

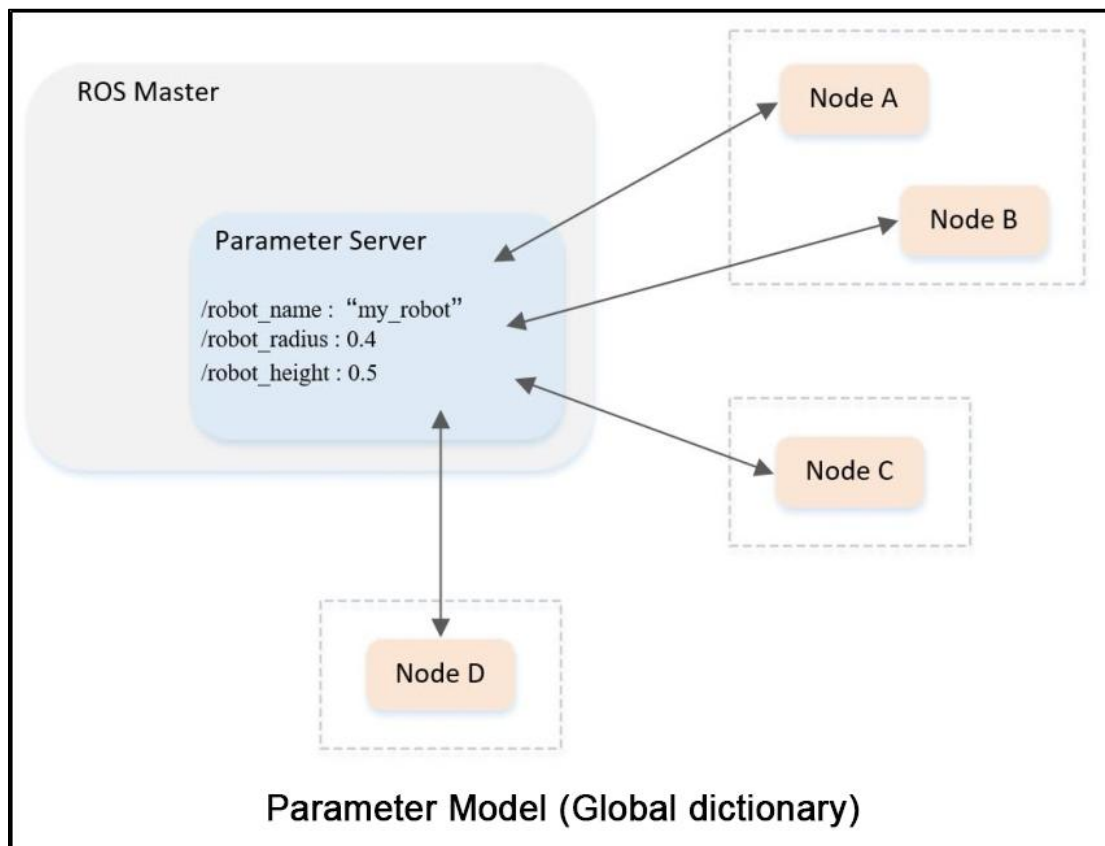
Lesson 11 Parameters Usage and Programming Method

1. Service Model

There is a parameter server in ROS master, which is a global dictionary to store configuration parameters among nodes. For example, parameter server for saving our name, radius and height can be globally accessible by each node.

If I access the robot name in Node A, I will get a value of “my_rot”. It only needs to send a query request to our ROS master, and then return the result of “my_rot”. The same goes for Node B, Node C, and Node D.

