

تمرین 01_مقدمات رباتیک و آشنایی با ROS

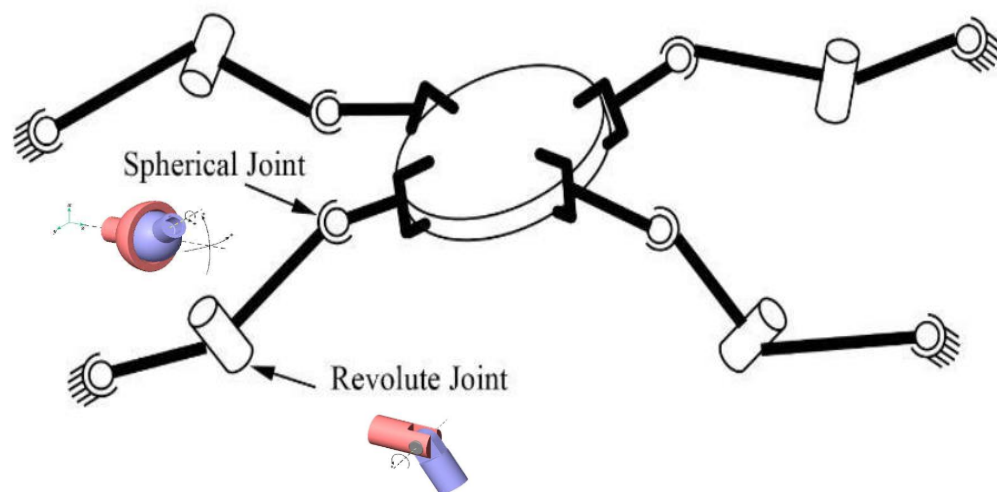
حورا سادات هاشمی _ 9731068

• بخش تئوری:

۱. ربات زیر از ۴ بازوی SRS تشکیل شده است که یک دیسک را نگه داشته‌اند. درجه آزادی آن را به دست آورید.

(راهنمایی: چهار مفصل واقع شده در چهار انتهای ربات به زمین متصل شده‌اند.) (بارم: ۵ امتیاز)

درجه آزادی: سیستمی که پیکربندی آن با n مختصات تعمیم یافته مستقل توصیف می‌شود دارای n درجه آزادی است.



$$N = (1)\text{ground} + (2 \times 4)\text{link} + (1) \text{ disk and others} = 10$$

$$J = (4 \times 3) \text{ 8RJ and 4SJ} = 12$$

$$m = (6) \text{ 3D} = 6$$

$$\text{SJ freedoms} = 3$$

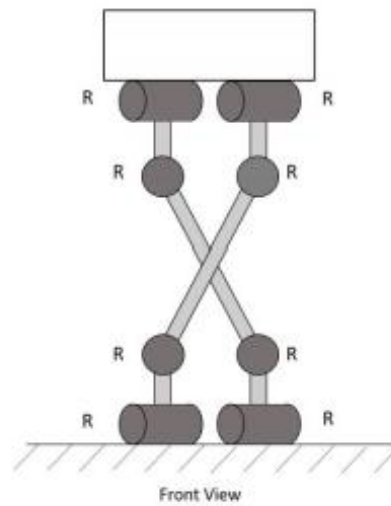
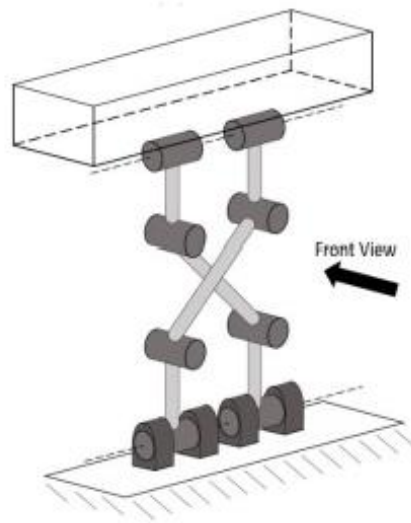
$$\text{RJ freedoms} = 1$$

$$\text{Sigma fi} = (8 \times 3) + (4 \times 1)$$

$$6 \times (10 - 1 - 12) + 8 \times 3 + 4 \times 1 = 10$$

۲. برای ربات زیر درجه آزادی را به دست آورید. (تصویر، ربات را از دو نما نشان می دهد)(بارم : ۵ امتیاز)

درجه آزادی: سیستمی که پیکربندی آن با n مختصات تعمیم یافته مستقل توصیف می شود دارای n درجه آزادی است.



