

Gazebo、Moveit 联机使用

注意：机器人工作空间是 catkin_ws

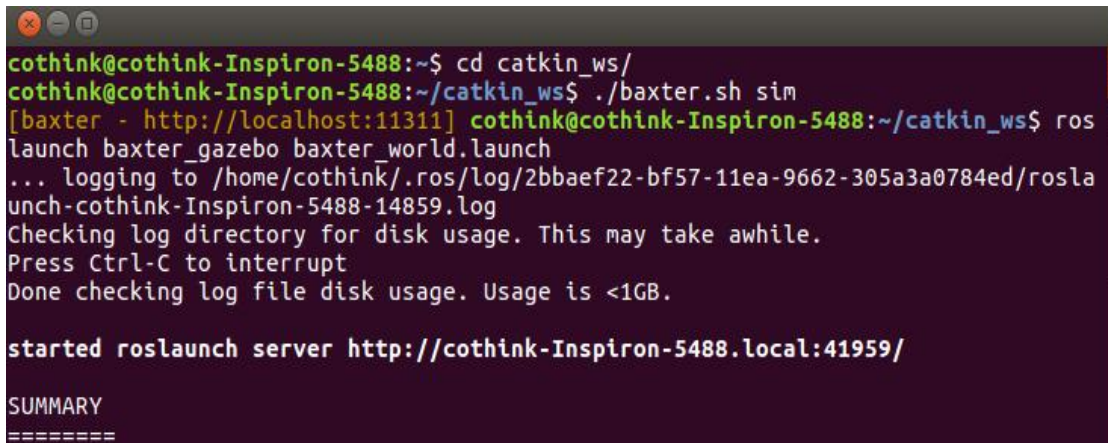
1、启动 Gazebo 仿真平台

①、打开终端输入如下指令，如图所示：

```
cd catkin_ws/
```

```
./baxter.sh sim
```

```
roslaunch baxter_gazebo baxter_world.launch
```

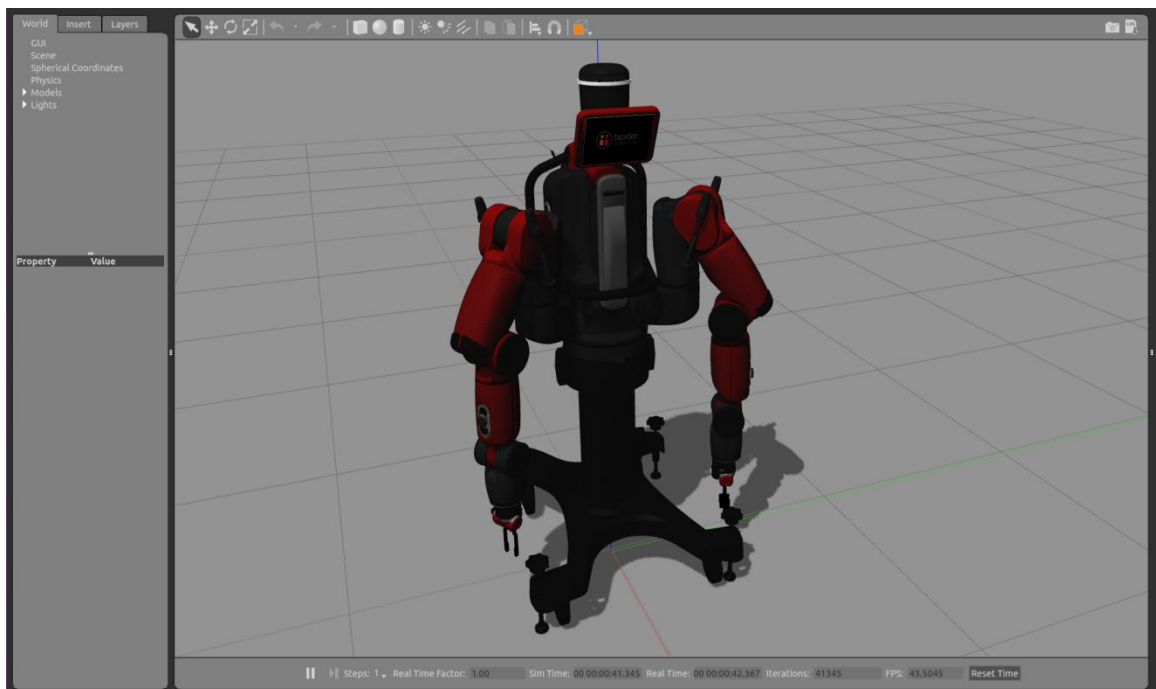


```
cothink@cothink-Inspiron-5488:~$ cd catkin_ws/
cothink@cothink-Inspiron-5488:~/catkin_ws$ ./baxter.sh sim
[baxter - http://localhost:11311] cothink@cothink-Inspiron-5488:~/catkin_ws$ ros
launch baxter_gazebo baxter_world.launch
... logging to /home/cothink/.ros/log/2bbaef22-bf57-11ea-9662-305a3a0784ed/rosla
unch-cothink-Inspiron-5488-14859.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://cothink-Inspiron-5488.local:41959/

SUMMARY
=====
```