The parameter server model is shown in the following figure:



2. rosparam Parameter

2.1 rosparam Detailed Parameter

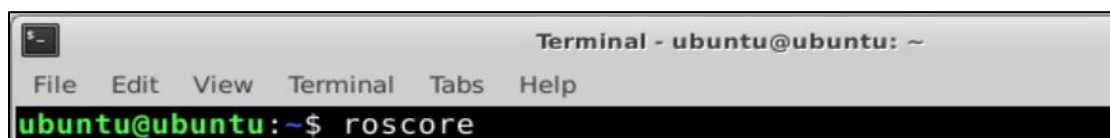
Let's get to know rosparam first and the detailed parameters are as follow:

- List the current number of parameter
`$ rosparam list`
- Display one of the parameter values
`$ rosparam get param_key`
- Set one of the parameter values
`$ rosparam set param_key param_value`
- Save the parameters to file
`$ rosparam dump file_name`
- Read the parameters from file
`$ rosparam load file_name`
- Delete parameter
`$ rosparam delete param_key`

2.2 Run Turtlesim Routine

Taking turtlesim project as an example, run the turtlesim routine first. The specific operation steps are as follows:

- 1) Enter “roscore” command and press “Enter”.



Note: If the prompt “**roscore cannot run as another roscore/master is already running**” appears, which means node manager has been started before and this step can be skipped.

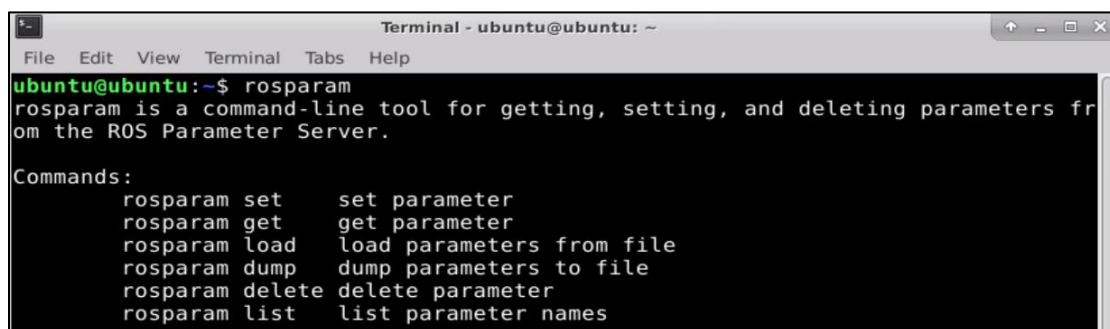
- 2) Enter the command “roslaunch turtlesim turtlesim_node”, and then press “Enter” to open the turtle simulator.



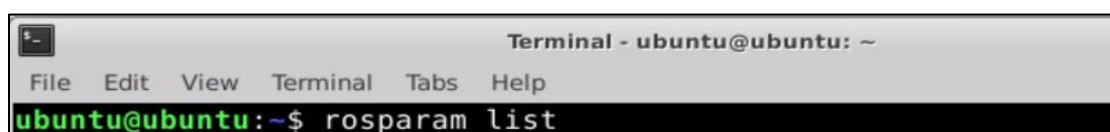
2.3 The Use of rosparam

The operation steps for the use of rosparam are as follow:

- 1) Open a new terminal.
- 2) Enter “rosparam” command and press “Enter”.

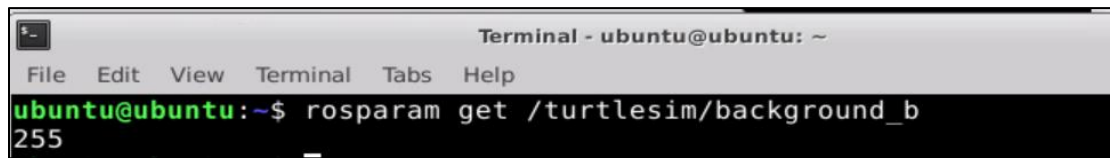


- 3) Enter the command "rosparam list" and press “Enter” to query the number of turtle parameters.



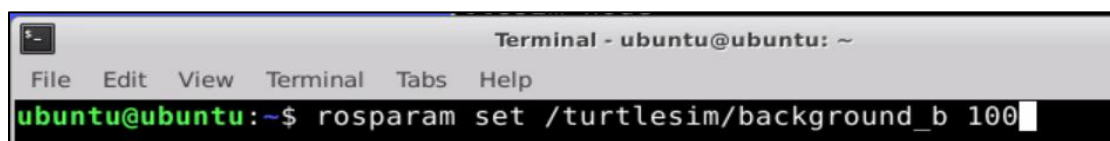
- 4) Enter “rosparam get /turtlesim/background_b” command and press “Enter”

to get the value of “background_b”. The same method goes for getting other values.



