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 sysuzyc Update cartographer.md

64998db 8 minutes ago

1 contributor

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在ROS下安装运行cartographer

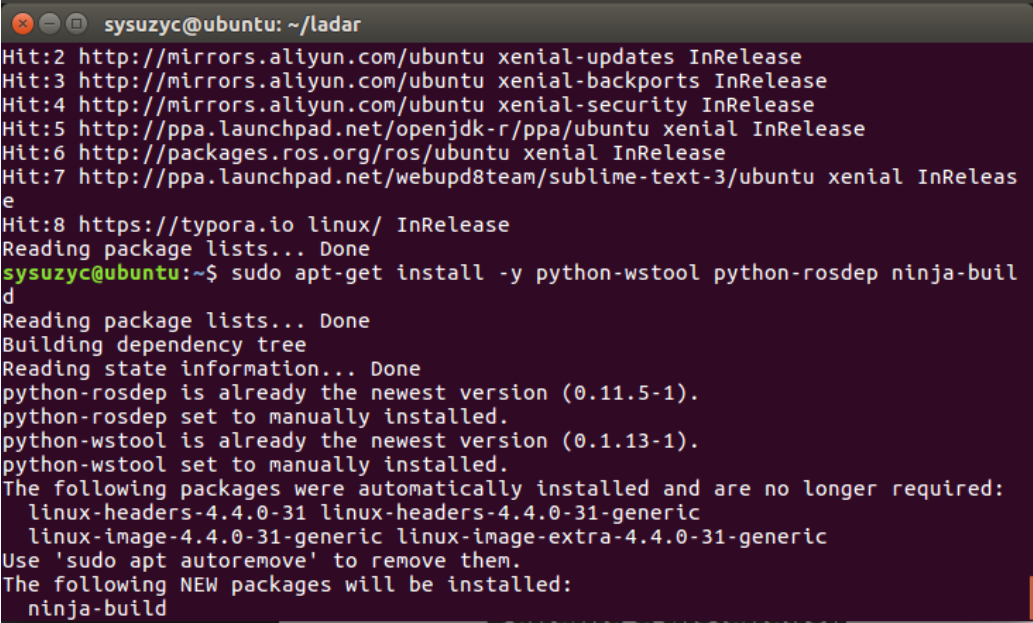
14353404 张亚琛

1、实验过程

Install wstool and rosdep

```
sudo apt-get update
sudo apt-get install -y python-wstool python-rosdep ninja-build
```

首先是对于在上一次的实验中安装的工具的初始化。



```
sysuzyc@ubuntu: ~/ladar
Hit:2 http://mirrors.aliyun.com/ubuntu xenial-updates InRelease
Hit:3 http://mirrors.aliyun.com/ubuntu xenial-backports InRelease
Hit:4 http://mirrors.aliyun.com/ubuntu xenial-security InRelease
Hit:5 http://ppa.launchpad.net/openjdk-r/ppa/ubuntu xenial InRelease
Hit:6 http://packages.ros.org/ros/ubuntu xenial InRelease
Hit:7 http://ppa.launchpad.net/webupd8team/sublime-text-3/ubuntu xenial InRelease
Hit:8 https://typora.io linux/ InRelease
Reading package lists... Done
sysuzyc@ubuntu:~$ sudo apt-get install -y python-wstool python-rosdep ninja-build
Reading package lists... Done
Building dependency tree
Reading state information... Done
python-rosdep is already the newest version (0.11.5-1).
python-rosdep set to manually installed.
python-wstool is already the newest version (0.1.13-1).
python-wstool set to manually installed.
The following packages were automatically installed and are no longer required:
  linux-headers-4.4.0-31 linux-headers-4.4.0-31-generic
  linux-image-4.4.0-31-generic linux-image-extra-4.4.0-31-generic
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  ninja-build
```