$$N = (1)\text{ground} + (6)\text{link} + (1)\text{ disk} = 8$$

$$J = (8) 4RJ = 8$$

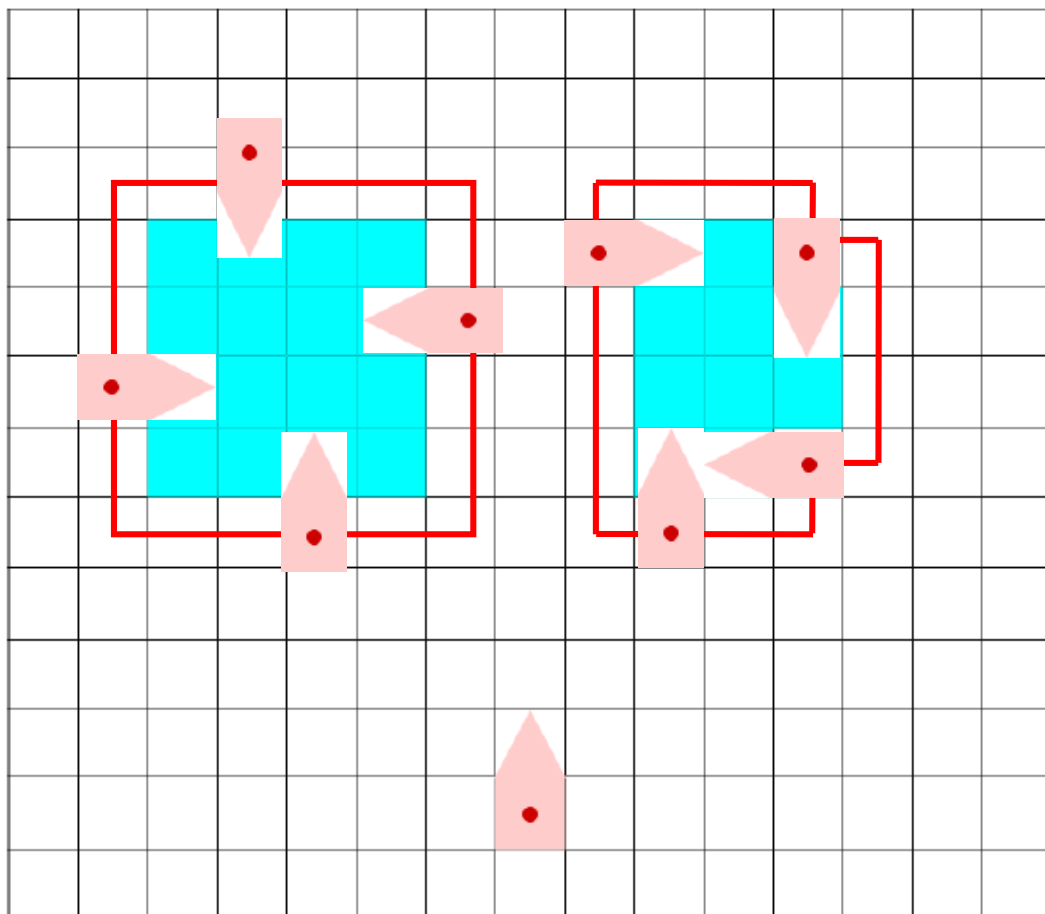
$$m = (6) 3D = 6$$

$$RJ \text{ freedoms} = 1$$

$$\text{Sigma } f_i = (8 \times 1) = 8$$

$$6 \times (8 - 1 - 8) + 8 \times 1 = 2$$

۳. برای ربات مشخص شده در تصویر زیر، C-space را مشخص کنید. (فرض کنید که ربات تنها امکان دوران ۹۰ درجه را دارد) (بارم: ۱۰ امتیاز)



اگر شکل یک خانه را اشغال می کرد work-space برابر با c-space می شد اما در این شکل خطوط قرمز رنگ محل هایی هستند که در آن ربات نمی تواند قرار بگیرد. به غیر از خانه های مشخص شده بقیه خانه ها جزو محدوده c-space است.

مثال های خانه های مشکل دار روی شکل نشان داده شده است.

- بخش عملی - گام اول:

```
noura@tesseract: ~/Desktop/catkin_ws00
File Edit View Search Terminal Help
noura@tesseract:~$ cd Desktop
noura@tesseract:~/Desktop$ mkdir catkin_ws00/src -p
noura@tesseract:~/Desktop$ cd catkin_ws00
noura@tesseract:~/Desktop/catkin_ws00$ ls
src
noura@tesseract:~/Desktop/catkin_ws00$ cd src
noura@tesseract:~/Desktop/catkin_ws00/src$ catkin_init_workspace
Creating symlink "/home/noura/Desktop/catkin_ws00/src/CMakeLists.txt" pointing to "/opt/ros/melodic/share/catkin/cmake/toplevel.cmake"
noura@tesseract:~/Desktop/catkin_ws00/src$ ls
CMakeLists.txt
noura@tesseract:~/Desktop/catkin_ws00/src$ cd ..
noura@tesseract:~/Desktop/catkin_ws00$ catkin_make
Base path: /home/noura/Desktop/catkin_ws00
Source space: /home/noura/Desktop/catkin_ws00/src
Build space: /home/noura/Desktop/catkin_ws00/build
Devel space: /home/noura/Desktop/catkin_ws00/devel
Install space: /home/noura/Desktop/catkin_ws00/install
####
#### Running command: "cmake /home/noura/Desktop/catkin_ws00/src -DCATKIN_DEVEL_PREFIX=/home/noura/Desktop/catkin_ws00/devel -DCMAKE_INSTALL_PREFIX=/home/noura/Desktop/catkin_ws00/install -G Unix Makefiles" in "/home/noura/Desktop/catkin_ws00/build"
####
-- The C compiler identification is GNU 7.5.0
-- The CXX compiler identification is GNU 7.5.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
```

ایجاد پروژه Ros

راه اندازی محیط

package

Compile کردن پروژه

برای شناخته شدن

توسط ترمینال

```
noura@tesseract: ~/Desktop/catkin_ws00
File Edit View Search Terminal Help
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Using CATKIN_DEVEL_PREFIX: /home/noura/Desktop/catkin_ws00/devel
-- Using CMAKE_PREFIX_PATH: /opt/ros/melodic
-- This workspace overlays: /opt/ros/melodic
-- Found PythonInterp: /usr/bin/python2 (found suitable version "2.7.17", minimum required is "2")
-- Using PYTHON_EXECUTABLE: /usr/bin/python2
-- Using Debian Python package layout
-- Using empy: /usr/bin/empy
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/noura/Desktop/catkin_ws00/build/test_results
-- Found gtest sources under '/usr/src/gtest': gtests will be built
-- Found gmock sources under '/usr/src/gtest': gmock will be built
-- Found PythonInterp: /usr/bin/python2 (found version "2.7.17")
-- Looking for pthread.h
-- Looking for pthread.h - found
-- Looking for pthread_create
-- Looking for pthread_create - not found
-- Looking for pthread_create in pthreads
-- Looking for pthread_create in pthreads - not found
-- Looking for pthread_create in pthread
-- Looking for pthread_create in pthread - found
-- Found Threads: TRUE
-- Using Python nosetests: /usr/bin/nosetests-2.7
-- catkin 0.7.29
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- Configuring done
-- Generating done
-- Build files have been written to: /home/noura/Desktop/catkin_ws00/build
####
#### Running command: "make -j4 -l4" in "/home/noura/Desktop/catkin_ws00/build"
####
noura@tesseract:~/Desktop/catkin_ws00$
```