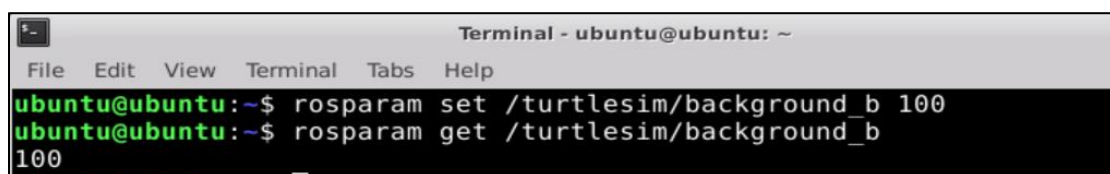
```
Terminal - ubuntu@ubuntu: ~
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~$ rosparam get /turtlesim/background_b
255
```

5) Enter “rosparam set /turtlesim/background_b 100” command and press “Enter” to set “background_b” value. The same method goes for setting other values.



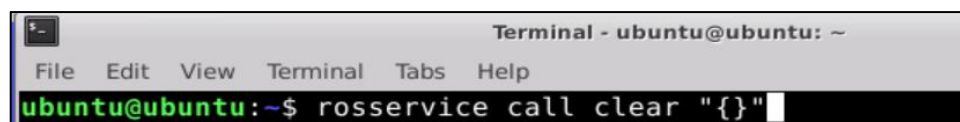
```
Terminal - ubuntu@ubuntu: ~
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~$ rosparam set /turtlesim/background_b 100
```

6) Enter “rosparam get /turtlesim/background_b” command and press “Enter”. Then you can find that the value has been modified to 100.



```
Terminal - ubuntu@ubuntu: ~
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~$ rosparam set /turtlesim/background_b 100
ubuntu@ubuntu:~$ rosparam get /turtlesim/background_b
100
```

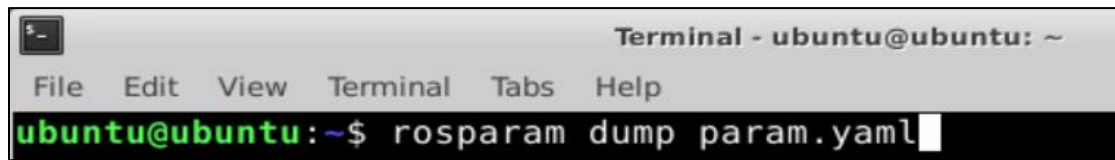
7) Enter “rosservice call clear '{}'” command and press “Enter” to send the request to change color.



```
Terminal - ubuntu@ubuntu: ~
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~$ rosservice call clear "{}"
```

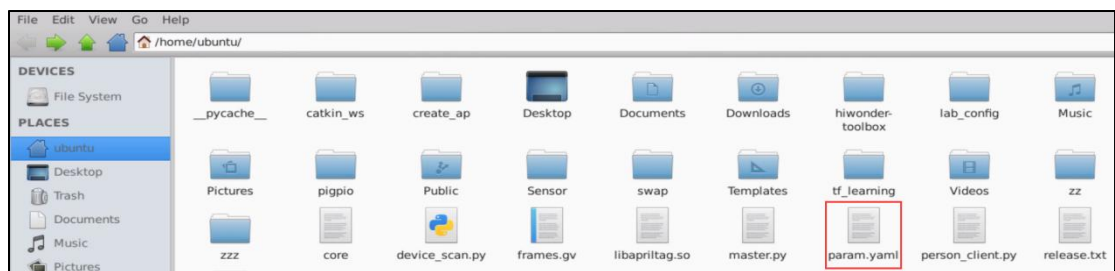


8) Enter “rosparam dump param.yaml” command and press “Enter” to save file.