Create a new workspace in 'catkin_ws'

```
mkdir catkin_ws
cd catkin_ws
wstool init src
wstool merge -t src https://raw.githubusercontent.com/googlecartographer/cartographer_ros/master/cartographer_ros.ros
wstool update -t src
```

```

sysuzyc@ubuntu: ~/catkin_ws
bash: install isolated/setup.bash: No such file or directory
cd sysuzyc@ubuntu:~$ cd catkin_ws
sysuzyc@ubuntu:~/catkin_ws$ wstool init src
Error: There already is a workspace config file .rosinstall at "src". Use wstool
install/modify.
sysuzyc@ubuntu:~/catkin_ws$ wstool merge -t src https://raw.githubusercontent.co
m/googlecartographer/cartographer_ros/master/cartographer_ros.rosinstall

Merge caused no change, no new elements found
sysuzyc@ubuntu:~/catkin_ws$ wstool update -t src
Prepare updating https://github.com/googlecartographer/cartographer_ros.git (ver
sion None) to /home/sysuzyc/catkin_ws/src/cartographer_ros
Url https://github.com/hitcm/cartographer_ros.git does not match https://github.
com/googlecartographer/cartographer_ros.git requested.
(d)elete and replace, (a)bort, (b)ackup and replace, (s)kip: s
Skipping install of cartographer_ros because: Url https://github.com/hitcm/carto
grapher_ros.git does not match https://github.com/googlecartographer/cartographe
r_ros.git requested.
[cartographer] Fetching https://github.com/googlecartographer/cartographer.git (
version None) to /home/sysuzyc/catkin_ws/src/cartographer
Cloning into '/home/sysuzyc/catkin_ws/src/cartographer'...
remote: Counting objects: 1305, done.
remote: Compressing objects: 100% (49/49), done.
remote: Total 1305 (delta 12), reused 0 (delta 0), pack-reused 1256
Receiving objects: 100% (1305/1305), 554.09 KiB | 227.00 KiB/s, done.
Resolving deltas: 100% (870/870), done.
Checking connectivity... done.
[cartographer] Done.
sysuzyc@ubuntu:~/catkin_ws$ wstool update -t src
Prepare updating https://github.com/googlecartographer/cartographer_ros.git (ver
sion None) to /home/sysuzyc/catkin_ws/src/cartographer_ros
Url https://github.com/hitcm/cartographer_ros.git does not match https://github.
com/googlecartographer/cartographer_ros.git requested.
(d)elete and replace, (a)bort, (b)ackup and replace, (s)kip: s
Skipping install of cartographer_ros because: Url https://github.com/hitcm/carto
grapher_ros.git does not match https://github.com/googlecartographer/cartographe
r_ros.git requested.
[cartographer] Updating /home/sysuzyc/catkin_ws/src/cartographer
[cartographer] Done.
sysuzyc@ubuntu:~/catkin_ws$

```

Install deb dependencies

```

rosdep init
rosdep update
rosdep install --from-paths src --ignore-src --rosdistro=${ROS_DISTRO} -y

```

```

sysuzyc@ubuntu: ~/catkin_ws
(d)elete and replace, (a)bort, (b)ackup and replace, (s)kip: s
Skipping install of cartographer_ros because: Url https://github.com/hitcm/carto
grapher_ros.git does not match https://github.com/googlecartographer/cartographe
r_ros.git requested.
[cartographer] Updating /home/sysuzyc/catkin_ws/src/cartographer
[cartographer] Done.
sysuzyc@ubuntu:~/catkin_ws$ rosdep init
ERROR: default sources list file already exists:
/etc/ros/rosdep/sources.list.d/20-default.list
Please delete if you wish to re-initialize
sysuzyc@ubuntu:~/catkin_ws$ rosdep update
reading in sources list data from /etc/ros/rosdep/sources.list.d
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/osx-homebrew.y
aml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/base.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/python.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/ruby.yaml
Hit https://raw.githubusercontent.com/ros/rosdistro/master/releases/fuerte.yaml
Query rosdistro index https://raw.githubusercontent.com/ros/rosdistro/master/ind
ex.yaml
Add distro "groovy"
Add distro "hydro"
Add distro "indigo"
Add distro "jade"
Add distro "kinetic"
updated cache in /home/sysuzyc/.ros/rosdep/sources.cache
sysuzyc@ubuntu:~/catkin_ws$ rosdep install --from-paths src --ignore-src --rosdi
stro=${ROS_DISTRO} -y
ERROR: the following packages/stacks could not have their rosdep keys resolved
to system dependencies:
cartographer: Cannot locate rosdep definition for [ceres_solver]
sysuzyc@ubuntu:~/catkin_ws$