ادامه compile و برگردان

تایید یا ارورها

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter - □ ×
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00$ roscd
noura@tesseract:/opt/ros/melodic$ cd ~/Desktop/catkin_ws00/
noura@tesseract:~/Desktop/catkin_ws00$ . devel/setup.bash
noura@tesseract:~/Desktop/catkin_ws00$ ls
build devel src
noura@tesseract:~/Desktop/catkin_ws00$ roscd
noura@tesseract:~/Desktop/catkin_ws00/devel$ cd ..
noura@tesseract:~/Desktop/catkin_ws00$ cd src
noura@tesseract:~/Desktop/catkin_ws00/src$ ls
CMakeLists.txt
noura@tesseract:~/Desktop/catkin_ws00/src$ catkin_create_pkg student_filter s
td_msgs rospy
Created file student_filter/package.xml
Created file student_filter/CMakeLists.txt
Created folder student_filter/src
Successfully created files in /home/noura/Desktop/catkin_ws00/src/student_fil
ter. Please adjust the values in package.xml.
noura@tesseract:~/Desktop/catkin_ws00/src$ ls
CMakeLists.txt student_filter
noura@tesseract:~/Desktop/catkin_ws00/src$ cd student_filter/
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ ls
CMakeLists.txt package.xml src
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$
```

شناساندن دستورات
ترمینالی ros به
سیستم عامل

ایجاد package با
تعیین نام و
دبستگی های آن

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ cat package.xml
<?xml version="1.0"?>
<package format="2">
  <name>student_filter</name>
  <version>0.0.0</version>
  <description>The student_filter package</description>

  <!-- One maintainer tag required, multiple allowed, one person per tag -->
  <!-- Example: -->
  <!-- <maintainer email="jane.doe@example.com">Jane Doe</maintainer> -->
  <maintainer email="noura@todo.todo">noura</maintainer>

  <!-- One license tag required, multiple allowed, one license per tag -->
  <!-- Commonly used license strings: -->
  <!-- BSD, MIT, Boost Software License, GPLv2, GPLv3, LGPLv2.1, LGPLv3 -->
  <license>TODO</license>

  <!-- Url tags are optional, but multiple are allowed, one per tag -->
  <!-- Optional attribute type can be: website, bugtracker, or repository -->
  <!-- Example: -->
  <!-- <url type="website">http://wiki.ros.org/student_filter</url> -->

  <!-- Author tags are optional, multiple are allowed, one per tag -->
  <!-- Authors do not have to be maintainers, but could be -->
  <!-- Example: -->
  <!-- <author email="jane.doe@example.com">Jane Doe</author> -->

  <!-- The *depend tags are used to specify dependencies -->
  <!-- Dependencies can be catkin packages or system dependencies -->
  <!-- Examples: -->
  <!-- Use depend as a shortcut for packages that are both build and exec dep
  endencies -->
  <!-- <depend>roscpp</depend> -->
```

مشخصات پکیج

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter
File Edit View Search Terminal Help
<!-- Examples: -->
<!-- Use depend as a shortcut for packages that are both build and exec dep
dependencies -->
<!-- <depend>roscpp</depend> -->
<!-- Note that this is equivalent to the following: -->
<!-- <build_depend>roscpp</build_depend> -->
<!-- <exec_depend>roscpp</exec_depend> -->
<!-- Use build_depend for packages you need at compile time: -->
<!-- <build_depend>message_generation</build_depend> -->
<!-- Use build_export_depend for packages you need in order to build agains
t this package: -->
<!-- <build_export_depend>message_generation</build_export_depend> -->
<!-- Use buildtool_depend for build tool packages: -->
<!-- <buildtool_depend>catkin</buildtool_depend> -->
<!-- Use exec_depend for packages you need at runtime: -->
<!-- <exec_depend>message_runtime</exec_depend> -->
<!-- Use test_depend for packages you need only for testing: -->
<!-- <test_depend>gtest</test_depend> -->
<!-- Use doc_depend for packages you need only for building documentation:
-->
<!-- <doc_depend>doxygen</doc_depend> -->
<buildtool_depend>catkin</buildtool_depend>
<build_depend>rospy</build_depend>
<build_depend>std_msgs</build_depend>
<build_export_depend>rospy</build_export_depend>
<build_export_depend>std_msgs</build_export_depend>
<exec_depend>rospy</exec_depend>
<exec_depend>std_msgs</exec_depend>

<!-- The export tag contains other, unspecified, tags -->
<export>
  <!-- Other tools can request additional information be placed here -->

</export>
</package>
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$
```

وابستگی های دیگر پکیج ها


```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter - □ ×
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ ls
CMakeLists.txt package.xml src
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ cd ../../
noura@tesseract:~/Desktop/catkin_ws00$ roscd student_filter
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ rospack depends1 stu
udent_filter
std_msgs
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ rospack depends stu
dent_filter
catkin
genmsg
genpy
cpp_common
rostime
roscpp_traits
roscpp_serialization
message_runtime
gencpp
geneus
gennodejs
genlisp
message_generation
roscpp
roscpp_traits
roscpp_serialization
std_msgs
rosgraph_msgs
xmlrpcpp
roscpp
rosgraph
ros_environment
rospack
roslib
rospy
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$
```

نمایش وابستگی های سطح اول

نمایش تمام وابستگی ها

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter - □ ×
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ rospack help
USAGE: rospack <command> [options] [package]
Allowed commands:
  help
  cflags-only-I [--deps-only] [package]
  cflags-only-other [--deps-only] [package]
  depends [package] (alias: deps)
  depends-indent [package] (alias: deps-indent)
  depends-manifests [package] (alias: deps-manifests)
  depends-msgsrv [package] (alias: deps-msgsrv)
  depends-on [package]
  depends-on1 [package]
  depends-why --target=<target> [package] (alias: deps-why)
  depends1 [package] (alias: deps1)
  export [--deps-only] --lang=<lang> --attrib=<attrib> [package]
  find [package]
  langs
  libs-only-L [--deps-only] [package]
  libs-only-l [--deps-only] [package]
  libs-only-other [--deps-only] [package]
  list
  list-duplicates
  list-names
  plugins --attrib=<attrib> [--top=<toppkg>] [package]
  profile [--length=<length>] [--zombie-only]
  rosdep [package] (alias: rosdeps)
  rosdep0 [package] (alias: rosdeps0)
  vcs [package]
  vcs0 [package]
Extra options:
  -q      Quiets error reports.

If [package] is omitted, the current working directory
is used (if it contains a package.xml or manifest.xml).
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$
```

