

ROS 安装

ROS 简介

ROS是一个开放的标准平台，提供了一系列的软件框架和工具以帮助如阿健开发者创建机器人应用软件，主要的目标是为机器人研究和开发提供代码复用的支持，提供了C++和Python两种主要的编程接口，提供了大量的包管理系统，开发者能够方便的开发、安装和管理应用包。

ROS 安装过程

- 配置Ubuntu软件仓库 这个操作一般是默认的，不需要进行修改
- 添加source.list
这个操作的目的是使得能够接受来自Packages.ros.org的软件。

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

```
root@Chenqt6:/home/bat# sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
root@Chenqt6:/home/bat# a
```

- 添加keys

```
sudo apt-key adv --keyserver hkp://ha.pool.sks-keyservers.NET:80 --recv-key 0xB01FA116
```

```
root@Chenqt6:/home/bat# sudo apt-key adv --keyserver hkp://ha.pool.sks-keyservers.NET:80 --recv-key 0xB01FA116 Executing:/tmp/tmp.vZcRo5lOC8/gpg.1.sh
--keyserver hkp://ha.pool.sks-keyservers.Net:80 --recv-key 0xB01FA116
Executing: /tmp/tmp.Cwx3sa1ASf/gpg.1.sh --keyserver hkp://ha.pool.sks-keyservers.NET:80
--recv-key 0xB01FA116
Executing:/tmp/tmp.vZcRo5lOC8/gpg.1.sh
--keyserver hkp://ha.pool.sks-keyservers.Net:80
--recv-key 0xB01FA116
gpg: "Executing:/tmp/tmp.vZcRo5lOC8/gpg.1.sh" not a key ID: skipping
gpg: "--keyserver" not a key ID: skipping
gpg: "hkp://ha.pool.sks-keyservers.Net:80" not a key ID: skipping
gpg: "--recv-key" not a key ID: skipping
gpg: requesting key B01FA116 from hkp server ha.pool.sks-keyservers.NET
gpg: requesting key B01FA116 from hkp server ha.pool.sks-keyservers.NET
gpg: key B01FA116: public key "ROS Builder <rosbuild@ros.org>" imported
gpg: key B01FA116: "ROS Builder <rosbuild@ros.org>" not changed
gpg: Total number processed: 2
gpg:         imported: 1
gpg:         unchanged: 1
root@Chenqt6:/home/bat#
```

- 安装
首先要确保软件包是最新的

```
sudo apt-get update
```

```

root@Chenqt5:/opt/ros# sudo apt-get update
Hit:1 http://us.archive.ubuntu.com/ubuntu xenial InRelease
Get:2 http://security.ubuntu.com/ubuntu xenial-security InRelease [94.5 kB]
Ign:3 http://packages.ros.org/ros/ubuntu $(lsb_release InRelease
Get:4 http://us.archive.ubuntu.com/ubuntu xenial-updates InRelease [95.7 kB]
Hit:5 http://packages.ros.org/ros/ubuntu xenial InRelease
Ign:6 http://packages.ros.org/ros/ubuntu $(lsb_release Release
Hit:7 http://us.archive.ubuntu.com/ubuntu xenial-backports InRelease
Ign:8 http://packages.ros.org/ros/ubuntu $(lsb_release/-sc) amd64 Packages
Get:9 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 Packages [42
0 kB]
Ign:10 http://packages.ros.org/ros/ubuntu $(lsb_release/-sc) i386 Packages
Ign:11 http://packages.ros.org/ros/ubuntu $(lsb_release/-sc) all Packages
Ign:12 http://packages.ros.org/ros/ubuntu $(lsb_release/-sc) Translation-en_US
Ign:13 http://packages.ros.org/ros/ubuntu $(lsb_release/-sc) Translation-en
Ign:14 http://packages.ros.org/ros/ubuntu $(lsb_release/-sc) amd64 DEP-11 Metada
ta

```

然后安装完

整版的程序包，这里包括了ROS核心组件、rqt、rviz、机器人通用库、2D\3D模拟器、导航以及2D\3D感知

```
sudo apt-get install ros-hydro-desktop-full
```

```

root@Chenqt5:/opt/ros# sudo apt-get install ros-kinetic-desktop-full
Reading package lists... Done
Building dependency tree
Reading state information... Done
ros-kinetic-desktop-full is already the newest version (1.3.0-0xenial-20161020-1
55501-0700).
The following packages were automatically installed and are no longer required:
  linux-headers-4.4.0-38 linux-headers-4.4.0-38-generic
  linux-image-4.4.0-38-generic linux-image-extra-4.4.0-38-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 91 not upgraded.