②、Gazebo 启动成功界面，如图显示：



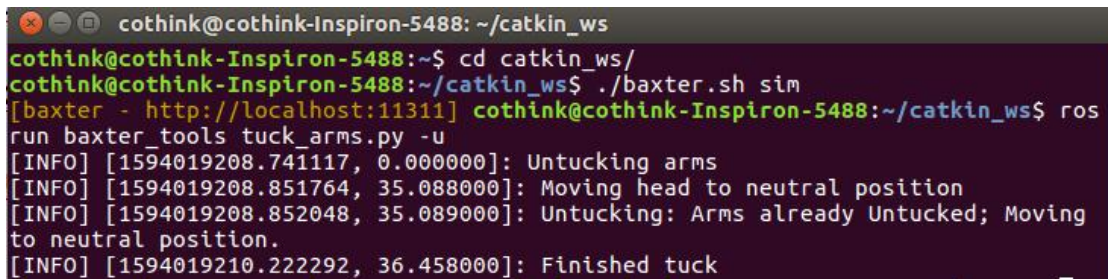
2、执行仿真 Baxter 机器人达到指定姿态指令

①、打开新终端输入如下指令，如图所示：

```
cd catkin_ws
```

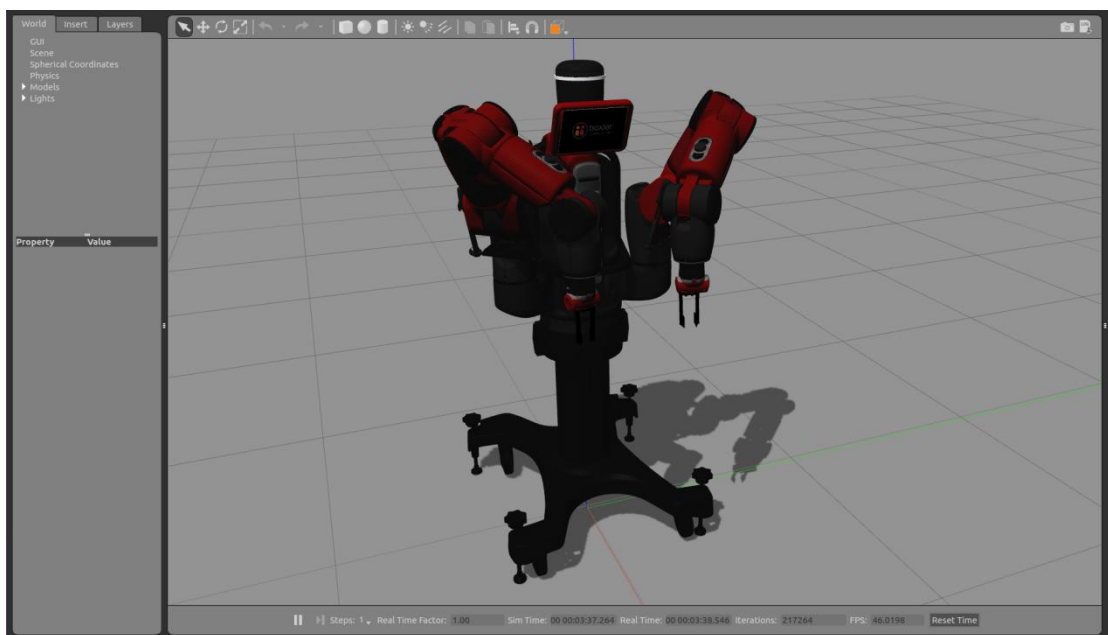
```
./baxter.sh sim
```

```
roslaunch baxter_tools tuck_arms.py -u
```



```
cothink@cothink-Inspiron-5488: ~/catkin_ws
cothink@cothink-Inspiron-5488:~$ cd catkin_ws/
cothink@cothink-Inspiron-5488:~/catkin_ws$ ./baxter.sh sim
[baxter - http://localhost:11311] cothink@cothink-Inspiron-5488:~/catkin_ws$ roslaunch baxter_tools tuck_arms.py -u
[INFO] [1594019208.741117, 0.000000]: Untucking arms
[INFO] [1594019208.851764, 35.088000]: Moving head to neutral position
[INFO] [1594019208.852048, 35.089000]: Untucking: Arms already Untucked; Moving to neutral position.
[INFO] [1594019210.222292, 36.458000]: Finished tuck
```