```

Build and install

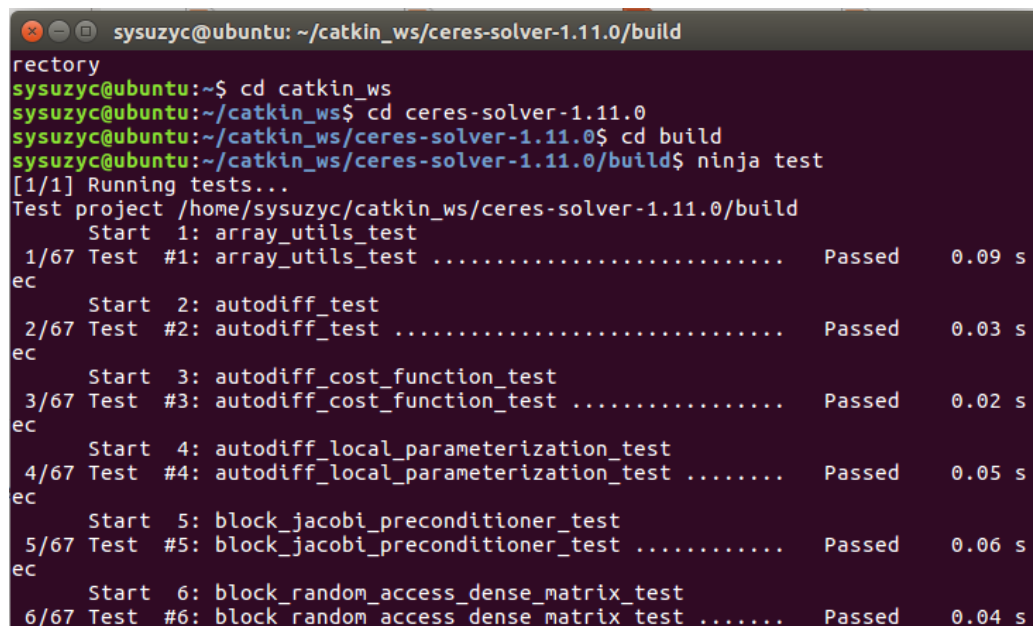
```
catkin_make_isolated --install --use-ninja
source install_isolated/setup.bash
```

本来按照google的官方网站的做法，是需要翻墙才可以的，不然的话，就会报错。但是如果不想翻墙的话，需要采用以下方法：

Build and install Ceres.

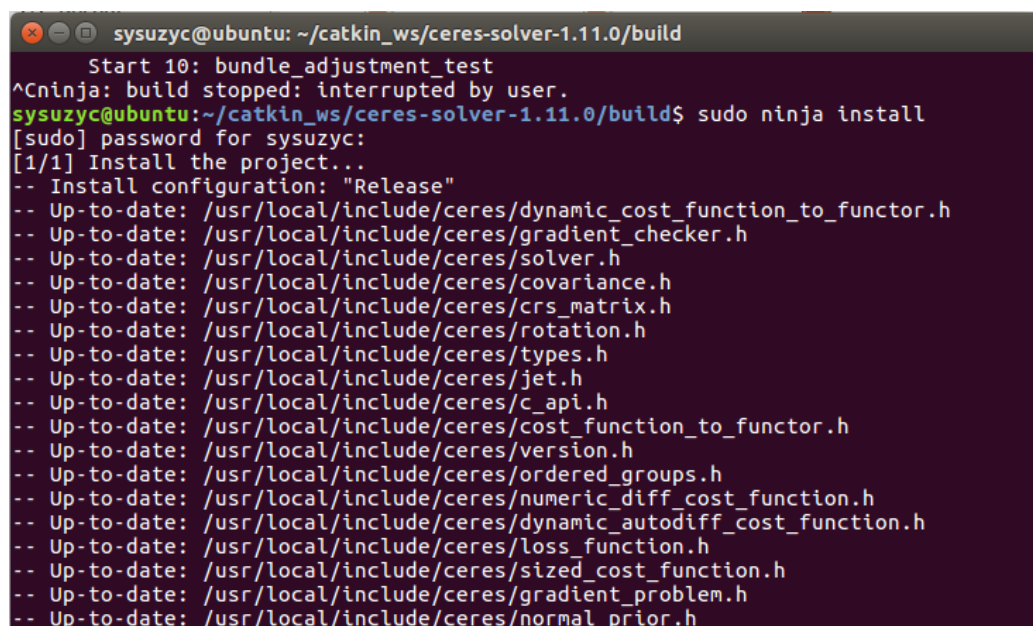
```
git clone https://ceres-solver.googlesource.com/ceres-solver
cd ceres-solver
mkdir build
cd build
cmake .. -G Ninja
ninja
ninja test
sudo ninja install
```

这一步得到的是ceres的建立和初始化，通过从导入对应的文件，可以很好的避免翻墙这种方法。结果也是比较正常的。



```
sysuzyc@ubuntu: ~/catkin_ws/ceres-solver-1.11.0/build
rectory
sysuzyc@ubuntu:~$ cd catkin_ws
sysuzyc@ubuntu:~/catkin_ws$ cd ceres-solver-1.11.0
sysuzyc@ubuntu:~/catkin_ws/ceres-solver-1.11.0$ cd build
sysuzyc@ubuntu:~/catkin_ws/ceres-solver-1.11.0/build$ ninja test
[1/1] Running tests...
Test project /home/sysuzyc/catkin_ws/ceres-solver-1.11.0/build
  Start 1: array_utils_test
1/67 Test #1: array_utils_test ..... Passed    0.09 s
ec
  Start 2: autodiff_test
2/67 Test #2: autodiff_test ..... Passed    0.03 s
ec
  Start 3: autodiff_cost_function_test
3/67 Test #3: autodiff_cost_function_test ..... Passed    0.02 s
ec
  Start 4: autodiff_local_parameterization_test
4/67 Test #4: autodiff_local_parameterization_test ..... Passed    0.05 s
ec
  Start 5: block_jacobi_preconditioner_test
5/67 Test #5: block_jacobi_preconditioner_test ..... Passed    0.06 s
ec
  Start 6: block_random_access_dense_matrix_test
6/67 Test #6: block_random_access_dense_matrix_test ..... Passed    0.04 s
```