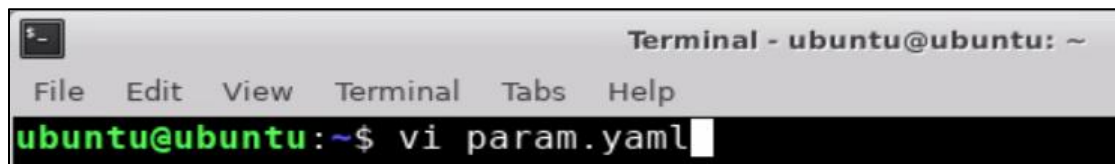


```
Terminal - ubuntu@ubuntu: ~
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~$ rosparam dump param.yaml
```

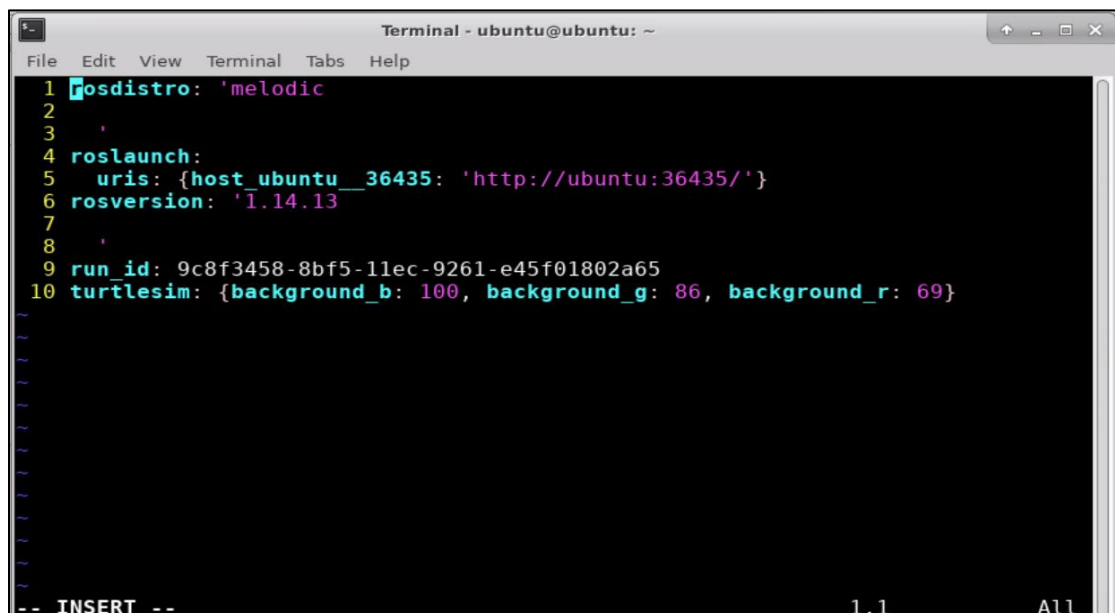
9) The created file is saved in the following path and open it directly.