②、运行上述指令后 Baxter 机器人会自动调节的如图形态：



3、执行 Baxter 机器人关节轨迹服务器指令

打开新终端输入如下指令：

```
cd catkin_ws
```

```
./baxter.sh sim
```

```
roslaunch baxter_interface joint_trajectory_action_server.py
```

```
cothink@cothink-Inspiron-5488:~/catkin_ws
cothink@cothink-Inspiron-5488:~$ cd catkin_ws/
cothink@cothink-Inspiron-5488:~/catkin_ws$ ./baxter.sh sim
[baxter - http://localhost:11311] cothink@cothink-Inspiron-5488:~/catkin_ws$ ros
run baxter_interface joint_trajectory_action_server.py

Initializing node...
Initializing joint trajectory action server...
Running. Ctrl-c to quit
```

4、执行 Baxter 机器人 Moveit 指令

注意：观察 Gazebo 3D 显示区的 Baxter 机器人末端是否有夹具

①、有夹具，打开新终端输入带夹具夹具启动指令，如图所示：

```
cd catkin_ws

./baxter.sh sim

roslaunch baxter_moveit_config baxter_grippers.launch
```

```
cothink@cothink-Inspiron-5488:~$ cd catkin_ws/
cothink@cothink-Inspiron-5488:~/catkin_ws$ ./baxter.sh sim
[baxter - http://localhost:11311] cothink@cothink-Inspiron-5488:~/catkin_ws$ ros
launch baxter_moveit_config baxter_grippers.launch
... logging to /home/cothink/.ros/log/2bbaef22-bf57-11ea-9662-305a3a0784ed/rosla
unch-cothink-Inspiron-5488-19244.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://cothink-Inspiron-5488.local:46271/

SUMMARY
=====
```

②、无夹具，打开新终端输入带不夹具夹具启动指令，如图所示：

```
cd catkin_ws

./baxter.sh sim

roslaunch baxter_moveit_config demo_baxter.launch
```

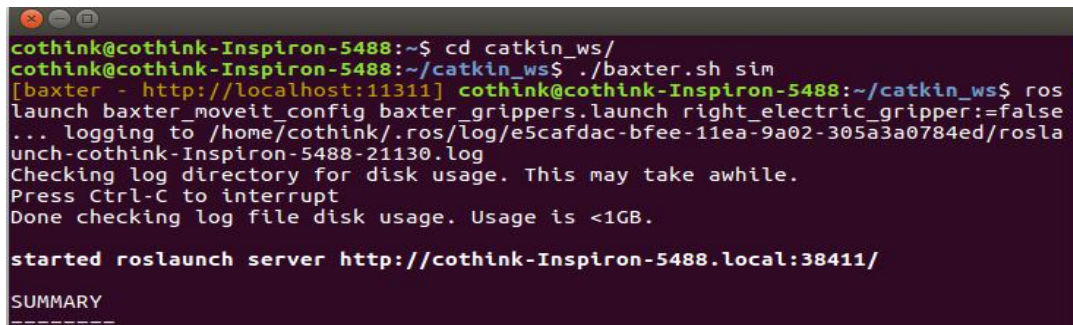
```
cothink@cothink-Inspiron-5488:~$ cd catkin_ws/
cothink@cothink-Inspiron-5488:~/catkin_ws$ ./baxter.sh sim
[baxter - http://localhost:11311] cothink@cothink-Inspiron-5488:~/catkin_ws$ ros
launch baxter_moveit_config demo_baxter.launch
... logging to /home/cothink/.ros/log/e5cafdac-bfee-11ea-9a02-305a3a0784ed/rosla
unch-cothink-Inspiron-5488-19437.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://cothink-Inspiron-5488.local:36391/

SUMMARY
=====
```