然后进行下最后一步，可以看到：



```
sysuzyc@ubuntu: ~/catkin_ws/ceres-solver-1.11.0/build
Start 10: bundle_adjustment_test
^Cninja: build stopped: interrupted by user.
sysuzyc@ubuntu:~/catkin_ws/ceres-solver-1.11.0/build$ sudo ninja install
[sudo] password for sysuzyc:
[1/1] Install the project...
-- Install configuration: "Release"
-- Up-to-date: /usr/local/include/ceres/dynamic_cost_function_to_funcutor.h
-- Up-to-date: /usr/local/include/ceres/gradient_checker.h
-- Up-to-date: /usr/local/include/ceres/solver.h
-- Up-to-date: /usr/local/include/ceres/covariance.h
-- Up-to-date: /usr/local/include/ceres/crs_matrix.h
-- Up-to-date: /usr/local/include/ceres/rotation.h
-- Up-to-date: /usr/local/include/ceres/types.h
-- Up-to-date: /usr/local/include/ceres/jet.h
-- Up-to-date: /usr/local/include/ceres/c_api.h
-- Up-to-date: /usr/local/include/ceres/cost_function_to_funcutor.h
-- Up-to-date: /usr/local/include/ceres/version.h
-- Up-to-date: /usr/local/include/ceres/ordered_groups.h
-- Up-to-date: /usr/local/include/ceres/numeric_diff_cost_function.h
-- Up-to-date: /usr/local/include/ceres/dynamic_autodiff_cost_function.h
-- Up-to-date: /usr/local/include/ceres/loss_function.h
-- Up-to-date: /usr/local/include/ceres/sized_cost_function.h
-- Up-to-date: /usr/local/include/ceres/gradient_problem.h
-- Up-to-date: /usr/local/include/ceres/normal_prior.h
```

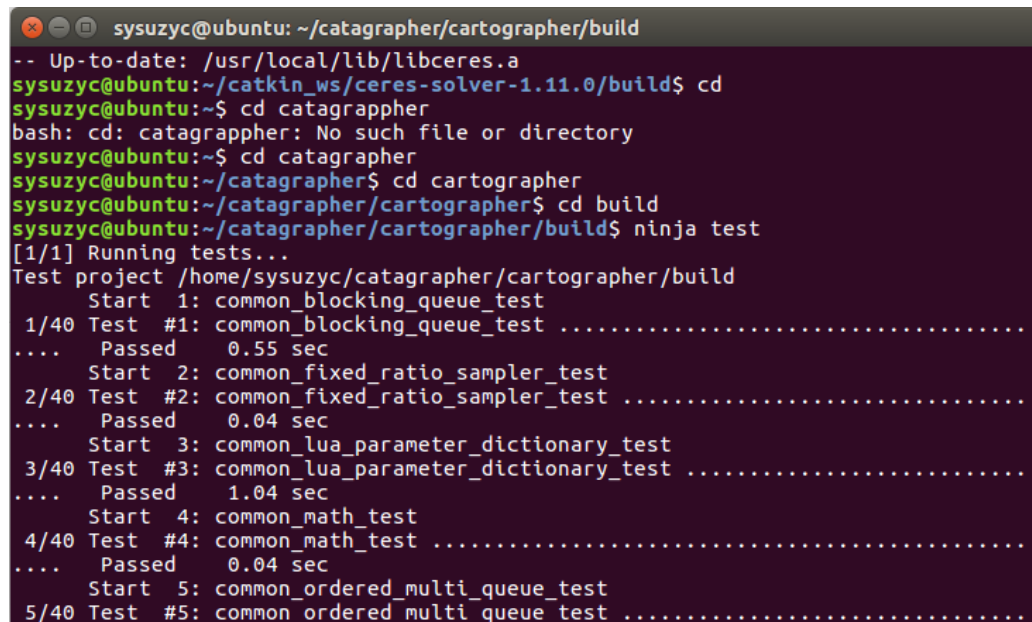
Build and install Cartographer

```

git clone https://github.com/hitcm/cartographer.git
cd cartographer
mkdir build
cd build
cmake .. -G Ninja
ninja
ninja test
sudo ninja install