با دستور help می توان انواع عملیات روی package ها را بررسی کرد

- ایجاد گره ها و topic ها :

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter/src
File Edit View Search Terminal Help
ws00
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ touch random_student.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ touch splitter.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ chmod +x hardware.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ chmod +x software.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ chmod +x random_student.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ chmod +x splitter.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ clear
```

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter/src
File Edit View Search Terminal Help
ws00
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ ls
hardware.py random_student.py software.py splitter.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$
```

```
noura@tesseract: ~/Desktop/catkin_ws00/src/student_filter/msg
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ ls
hardware.py random_student.py software.py splitter.py
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/src$ cd ..
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ ls
CMakeLists.txt package.xml src
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ mkdir msg
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter$ cd msg
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/msg$ touch Student.msg
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/msg$ ls
Student.msg
noura@tesseract:~/Desktop/catkin_ws00/src/student_filter/msg$
```

```
roscore http://tesseract:11311/
File Edit View Search Terminal Help
ws00
noura@tesseract:~$ cd Desktop/catkin_ws00
noura@tesseract:~/Desktop/catkin_ws00$ . devel/setup.bash
noura@tesseract:~/Desktop/catkin_ws00$ ls
build devel src
noura@tesseract:~/Desktop/catkin_ws00$ roscore
... logging to /home/noura/.ros/log/dcb693be-ad42-11ec-87aa-742f68b5bbf5/
roslaunch-tesseract-15602.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://tesseract:34569/
ros_comm version 1.14.13

SUMMARY
=====

PARAMETERS
* /roscore: melodic
* /roscore: 1.14.13

NODES
auto-starting new master
process[roscore]: started with pid [15615]
ROS_MASTER_URI=http://tesseract:11311/

setting /run_id to dcb693be-ad42-11ec-87aa-742f68b5bbf5
process[roscore-1]: started with pid [15629]
started core service [/roscore]
```

```

1 #!/usr/bin/python
2
3 from student_filter.msg import Student
4 from random import randint, seed, choice
5 from time import time
6 import rospy
7
8
9 def callback(data):
10     rospy.loginfo("S\n-----\nStudent Info:\n\t Name: {}\n\t
11     LastName: {}\n\t Age: {}\n\t Departement: {}\n-----\n"
12     .format(data.name, data.last_name, data.age, data.departement))
13
14     چاپ مقدار دریافتی
15
16 def listener():
17     student = Student()
18     rospy.init_node('software', anonymous=True)
19     rospy.Subscriber('software', Student, callback)
20
21     دریافت از تایپیک مورد نظر
22     حلقه انتظار
23     rate = rospy.Rate(1)
24
25 if __name__ == '__main__':
26     listener()

```

```

1 #!/usr/bin/python
2 #!/usr/bin/python
3
4 from student_filter.msg import Student
5 from random import randint, seed, choice
6 from time import time
7 import rospy
8
9
10 def callback(data):
11     rospy.loginfo("H\n-----\nStudent Info:\n\t Name: {}\n\t LastName: {}\n\t
12     Age: {}\n\t Departement: {}\n-----\n"
13     .format(data.name, data.last_name, data.age, data.departement))
14
15     چاپ مقدار دریافتی
16
17 def listener():
18     student = Student()
19     rospy.init_node('hardware', anonymous=True)
20     rospy.Subscriber('hardware', Student, callback)
21
22     دریافت از تایپیک مورد نظر
23     حلقه انتظار
24     rate = rospy.Rate(1)
25
26 if __name__ == '__main__':
27     listener()

```

```

75 "Majidi",
76 "Karimi",
77 "Ghafori",
78 "Pormokhber",
79 "Ansari",
80 "Modiri",
81 "Fallah",
82 "Ansarifard",
83 ]
84
85
86 departements= [
87     "Software",
88     "Hardware",
89 ]
90
91
92 def talker():
93     rospy.init_node('student_request', anonymous=True)
94     pub = rospy.Publisher('std_request', Student, queue_size=10)
95     rate = rospy.Rate(1)
96
97     ارسال داده
98
99     while not rospy.is_shutdown():
100         student = randStudent()
101         rospy.loginfo("SEND DATA:\n\t Name: {}, Last_name: {}, Age: {}, Departement: {}\n"
102         .format(student.name, student.last_name, student.age, student.departement))
103         pub.publish(student)
104         topic روی داده
105         rate.sleep()
106
107 if __name__ == '__main__':
108     try:
109         talker()
110     except rospy.ROSInterruptException:
111         pass

```

splitter.py
random_student.py
software.py
hardware.py

```

2
3 from student_filter.msg import Student
4 from random import randint, seed, choice
5 from time import time
6 import rospy
7
8
9 def callback(data):
10     rospy.loginfo("RECEIVE DATA:\n\t Name: {}, Last_name: {}, Age: {}, Departement: {}\n\t"
11                  .format(data.name, data.last_name, data.age, data.departement))
12
13 def check_departement(data):
14     pub_s = rospy.Publisher('software', Student, queue_size=10)
15     pub_h = rospy.Publisher('hardware', Student, queue_size=10)
16
17     if data.departement == "Software":
18         pub_s.publish(data)
19     elif data.departement == "Hardware":
20         pub_h.publish(data)
21     else:
22         rospy.loginfo("Invalid Data!")
23
24
25 def listener():
26     student = Student()
27     rospy.init_node('splitter', anonymous=True)
28     rospy.Subscriber('std_request', Student, callback)
29     rospy.Subscriber('std_request', Student, check_departement)
30
31     rospy.spin()
32
33     if __name__ == '__main__':
34         listener()