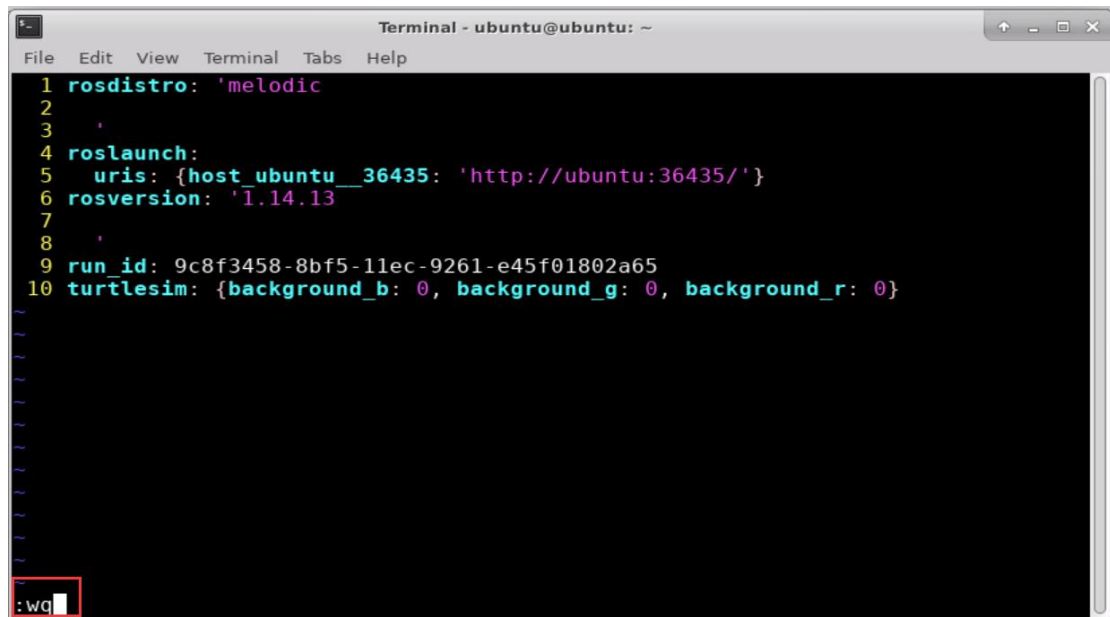
10) Enter “vi param.yaml” command and press “Enter”. Then press “i” to modify “param.yaml”.



```
Terminal - ubuntu@ubuntu: ~
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~$ vi param.yaml
```



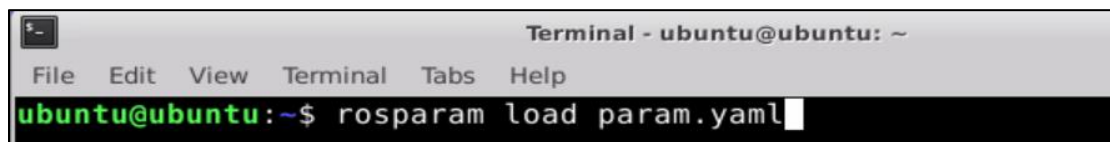
11) The color can be modified to 0 which is black. After modifying, press “Esc” and enter “:wq” to save and exit.

A terminal window titled "Terminal - ubuntu@ubuntu: ~" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal displays a ROS launch configuration file with the following content:

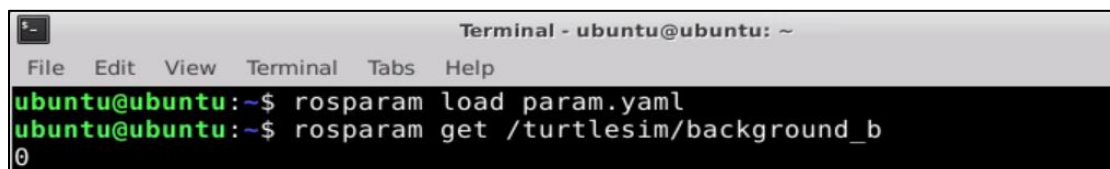
```
1 rosdistro: 'melodic'
2
3
4 roslaunch:
5   uris: {host_ubuntu_36435: 'http://ubuntu:36435/'}
6   rosversion: '1.14.13'
7
8
9 run_id: 9c8f3458-8bf5-11ec-9261-e45f01802a65
10 turtlesim: {background_b: 0, background_g: 0, background_r: 0}
```

The prompt is `:wq` with a cursor.

12) Enter “rosparam load param.yaml” command and press “Enter” to load the file.

A terminal window titled "Terminal - ubuntu@ubuntu: ~" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal shows the command `rosparam load param.yaml` being entered at the prompt `ubuntu@ubuntu:~$`.