```

在自己下载的cartographer文件夹中，执行上述的命令，就可以很好的完成这次的实验了。

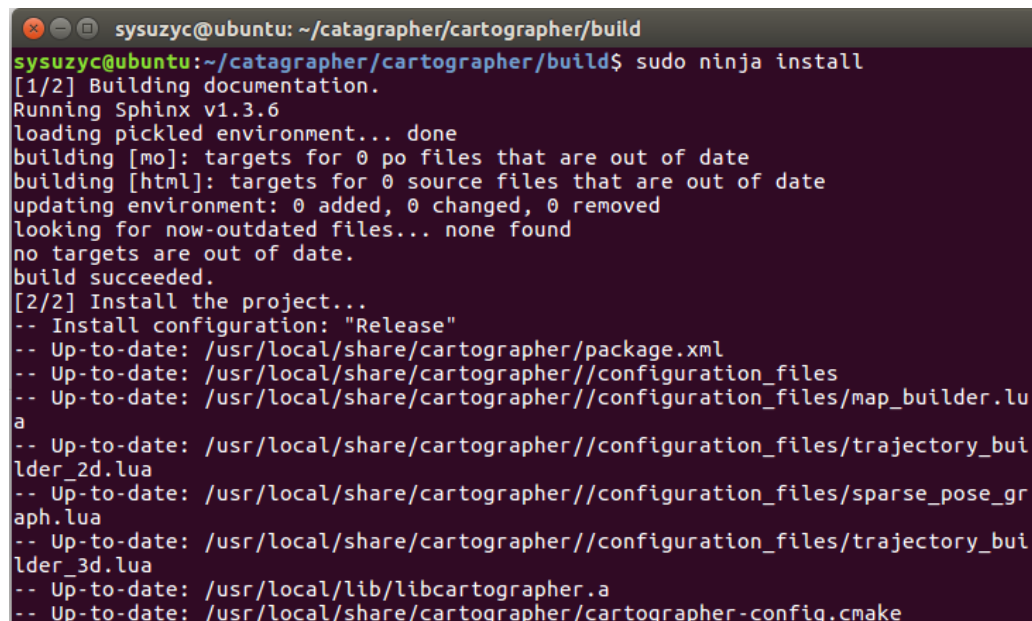


```

sysuzyc@ubuntu: ~/catagrapper/cartographer/build
-- Up-to-date: /usr/local/lib/libceres.a
sysuzyc@ubuntu:~/catkin_ws/ceres-solver-1.11.0/build$ cd
sysuzyc@ubuntu:~$ cd catagrapper
bash: cd: catagrapper: No such file or directory
sysuzyc@ubuntu:~$ cd catagrapper
sysuzyc@ubuntu:~/catagrapper$ cd cartographer
sysuzyc@ubuntu:~/catagrapper/cartographer$ cd build
sysuzyc@ubuntu:~/catagrapper/cartographer/build$ ninja test
[1/1] Running tests...
Test project /home/sysuzyc/catagrapper/cartographer/build
  Start 1: common_blocking_queue_test
 1/40 Test #1: common_blocking_queue_test .....
.... Passed    0.55 sec
  Start 2: common_fixed_ratio_sampler_test
 2/40 Test #2: common_fixed_ratio_sampler_test .....
.... Passed    0.04 sec
  Start 3: common_lua_parameter_dictionary_test
 3/40 Test #3: common_lua_parameter_dictionary_test .....
.... Passed    1.04 sec
  Start 4: common_math_test
 4/40 Test #4: common_math_test .....
.... Passed    0.04 sec
  Start 5: common_ordered_multi_queue_test
 5/40 Test #5: common_ordered_multi_queue_test .....

```

同样的最后的一步执行如下：



```

sysuzyc@ubuntu: ~/catagrapper/cartographer/build
sysuzyc@ubuntu:~/catagrapper/cartographer/build$ sudo ninja install
[1/2] Building documentation.
Running Sphinx v1.3.6
loading pickled environment... done
building [mo]: targets for 0 po files that are out of date
building [html]: targets for 0 source files that are out of date
updating environment: 0 added, 0 changed, 0 removed
looking for now-outdated files... none found
no targets are out of date.
build succeeded.
[2/2] Install the project...
-- Install configuration: "Release"
-- Up-to-date: /usr/local/share/cartographer/package.xml
-- Up-to-date: /usr/local/share/cartographer/configuration_files
-- Up-to-date: /usr/local/share/cartographer/configuration_files/map_builder.lua
-- Up-to-date: /usr/local/share/cartographer/configuration_files/trajectory_builder_2d.lua
-- Up-to-date: /usr/local/share/cartographer/configuration_files/sparse_pose_graph.lua
-- Up-to-date: /usr/local/share/cartographer/configuration_files/trajectory_builder_3d.lua
-- Up-to-date: /usr/local/lib/libcartographer.a
-- Up-to-date: /usr/local/share/cartographer/cartographer-config.cmake