③、如果只插入一个夹持器，则始终可以禁用缺失夹持器碰撞形状，方法是使用 `arg <side>\u electric_clipper:=false` 启动，如图所示：

```
cd catkin_ws
./baxter.sh sim
roslaunch baxter_moveit_config baxter_grippers.launch
right_electric_gripper:=false
```

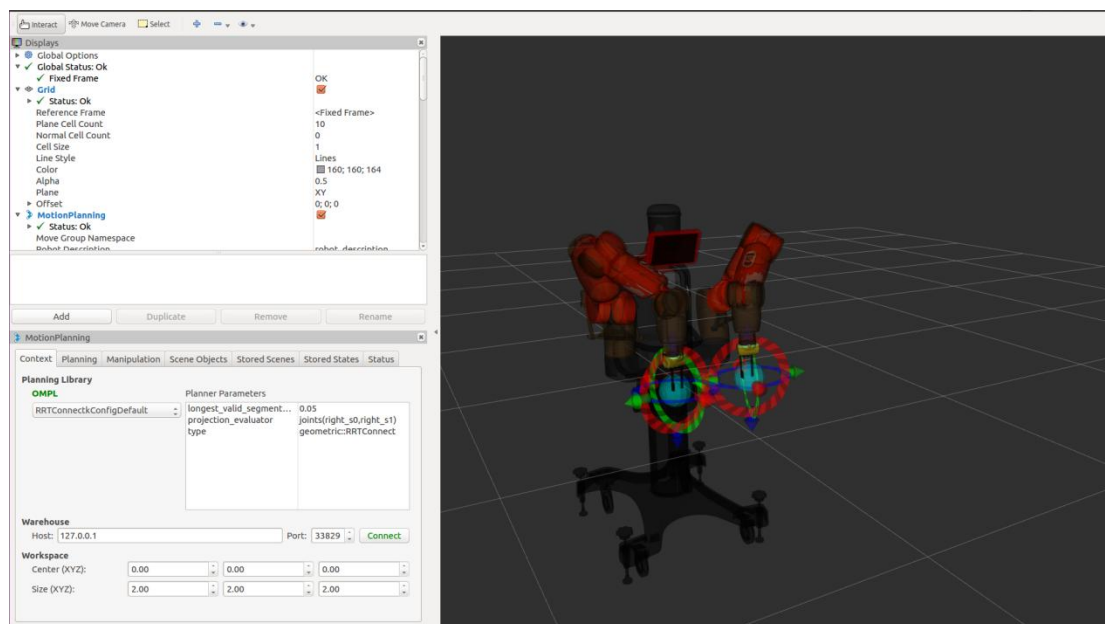


```
cothink@cothink-Inspiron-5488:~$ cd catkin_ws/
cothink@cothink-Inspiron-5488:~/catkin_ws$ ./baxter.sh sim
[baxter - http://localhost:11311] cothink@cothink-Inspiron-5488:~/catkin_ws$ roslaunch baxter_moveit_config baxter_grippers.launch right_electric_gripper:=false
... logging to /home/cothink/.ros/log/e5cafdac-bfee-11ea-9a02-305a3a0784ed/ros-launch-cothink-Inspiron-5488-21130.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://cothink-Inspiron-5488.local:38411/

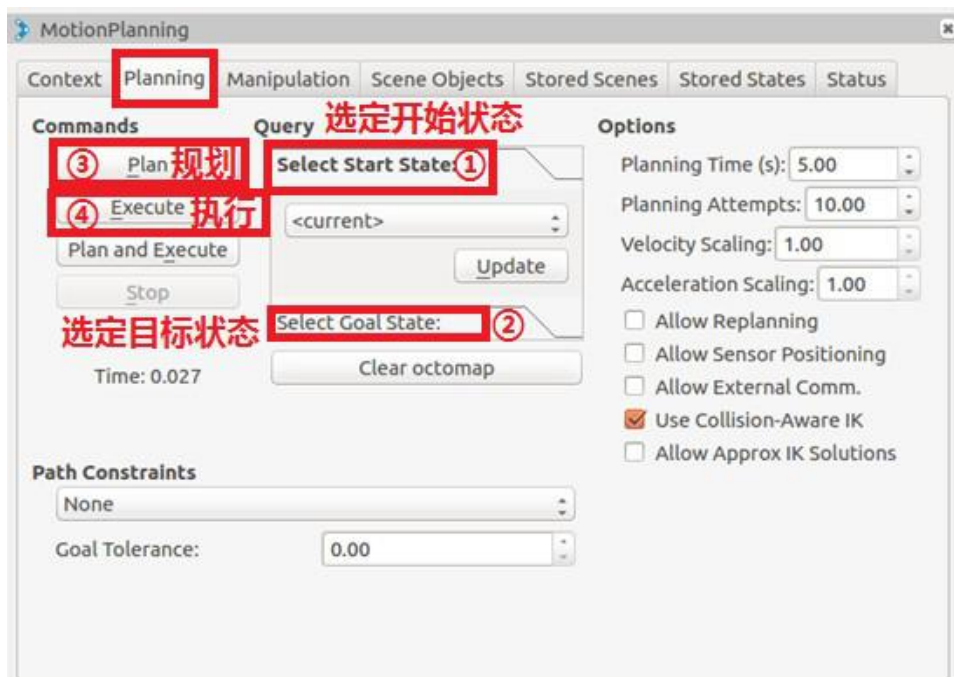
SUMMARY
=====
```