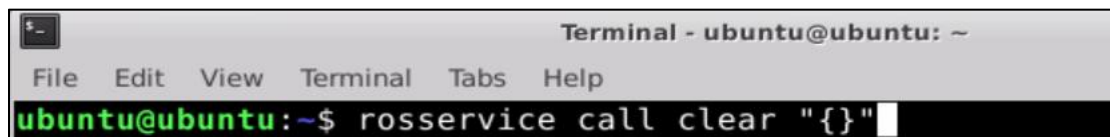
13) Enter “rosparam get /turtlesim/background_b” command and press “Enter” to check the loading effect.

A terminal window titled "Terminal - ubuntu@ubuntu: ~" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal shows two commands being entered at the prompt `ubuntu@ubuntu:~$`:

```
rosparam load param.yaml
rosparam get /turtlesim/background_b
```

The output of the second command is `0`.

14) Enter “rosservice call clear '{}'” command and press “Enter” to send a request that changes the background scolor to black.

A terminal window titled "Terminal - ubuntu@ubuntu: ~" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal shows the command `rosservice call clear '{}'` being entered at the prompt `ubuntu@ubuntu:~$`.



15) Enter “rosparam delete /turtlesim/background_g” command and press “Enter” to delete the color of g.

```
Terminal - ubuntu@ubuntu: ~  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~$ rosparam delete /turtlesim/background_g
```

16) Enter “rosparam list” command and press “Enter” to check effect.

```
Terminal - ubuntu@ubuntu: ~  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~$ rosparam list
```

17) Enter “rosservice call clear '{}'” command and press “Enter” to refresh the background color to check effect.

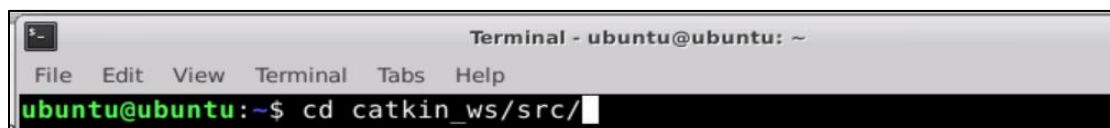
```
Terminal - ubuntu@ubuntu: ~  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~$ rosservice call clear "{}"
```




3. Programming Method

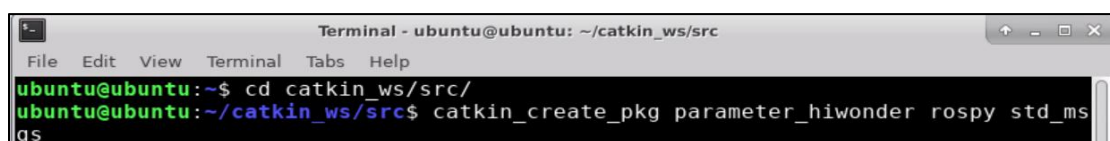
The operation steps for creating package is as follow:

- 1) Enter "cd catkin_ws/src/" command and press "Enter" to come to workspace.

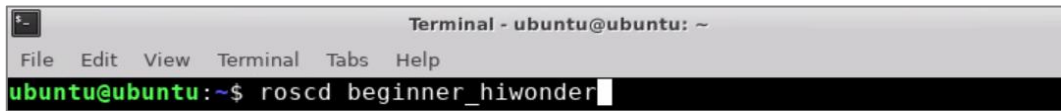


- 2) Enter "catkin_create_pkg parameter_hiwonder rospy std_msgs" command and press "Enter" to create package.

3.1 Write Control Program

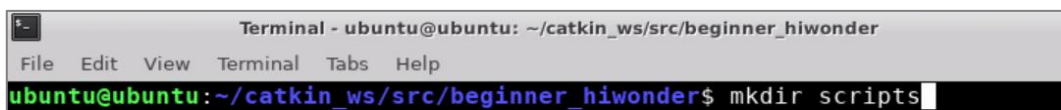


- 1) Open the terminal.
- 2) Enter “roscd parameter_hiwonder” command and press “Enter” to come to the package directory.



