang movement. Let's take a circular trajectory as an example. In a circular trajectory, Xiaoqiang can move clockwise and also counterclockwise.



Click the navigation point settings button at the bottom of the toolbar on the left. Then start marking key points. Feel free to click on a point on the navigation route and you can see that there is a 0 at this point. This indicates that point 0 has been added here.



If you want to make Xiaoqiang counterclockwise, you can mark a point on the right side. Just add the key points in turn



Click the right mouse button to delete a recently added navigation point. You can also use the eraser and delete tools to delete navigation points. Xiaoqiang will move in the order of the key points.

Export data

1. Export the navigation path file After the navigation path is drawn, click `File -> Export Navigation Path File` in the menu in the upper left corner and select the location where the file is saved. After exporting the file, you can also import it from the menu for secondary editing.
2. Export Navigation Key File After the navigation key is drawn, click `File -> Save Navigation Point` in the menu in the upper left corner and select the file save location. After exporting the file, you can also import it from the menu again for secondary editing. Note: Navigation keys can only be imported after the navigation path file has been successfully imported.

The exported data can be placed in Xiaoqiang's corresponding folder to start visual navigation.

Xiaoqiang Homepage Back To Index