```

- 初始化rosdep
在使用之前需要进行初始化

```

sudo rosdep init
rosdep update

```

```

root@Chenqt5:/opt/ros# sudo 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
root@Chenqt5:/opt/ros#

```

```

root@Chenqt5:/opt/ros# rosdep update
reading in sources list data from /etc/ros/rosdep/sources.list.d
Warning: running 'rosdep update' as root is not recommended.
  You should run 'sudo rosdep fix-permissions' and invoke 'rosdep update' again
without sudo.
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.ya
ml
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 /root/.ros/rosdep/sources.cache
root@Chenqt5:/opt/ros#

```

- 环境配置

为了方便，可以设置在每次打开终端的时候就让系统自动配置好ROS环境变量

```
echo "source /opt/ros/hydro/setup.bash" >> ~/.bashrc
```

```
source ~/.bashrc
```

```
root@chenqt5:/opt/ros# echo "source /opt/ros/kinetic/setup.bash" >> ~/.bashrc
root@chenqt5:/opt/ros# source ~/.bashrc
root@chenqt5:/opt/ros#
```

- 安装rosinstall
ros是一个与发行RPS版本无关的常用命令行工具，只需要一个命令就可以轻松的下载ROS程序包所需要的资源树

```
sudo apt-get install python-rosinstall
```

```
root@chenqt5:/opt/ros# source ~/.bashrc
root@chenqt5:/opt/ros# sudo apt-get install python-rosinstall
Reading package lists... Done
Building dependency tree
Reading state information... Done
python-rosinstall is already the newest version (0.7.8-1).
The following packages were automatically installed and are no longer required:
  linux-headers-4.4.0-38 linux-headers-4.4.0-38-generic
  linux-image-4.4.0-38-generic linux-image-extra-4.4.0-38-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 91 not upgraded.
root@chenqt5:/opt/ros#
```

实验结果

通过其中一条ROS指令进行测试发，发现是由相应的输出，证明ROS已经安装成功了。

```
root@chenqt5:/opt/ros# export | grep ROS
declare -x ROSLISP_PACKAGE_DIRECTORIES=""
declare -x ROS_DISTRO="kinetic"
declare -x ROS_ETC_DIR="/opt/ros/kinetic/etc/ros"
declare -x ROS_MASTER_URI="http://localhost:11311"
declare -x ROS_PACKAGE_PATH="/opt/ros/kinetic/share"
declare -x ROS_ROOT="/opt/ros/kinetic/share/ros"
root@chenqt5:/opt/ros# a
```

CARTOGRAPHER安装

Cartographer简介

Cartographer是一个提供多平台和多传感器配置下完成2D和3D下的SLAM(实时地图构建和定位)系统. 同时google也提供了ROS下的集成.

Cartographer安装

安装所有依赖项

```
sudo apt-get install -y google-mock libboost-all-dev libeigen3-dev libgflags-
dev libgoogle-glog-dev liblua5.2-dev libprotobuf-dev libsuitesparse-dev
libwebp-dev ninja-build protobuf-compiler python-sphinx ros-kinetic-tf2-eigen
libatlas-base-dev libsuitesparse-dev liblapack-dev
```

安装Ceres Solver

- 在Home下新建一个Car文件夹以备后面使用
- 获取cere-solver开源代码

```
1. git clone https://github.com/hitcm/ceres-solver-1.11.0.git
```

- 在ceres-solver-1.11.0下创建build文件夹，并进入build文件夹

```
2. cd ceres-solver-1.11.0
3. mkdir build
4. cd ceres-solver-1.11.0/build
```

- 编译

```
5. cmake ..
6. make
```

- 安装

```
7. sudo make install
```

安装Cartographer

- 回退到Car文件夹中
- 获取cartographer的开源代码

```
1. git clone https://github.com/hitcm/cartographer.git
```

- 在cartographer下创建build文件夹，并进入build文件夹

```
2. cd cartographer
3. mkdir build
4. cd build
```

- 编译并测试

```
5. cmake .. -G Ninja
6. ninja
7. njia test
```

- 安装

```
8. sudo make install
```

安装Cartographer_ros

- 回退到Car文件夹
- 安装wstool和rosdep

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

- 创建catkin_ws文件夹并初始化src

```
3. mkdir catkin_ws
4. cd catkin_ws
```

```
5. wstol init src
```

- 进入src

```
6. cd src
```

- 获取cartographer_ros的源码

```
7. git clone https://github.com/hitcm/cartographer_ros.git
```

- 回退到catkin_ws文件夹并运行*catkinmake*

```
8. cd ..
```

```
9. catkin_make
```

Cartographer测试

- 将2d数据包放置在home文件夹下
- 配置catkin_ws

```
1. source ~/catkin_ws/devel/setup.bash
```

```
2. rospack profile
```

- 运行数据包

```
3. roslaunch cartographer_ros demo_backpack_2d.launch
```

```
bag_filename:=${HOME}/Downloads/cartographer_paper_deutsches_museum.bag
```

- 结果

Interact

Move Camera

Select

Focus Camera

Measure

2D Pose Estimate

2D Nav Goal

Views

Type: TopDownOrthoZero

Current View

TopDownOrtho

Near Clip ...0.01

Target Fra...<Fixed Frame>

Scale4.49905

Angle-0.824999

X0

Y0

Save

Remove

Rename

Time

ROS Time: 7104.65

ROS Elapsed: 88.11

Wall Time: 1205.39

Wall Elapsed: 92.46

☐ Experimental

Interact

Move Camera

Select

Focus Camera

Measure

2D Pose Estimate

2D Nav Goal

Views

Type: TopDownOrthoZero

Current View

TopDownOrtho

Near Clip ...0.01

Target Fra...<Fixed Frame>

Scale6.32084

Angle-3.435

X0

Y0

Save

Remove

Rename

Time

ROS Time: 7155.23

ROS Elapsed: 138.69

Wall Time: 1255.98

Wall Elapsed: 143.11

☐ Experimental