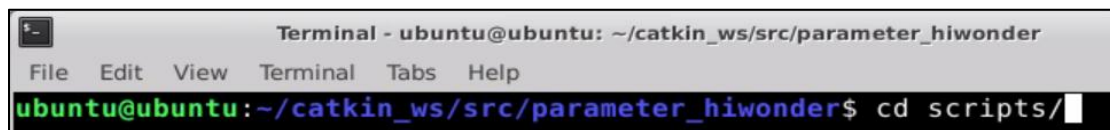
```
Terminal - ubuntu@ubuntu: ~  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~$ roscd beginner_hiwonder
```

- 3) Enter “mkdir scripts” command and press “Enter” to create a new folder “scripts” where Python scripts are stored.



```
Terminal - ubuntu@ubuntu: ~/catkin_ws/src/beginner_hiwonder  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~/catkin_ws/src/beginner_hiwonder$ mkdir scripts
```

- 4) Enter “cd scripts/” command and press “Enter” to come to the “scripts” folder.



```
Terminal - ubuntu@ubuntu: ~/catkin_ws/src/parameter_hiwonder  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~/catkin_ws/src/parameter_hiwonder$ cd scripts/
```

- 5) Enter the command “vi parameter_config.py” to edit the program, and then copy the following program. If want to modify, you can press “i”. After modifying, press “Esc” and enter “:wq” to save and exit.



```
Terminal - ubuntu@ubuntu: ~/catkin_ws/src/parameter_hiwonder/scripts  
File Edit View Terminal Tabs Help  
ubuntu@ubuntu:~/catkin_ws/src/parameter_hiwonder/scripts$ vi parameter_config.py
```

```
#!/usr/bin/env python  
  
# -*- coding: utf-8 -*-  
  
# This routine set and read the parameter in turtle routine  
  
import sys
```

```
import rospy

from std_srvs.srv import Empty

def parameter_config():

    # Initialize ROS node

    rospy.init_node('parameter_config', anonymous=True)

    # read the parameter of blackground color

    red    = rospy.get_param('/turtlesim/background_r')

    green = rospy.get_param('/turtlesim/background_g')

    blue   = rospy.get_param('/turtlesim/background_b')

    rospy.loginfo("Get Backgroud Color[%d, %d, %d]", red, green, blue)

    # set the parameter of blackground color

    rospy.set_param("/turtlesim/background_r", 255);

    rospy.set_param("/turtlesim/background_g", 255);

    rospy.set_param("/turtlesim/background_b", 255);

    rospy.loginfo("Set Backgroud Color[255, 255, 255]");

    # read the parameter of blackground color
```

```
red    = rospy.get_param('/turtlesim/background_r')

green = rospy.get_param('/turtlesim/background_g')

blue   = rospy.get_param('/turtlesim/background_b')


rospy.loginfo("Get Backgroud Color[%d, %d, %d]", red, green, blue)


# After finding /spawn, create a service client, and then connect service named /spawn.

rospy.wait_for_service('/clear')

try:

    clear_background = rospy.ServiceProxy('/clear', Empty)

    # Request service call, enter request data

    response = clear_background()

    return response

except rospy.ServiceException, e:

    print "Service call failed: %s"%e


if __name__ == "__main__":

    parameter_config()
```

```

Terminal - ubuntu@ubuntu: ~/catkin_ws/src/parameter_hiwonder/scripts
File Edit View Terminal Tabs Help
25
26     rospy.loginfo("Set Background Color[255, 255, 255]");
27
28     # 读取背景颜色参数
29     red = rospy.get_param('/turtlesim/background_r')
30     green = rospy.get_param('/turtlesim/background_g')
31     blue = rospy.get_param('/turtlesim/background_b')
32
33     rospy.loginfo("Get Background Color[%d, %d, %d]", red, green, blue)
34
35     # 发现 /spawn 服务后，创建一个服务客户端，连接名为 /spawn 的服务
36     rospy.wait_for_service('/clear')
37     try:
38         clear_background = rospy.ServiceProxy('/clear', Empty)
39
40         # 请求服务调用，输入请求数据
41         response = clear_background()
42         return response
43     except rospy.ServiceException, e:
44         print "Service call failed: %s"%e
45
46 if __name__ == "__main__":
47     parameter_config()
:wg