```

上面的命令执行完了之后，我们需要做的就是安装cartographer_ros。

为了安装的方便，我们都并没有下载到catkin_ws文件夹下面，所以，自己下载到任意路径之后，执行以下的操作。 cd catkin_ws/src git clone https://github.com/hitcm/artographer_ros.git cd catkin_ws catkin_make


```

/home/sysuzyc/catkin_ws/src/cartographer_ros/cartographer_ros/launch/demo_backpack
bash: install_isolated/setup.bash: No such file or directory
sysuzyc@ubuntu:~$ cd catkin_ws
sysuzyc@ubuntu:~/catkin_ws$ cd src
sysuzyc@ubuntu:~/catkin_ws/src$ cd
sysuzyc@ubuntu:~$ cd catkin_ws
sysuzyc@ubuntu:~/catkin_ws$ catkin_make
Base path: /home/sysuzyc/catkin_ws
Source space: /home/sysuzyc/catkin_ws/src
Build space: /home/sysuzyc/catkin_ws/build
Devel space: /home/sysuzyc/catkin_ws/devel
Install space: /home/sysuzyc/catkin_ws/install
####
#### Running command: "cmake /home/sysuzyc/catkin_ws/src -DCATKIN_DEVEL_PREFIX=/
home/sysuzyc/catkin_ws/devel -DCMAKE_INSTALL_PREFIX=/home/sysuzyc/catkin_ws/inst
all -G Unix Makefiles" in "/home/sysuzyc/catkin_ws/build"
####
-- Using CATKIN_DEVEL_PREFIX: /home/sysuzyc/catkin_ws/devel
-- Using CMAKE_PREFIX_PATH: /home/sysuzyc/catkin_ws/devel;/opt/ros/kinetic
-- This workspace overlays: /home/sysuzyc/catkin_ws/devel;/opt/ros/kinetic
-- Using PYTHON_EXECUTABLE: /usr/bin/python
-- Using Debian Python package layout
-- Using empy: /usr/bin/empy
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()

```

等这些语句运行完之后，看下catkin_ws的src文件夹下都有哪些内容：

```

sysuzyc@ubuntu:~/catkin_ws/src$ ls
cartographer  cartographer_ros  CMakeLists.txt
sysuzyc@ubuntu:~/catkin_ws/src$

```

如果是上面这些内容的话，那么结果就是正确的了。

Running the demos

Download the 2D backpack example bag.

```
wget -P ~/Downloads https://storage.googleapis.com/cartographer-public-data/bags/backpack_2d/cartographer_paper_deuts
```

Launch the 2D backpack demo.

```
roslaunch cartographer_ros demo_backpack_2d.launch bag_filename:=${HOME}/Downloads/cartographer_paper_deutsches_museu
```