```

چاپ مقدار دریافتی

ایجاد گره

ایجاد گره

بررسی department

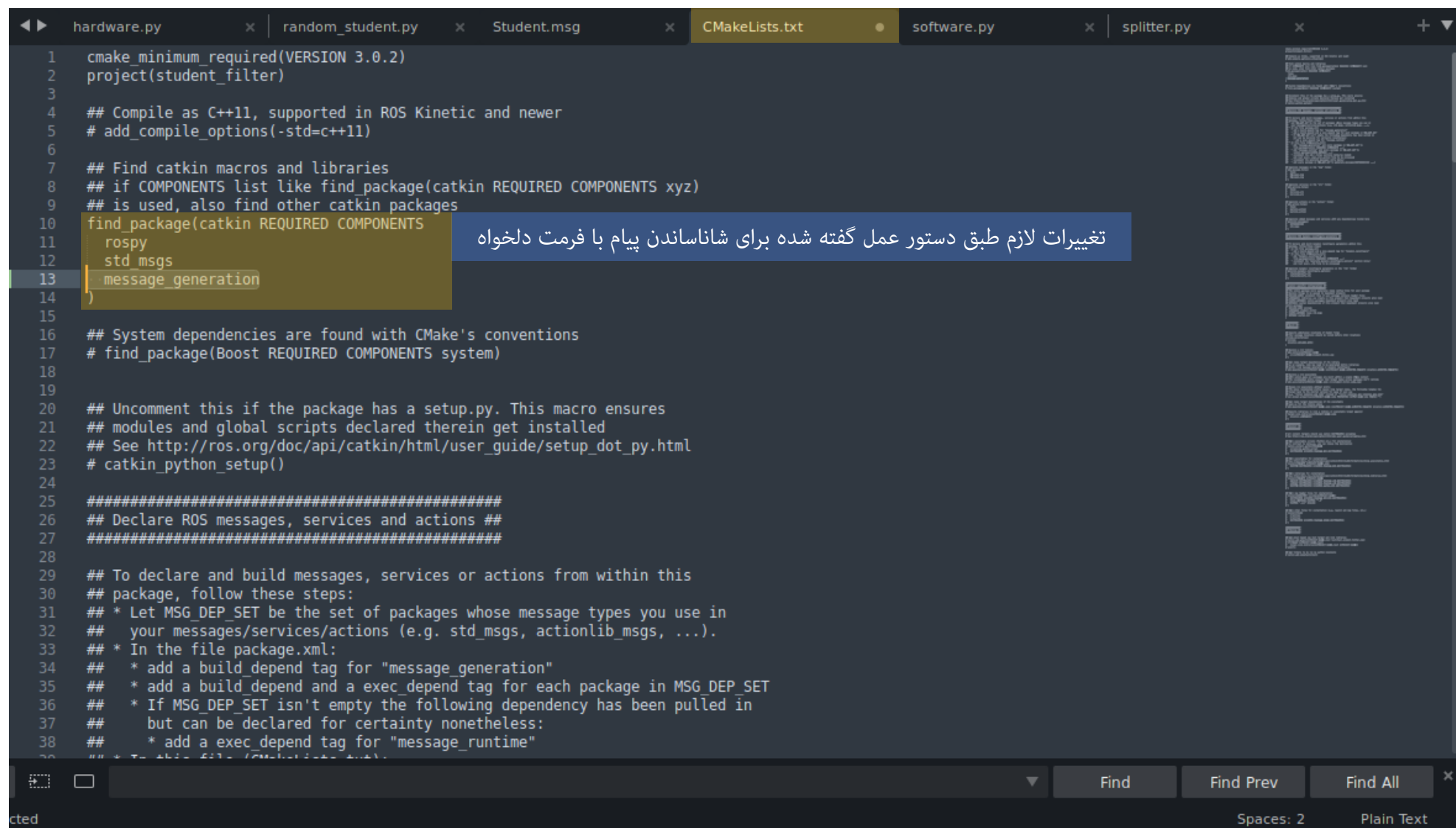
ایجاد گره

از آنجایی که هر دو یک داده را از یک نود دریافت می کنند می توان دو تابع جداگانه را اجرا کنند

تایپکی که به آن گوش می کند

حلقه انتظار

• ایجاد message با فرمت دلخواه:



```
1 cmake_minimum_required(VERSION 3.0.2)
2 project(student_filter)
3
4 ## Compile as C++11, supported in ROS Kinetic and newer
5 # add_compile_options(-std=c++11)
6
7 ## Find catkin macros and libraries
8 ## if COMPONENTS list like find_package(catkin REQUIRED COMPONENTS xyz)
9 ## is used, also find other catkin packages
10 find_package(catkin REQUIRED COMPONENTS
11   rospy
12   std_msgs
13   message_generation
14 )
15
16 ## System dependencies are found with CMake's conventions
17 # find_package(Boost REQUIRED COMPONENTS system)
18
19
20 ## Uncomment this if the package has a setup.py. This macro ensures
21 ## modules and global scripts declared therein get installed
22 ## See http://ros.org/doc/api/catkin/html/user_guide/setup_dot_py.html
23 # catkin_python_setup()
24
25 #####
26 ## Declare ROS messages, services and actions ##
27 #####
28
29 ## To declare and build messages, services or actions from within this
30 ## package, follow these steps:
31 ## * Let MSG_DEP_SET be the set of packages whose message types you use in
32 ##   your messages/services/actions (e.g. std_msgs, actionlib_msgs, ...).
33 ## * In the file package.xml:
34 ##   * add a build_depend tag for "message_generation"
35 ##   * add a build_depend and a exec_depend tag for each package in MSG_DEP_SET
36 ##   * If MSG_DEP_SET isn't empty the following dependency has been pulled in
37 ##     but can be declared for certainty nonetheless:
38 ##     * add a exec_depend tag for "message_runtime"
```