```

6) Enter “chmod +x parameter_config.py” command and press “Enter” to give the executable permission to the saved parameter_config.py.

```

Terminal - ubuntu@ubuntu: ~/catkin_ws/src/parameter_hiwonder/scripts
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~/catkin_ws/src/parameter_hiwonder/scripts$ chmod +x parameter_config.py

```

4.2 Run Program

1) Enter “roscore” command and press “Enter” to start node manager.

```

Terminal - ubuntu@ubuntu: ~/catkin_ws
File Edit View Terminal Tabs Help
ubuntu@ubuntu:~/catkin_ws$ roscore

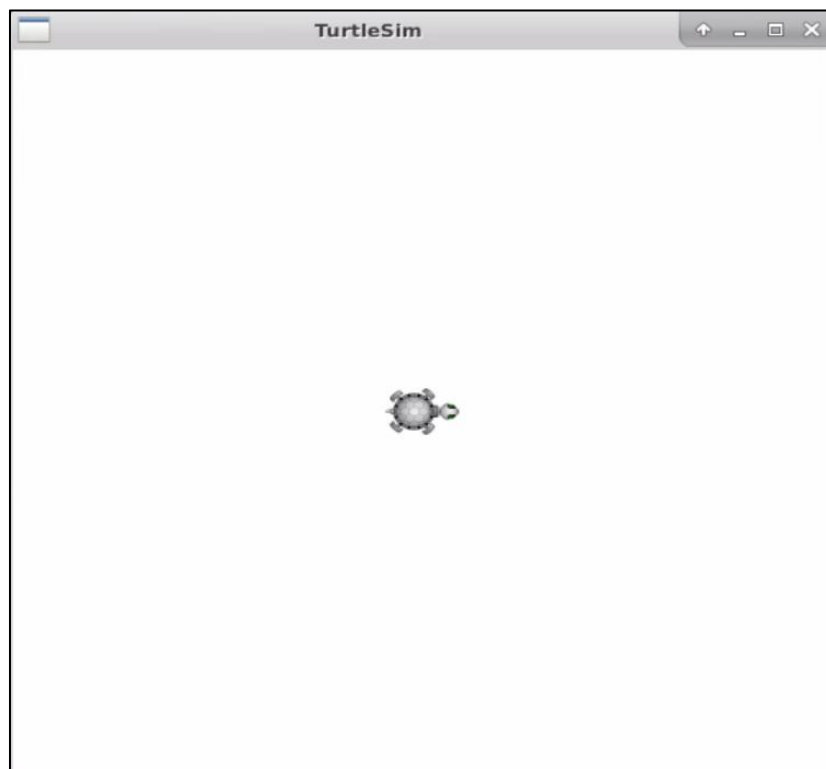
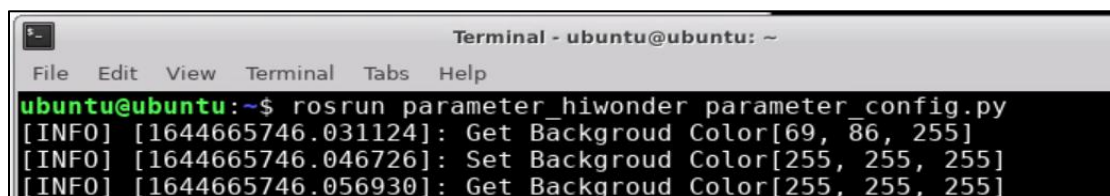
```

Note: If the prompt “roscore cannot run as another roscore/master is already running” appears, it means node manager has been started up so this step can be skipped directly.

2) Enter “roslaunch turtlesim turtlesim_node” command and press “Enter” to open the turtle simulator.



- 3) Enter “roslaunch parameter_hiwonder parameter_config.py” command and press “Enter” to run the program, which changes the background color of turtle to white, as the figure shown below:



- 4) If want to stop running program, you can press “Ctrl+C”.