如果前面的步骤都是正确的话，这一步是可以正确的完成的。

初次运行如下所示：

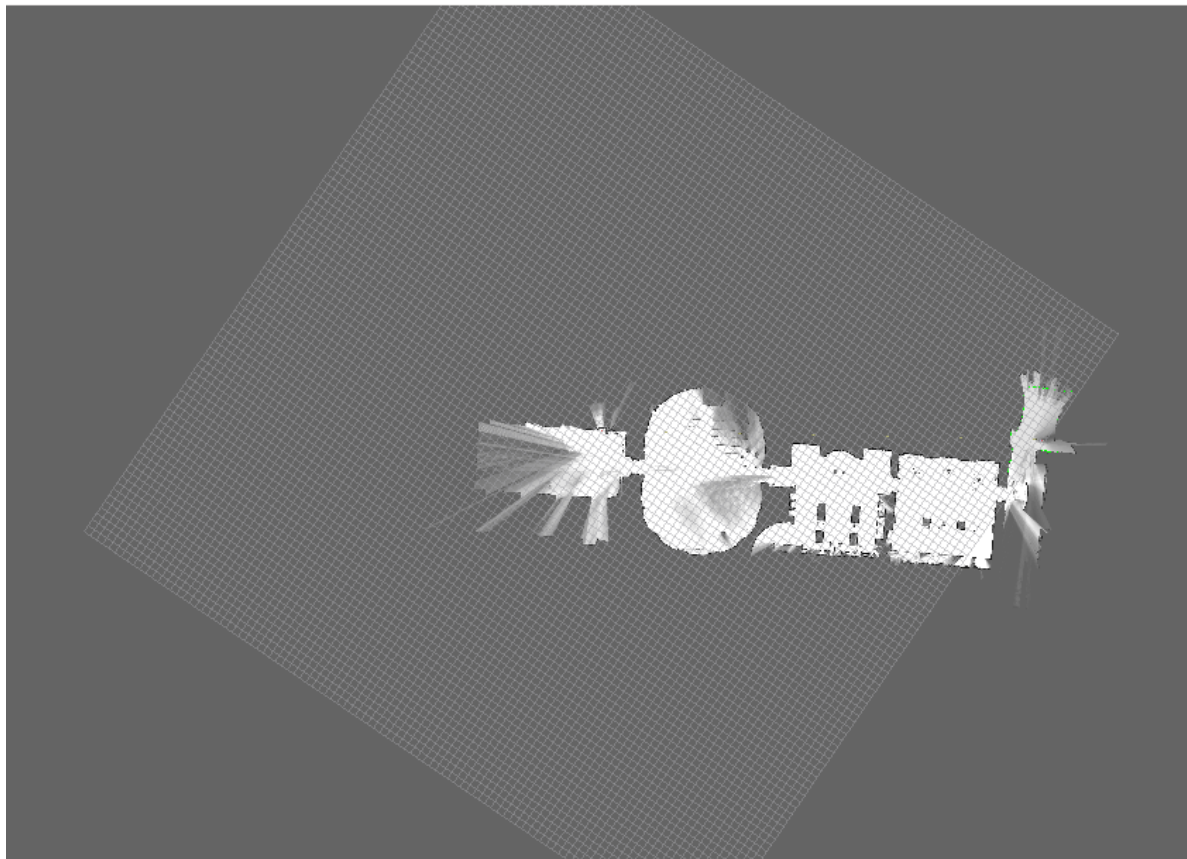
```

/home/sysuzyc/catkin_ws/src/cartographer_ros/cartographer_ros/launch/demo_backpack
v
[ 55%] Built target cartographer_ros_msgs_generate_messages_nodejs
Scanning dependencies of target cartographer_ros_msgs_generate_messages_cpp
[ 58%] Generating C++ code from cartographer_ros_msgs/SubmapEntry.msg
[ 60%] Generating C++ code from cartographer_ros_msgs/TrajectorySubmapList.msg
[ 62%] Generating C++ code from cartographer_ros_msgs/SubmapList.msg
[ 65%] Generating C++ code from cartographer_ros_msgs/SubmapQuery.srv
[ 67%] Generating C++ code from cartographer_ros_msgs/FinishTrajectory.srv
[ 67%] Built target cartographer_ros_msgs_generate_messages_cpp
Scanning dependencies of target cartographer_ros_msgs_generate_messages
[ 67%] Built target cartographer_ros_msgs_generate_messages
Scanning dependencies of target cartographer_node
[ 69%] Building CXX object cartographer_ros/CMakeFiles/cartogra
pher_node.dir/src/cartographer_node_main.cc.o
Generating moc_submaps_display.cpp
[ 69%] Built target cartographer_rviz_submaps_visualization_automoc
[ 72%] Building CXX object cartographer_ros/CMakeFiles/cartogra
pher_node.dir/src/map_writer.cc.o
[ 74%] Building CXX object cartographer_ros/CMakeFiles/cartogra
pher_node.dir/src/msg_conversion.cc.o
Scanning dependencies of target cartographer_rviz_submaps_visualization
[ 76%] Building CXX object cartographer_ros/CMakeFiles/cartogr
apher_rviz_submaps_visualization.dir/src/drawable_submap.cc.o
[ 79%] Building CXX object cartographer_ros/CMakeFiles/cartogra