تغییرات لازم طبق دستور عمل گفته شده برای شناساندن پیام با فرمت دلخواه

Find Find Prev Find All

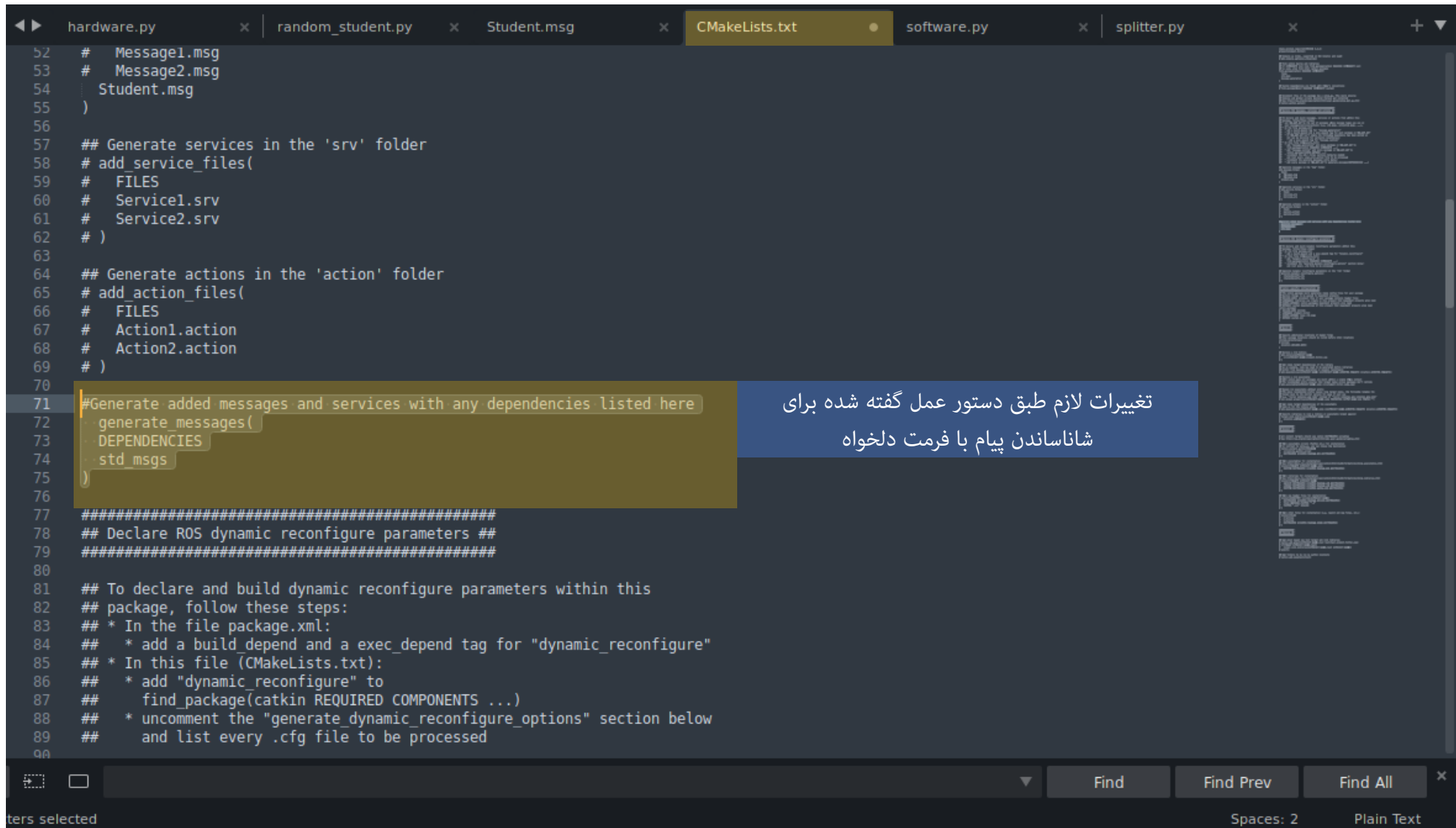
Spaces: 2 Plain Text

```
hardware.py  random_student.py  Student.msg  CMakeLists.txt  software.py  splitter.py
31  ## * Let MSG_DEP_SET be the set of packages whose message types you use in
32  ## * your messages/services/actions (e.g. std_msgs, actionlib_msgs, ...).
33  ## * In the file package.xml:
34  ## * add a build_depend tag for "message_generation"
35  ## * add a build_depend and a exec_depend tag for each package in MSG_DEP_SET
36  ## * If MSG_DEP_SET isn't empty the following dependency has been pulled in
37  ## * but can be declared for certainty nonetheless:
38  ## * add a exec_depend tag for "message_runtime"
39  ## * In this file (CMakeLists.txt):
40  ## * add "message_generation" and every package in MSG_DEP_SET to
41  ## * find_package(catkin REQUIRED COMPONENTS ...)
42  ## * add "message_runtime" and every package in MSG_DEP_SET to
43  ## * catkin_package(CATKIN_DEPENDS ...)
44  ## * uncomment the add_*_files sections below as needed
45  ## * and list every .msg/.srv/.action file to be processed
46  ## * uncomment the generate_messages entry below
47  ## * add every package in MSG_DEP_SET to generate_messages(DEPENDENCIES ...)
48
49  ## Generate messages in the 'msg' folder
50  add_message_files(
51    FILES
52    #   Message1.msg
53    #   Message2.msg
54    Student.msg
55  )
56
57  ## Generate services in the 'srv' folder
58  # add_service_files(
59  #   FILES
60  #   Service1.srv
61  #   Service2.srv
62  # )
63
64  ## Generate actions in the 'action' folder
65  # add_action_files(
66  #   FILES
67  #   Action1.action
68  #   Action2.action
69  # )
```