④、指令运行结束后会出现下图所示窗口：



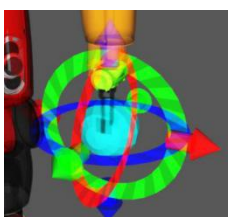
从窗口中可以看出，baxter 机器人已载入 rviz 模型显示区，同时两手臂末端有姿态调整工具，左侧显示区可以看到 moveit 插件 GUI 界面，实验中主要使用MotionPlanning GUI 的Planning、标签。Planning 主要用于指定运动起始状态，设定运动目标状态，执行运动规划并进行运动执行。

⑤、下图为MotionPlanning Planning 标签界面：



1)、标签① “Select Start State” 用于选定机器人的开始状态，运动规划时使用机器人实际所在位置作为开始状态，若机器人实际位置不在指定的开始状态需将位置调整到指定的开始状态；下拉菜单可选项： random valid、random、current、same as goal；选定 current；

2)、标签② “Select goal State” 用于选定机器人目标状态，若有已命名保存的状态点则选择该状态点即可，没有则保持默认选项；可通过鼠标拖动机器人末端状态调整工具实现目标状态的设置。末端工具包含 7 个控件：调整手臂末端空间位置的球；调整手臂姿态的红、绿、蓝三个圆环及调整特定方向位移的红、绿、蓝三个箭头，通过鼠标移动到相应控件拖动即可对机器人手臂进行状态调整。



3) 、设定机器人目标状态后，使用按钮③ “Plan” 启动机器人运动规划，若规划成功则会显示 time: xxx; 若运动规划失败则显示 Failed, 当规划失败后，可以再次点击 Plan 按钮进行规划；运动规划成功后 rviz 3d 显示区可以看到机器人模型的运行轨迹；

4) 、运动规划成功后，点击④ “Execute” 按键，此时可以看到与实验电脑相连的机器人baxter 已经开始运动了，运动轨迹与机器人模型的运行轨迹一致，目标状态完全一致。