```

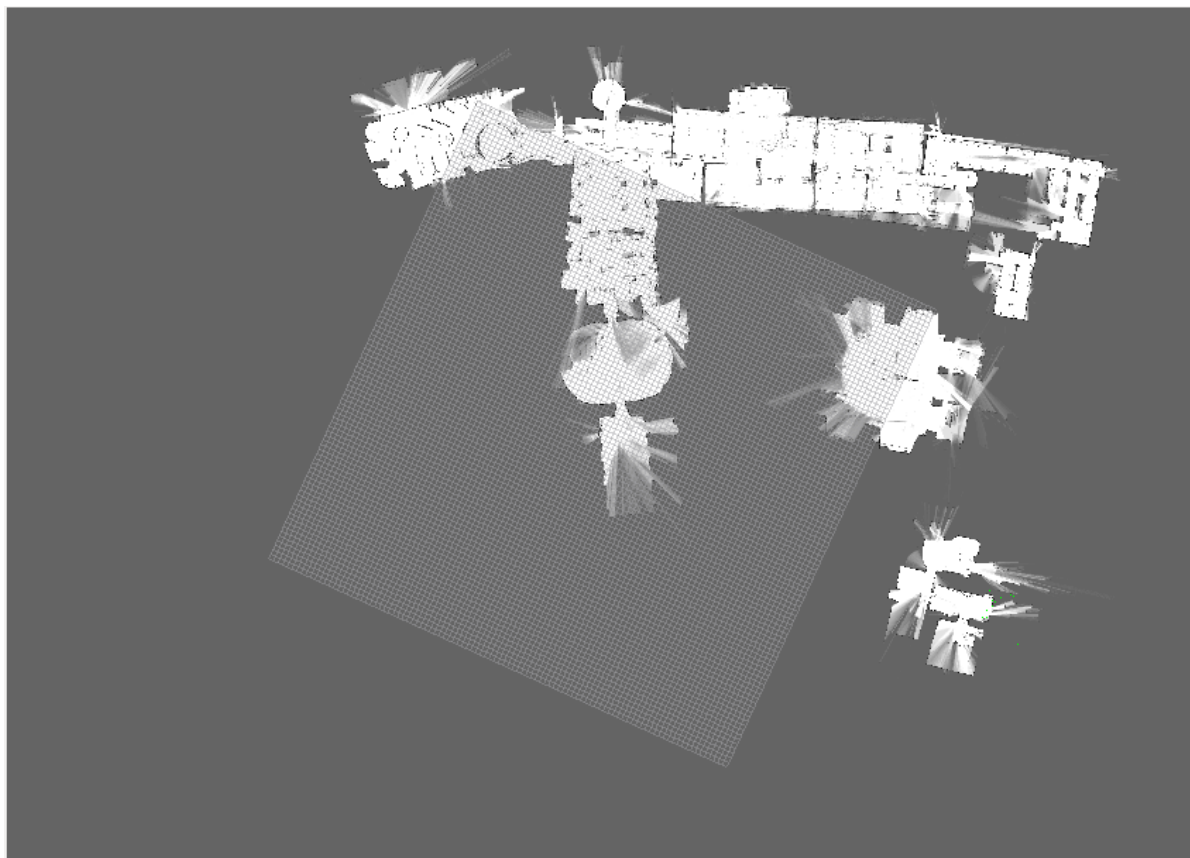
```
/home/sysuzyc/catkin_ws/src/cartographer_ros/cartographer_ros/launch/demo_backpack
[ INFO] [1478595719.160346201, 1432647136.963191257]: I1108 17:01:59.000000 357
0 cartographer_node_main.cc:615] horizontal_laser_link rate: 36.93 Hz 2.71e-02 s
+/- 2.48e-03 s (pulsed at 49.14% real time)
[ INFO] [1478595719.184786934, 1432647136.963191257]: I1108 17:01:59.000000 357
0 cartographer_node_main.cc:615] imu_link rate: 249.93 Hz 4.00e-03 s +/- 3.09e-0
3 s (pulsed at 47.55% real time)
[ INFO] [1478595723.539416748, 1432647141.665800835]: I1108 17:02:03.000000 357
0 submaps.cc:176] Added submap 22
[ INFO] [1478595732.518586920, 1432647150.543806973]: I1108 17:02:12.000000 357
0 motion_filter.cc:42] Motion filter reduced the number of scans to 49.325%.
[ INFO] [1478595733.745852833, 1432647151.717114429]: I1108 17:02:13.000000 357
0 submaps.cc:176] Added submap 23
[ INFO] [1478595734.193480519, 1432647152.292945283]: I1108 17:02:14.000000 357
0 cartographer_node_main.cc:615] horizontal_laser_link rate: 36.77 Hz 2.72e-02 s
+/- 2.46e-03 s (pulsed at 54.73% real time)
[ INFO] [1478595734.196917853, 1432647152.292945283]: I1108 17:02:14.000000 357
0 cartographer_node_main.cc:615] imu_link rate: 241.86 Hz 4.13e-03 s +/- 4.72e-0
3 s (pulsed at 54.80% real time)
[ INFO] [1478595738.524541139, 1432647156.650366421]: I1108 17:02:18.000000 357
0 submaps.cc:176] Added submap 24
[ INFO] [1478595744.272144581, 1432647162.146078383]: I1108 17:02:24.000000 357
0 submaps.cc:176] Added submap 25
[ INFO] [1478595748.625981412, 1432647166.747786785]: I1108 17:02:28.000000 357
0 motion_filter.cc:42] Motion filter reduced the number of scans to 49.6222%.
```

看到结果如下所示:



这个是最开始的界面图。

下面的是运行了半个小时之后的效果图:



所以，结果是正确的。

2、实验感想

这次的实验其实是比较麻烦的，主要是需要翻墙才可以进行那一步操作，如果不翻墙的话，是不可以的，所以，我们需要找对方法来替代那一步对应的操作。所以，这里是比较麻烦的。然后，虽然过程比较坎坷，但是最终还是做出来了。看到这些图片的时候，还是比较开心的。毕竟自己调了一天了，还是没有调通，最后在师兄的指导下，改正了错误，才终于搞好了。也是不容易啊！最后，还是比较开心自己能够搞出来这个东西啦~