تغییرات لازم طبق دستور عمل گفته شده برای شناساندن پیام با فرمت دلخواه

Find Find Prev Find All

Characters selected Spaces: 2 Plain Text




```
hardware.py x random_student.py x Student.msg x CMakeLists.txt software.py x splitter.py x
84  ## * add a build_depend and a exec_depend tag for "dynamic_reconfigure"
85  ## * In this file (CMakeLists.txt):
86  ## * add "dynamic_reconfigure" to
87  ##   find_package(catkin REQUIRED COMPONENTS ...)
88  ## * uncomment the "generate_dynamic_reconfigure_options" section below
89  ##   and list every .cfg file to be processed
90
91  ## Generate dynamic reconfigure parameters in the 'cfg' folder
92  # generate_dynamic_reconfigure_options(
93  #   cfg/DynReconf1.cfg
94  #   cfg/DynReconf2.cfg
95  # )
96
97  #####
98  ## catkin specific configuration ##
99  #####
100  ## The catkin package macro generates cmake config files for your package
101  ## Declare things to be passed to dependent projects
102  ## INCLUDE_DIRS: uncomment this if your package contains header files
103  ## LIBRARIES: libraries you create in this project that dependent projects also need
104  ## CATKIN_DEPENDS: catkin_packages dependent projects also need
105  ## DEPENDS: system dependencies of this project that dependent projects also need
106  catkin_package(
107    # INCLUDE_DIRS include
108    # LIBRARIES student_filter
109    CATKIN_DEPENDS rospy std_msgs
110    # DEPENDS system lib
111    CATKIN_DEPENDS rospy message_runtime
112  )
113
114  #####
115  ## Build ##
116  #####
117
118  ## Specify additional locations of header files
119  ## Your package locations should be listed before other locations
120  include_directories(
121    # include
122    ${catkin_INCLUDE_DIRS}
```

تغییرات لازم طبق دستور عمل گفته شده برای شاناساندن پیام با فرمت دلخواه

catkin_package

Find Find Prev Find All

Characters selected Spaces: 2 Plain Text

hardware.py × random_student.py × Student.msg × CMakeLists.txt software.py × splitter.py + ▾

```
117
118 ## Specify additional locations of header files
119 ## Your package locations should be listed before other locations
120 include_directories(
121 include
122   ${catkin_INCLUDE_DIRS}
123 )
124
125 ## Declare a C++ library
126 # add_library(${PROJECT_NAME}
127 #   src/${PROJECT_NAME}/student_filter.cpp
128 # )
129
130 ## Add cmake target dependencies of the library
131 ## as an example, code may need to be generated before libraries
132 ## either from message generation or dynamic reconfigure
133 # add_dependencies(${PROJECT_NAME} ${${PROJECT_NAME}_EXPORTED_TARGETS} ${catkin_EXPORTED_TARGETS})
134
135 ## Declare a C++ executable
136 ## With catkin_make all packages are built within a single CMake context
137 ## The recommended prefix ensures that target names across packages don't collide
138 # add_executable(${PROJECT_NAME}_node src/student_filter_node.cpp)
139
140 ## Rename C++ executable without prefix
141 ## The above recommended prefix causes long target names, the following renames the
142 ## target back to the shorter version for ease of user use
143 ## e.g. "roslaunch someones_pkg node" instead of "roslaunch someones_pkg someones_pkg_node"
144 # set_target_properties(${PROJECT_NAME}_node PROPERTIES OUTPUT_NAME node PREFIX "")
145
146 ## Add cmake target dependencies of the executable
147 ## same as for the library above
148 # add_dependencies(${PROJECT_NAME}_node ${${PROJECT_NAME}_EXPORTED_TARGETS} ${catkin_EXPORTED_TARGETS})
149
150 ## Specify libraries to link a library or executable target against
151 # target_link_libraries(${PROJECT_NAME}_node
152 #   ${catkin_LIBRARIES}
153 # )
154
155 #####
```

catkin_package ▾ Find Find Prev Find All ×

ers selected Spaces: 2 Plain Text

تغییرات لازم طبق دستور عمل گفته شده برای شاناساندن پیام با فرمت دلخواه

```
hardware.py x random_student.py x Student.msg x CMakeLists.txt x package.xml software.py x splitter.py x
22 <!-- <url type="website">http://wiki.ros.org/student_filter</url> -->
23
24
25 <!-- Author tags are optional, multiple are allowed, one per tag -->
26 <!-- Authors do not have to be maintainers, but could be -->
27 <!-- Example: -->
28 <!-- <author email="jane.doe@example.com">Jane Doe</author> -->
29
30
31 <!-- The *depend tags are used to specify dependencies -->
32 <!-- Dependencies can be catkin packages or system dependencies -->
33 <!-- Examples: -->
34 <!-- Use depend as a shortcut for packages that are both build and exec dependencies -->
35 <!-- <depend>roscpp</depend> -->
36 <!-- Note that this is equivalent to the following: -->
37 <!-- <build_depend>roscpp</build_depend> -->
38 <!-- <exec_depend>roscpp</exec_depend> -->
39 <!-- Use build_depend for packages you need at compile time: -->
40 <build_depend>message_generation</build_depend>
41 <!-- Use build_export_depend for packages you need in order to build against this package: -->
42 <build_export_depend>message_generation</build_export_depend>
43 <!-- Use buildtool_depend for build tool packages: -->
44 <!-- <buildtool_depend>catkin</buildtool_depend> -->
45 <!-- Use exec_depend for packages you need at runtime: -->
46 <exec_depend>message_runtime</exec_depend>
47 <!-- Use test_depend for packages you need only for testing: -->
48 <!-- <test_depend>gtest</test_depend> -->
49 <!-- Use doc_depend for packages you need only for building documentation: -->
50 <!-- <doc_depend>doxygen</doc_depend> -->
51 <buildtool_depend>catkin</buildtool_depend>
52 <build_depend>rospy</build_depend>
53 <build_depend>std_msgs</build_depend>
54 <build_export_depend>rospy</build_export_depend>
55 <build_export_depend>std_msgs</build_export_depend>
56 <exec_depend>rospy</exec_depend>
57 <exec_depend>std_msgs</exec_depend>
58
59
60 <!-- The export tag contains other, unspecified, tags -->
```

Uncomment کردن وابستگی ها برای پکیج مورد نظر

- Build و compile کردن برنامه و اعمال تغییرات:

```
noura@tesseract: ~/Desktop/catkin_ws00
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00$ catkin_make
Base path: /home/noura/Desktop/catkin_ws00
Source space: /home/noura/Desktop/catkin_ws00/src
Build space: /home/noura/Desktop/catkin_ws00/build
Devel space: /home/noura/Desktop/catkin_ws00/devel
Install space: /home/noura/Desktop/catkin_ws00/install
####
#### Running command: "cmake /home/noura/Desktop/catkin_ws00/src -DCATKIN_DEVEL_PREFIX=/home/noura/Desktop/catkin_ws00/devel -DCMAKE_INSTALL_PREFIX=/home/noura/Desktop/catkin_ws00/install -G Unix Makefiles" in "/home/noura/Desktop/catkin_ws00/build"
####
-- Using CATKIN_DEVEL_PREFIX: /home/noura/Desktop/catkin_ws00/devel
-- Using CMAKE_PREFIX_PATH: /home/noura/Desktop/catkin_ws00/devel;/opt/ros/melodic
-- This workspace overlays: /home/noura/Desktop/catkin_ws00/devel;/opt/ros/melodic
-- Found PythonInterp: /usr/bin/python2 (found suitable version "2.7.17", minimum required is "2")
-- Using PYTHON_EXECUTABLE: /usr/bin/python2
-- Using Debian Python package layout
-- Using empy: /usr/bin/empy
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/noura/Desktop/catkin_ws00/build/test_results
-- Found gtest sources under '/usr/src/gtest': gtests will be built
-- Found gmock sources under '/usr/src/gtest': gmock will be built
-- Found PythonInterp: /usr/bin/python2 (found version "2.7.17")
-- Using Python nosetests: /usr/bin/nosetests-2.7
-- catkin 0.7.29
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- traversing 1 packages in topological order:
-- - student_filter
-- processing catkin package: 'student_filter'
==> add_subdirectory(student_filter)
-- Using these message generators: aencpp:aeneus:aenlisp:aennodejs:aenpy
```

Build کردن پروژه برای تایید
تغییرات جدید و فایل های
ایجاد شده

```
noura@tesseract: ~/Desktop/catkin_ws00
File Edit View Search Terminal Help
-- student_filter: 1 messages, 0 services
-- Configuring done
-- Generating done
-- Build files have been written to: /home/noura/Desktop/catkin_ws00/build
####
#### Running command: "make -j4 -l4" in "/home/noura/Desktop/catkin_ws00/build"
####
Scanning dependencies of target std_msgs_generate_messages_py
Scanning dependencies of target std_msgs_generate_messages_lisp
Scanning dependencies of target _student_filter_generate_messages_check_deps_Student
nt
Scanning dependencies of target std_msgs_generate_messages_cpp
[ 0%] Built target std_msgs_generate_messages_lisp
[ 0%] Built target std_msgs_generate_messages_py
[ 0%] Built target std_msgs_generate_messages_cpp
Scanning dependencies of target std_msgs_generate_messages_eus
Scanning dependencies of target std_msgs_generate_messages_nodejs
[ 0%] Built target std_msgs_generate_messages_eus
[ 0%] Built target std_msgs_generate_messages_nodejs
[ 0%] Built target _student_filter_generate_messages_check_deps_Student
Scanning dependencies of target student_filter_generate_messages_lisp
Scanning dependencies of target student_filter_generate_messages_cpp
Scanning dependencies of target student_filter_generate_messages_py
Scanning dependencies of target student_filter_generate_messages_eus
[ 14%] Generating C++ code from student_filter/Student.msg
[ 28%] Generating Lisp code from student_filter/Student.msg
[ 42%] Generating EusLisp code from student_filter/Student.msg
[ 57%] Generating Python from MSG student_filter/Student
[ 71%] Generating EusLisp manifest code for student_filter
[ 71%] Built target student_filter_generate_messages_lisp
Scanning dependencies of target student_filter_generate_messages_nodejs
[ 85%] Generating Javascript code from student_filter/Student.msg
[ 85%] Built target student_filter_generate_messages_cpp
[ 85%] Built target student_filter_generate_messages_nodejs
[ 85%] Built target student_filter_generate_messages_eus
[100%] Generating Python msg __init__.py for student_filter
[100%] Built target student_filter_generate_messages_py
Scanning dependencies of target student_filter_generate_messages
```

بدون خطا 100
build شده است

roscore http://tesseract:11311/

File Edit View Search Terminal Help

```
noura@tesseract:~$ cd Desktop/catkin_ws00
noura@tesseract:~/Desktop/catkin_ws00$ . devel/setup.bash
noura@tesseract:~/Desktop/catkin_ws00$ ls
build devel src
```

```
noura@tesseract:~/Desktop/catkin_ws00$ roscore
... logging to /home/noura/.ros/log/dcb693be-ad42-11ec-87a
a-742f68b5bbf5/roslaunch-tesseract-15602.log
Checking log directory for disk usage. This may take a whi
le.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.
```

```
started roslaunch server http://tesseract:34569/
ros_comm version 1.14.13
```

SUMMARY
=====

PARAMETERS
* /rostdistro: melodic
* /rosversion: 1.14.13

NODES

```
auto-starting new master
process[master]: started with pid [15615]
ROS_MASTER_URI=http://tesseract:11311/
```

```
setting /run_id to dcb693be-ad42-11ec-87aa-742f68b5bbf5
process[rosout-1]: started with pid [15629]
started core service [/rosout]
```

راه اندازی هسته

noura@tesseract: ~/Desktop/catkin_ws00

File Edit View Search Terminal Help

```
noura@tesseract:~/Desktop/catkin_ws00$ rosrn student_filter random_student.py
```

راه اندازی node فرستنده

noura@tesseract: ~/Desktop/catkin_ws00

File Edit View Search Terminal Help

```
noura@tesseract:~$ cd Desktop/catkin_ws00
noura@tesseract:~/Desktop/catkin_ws00$ . devel/setup.bash
noura@tesseract:~/Desktop/catkin_ws00$ rosrn student_filter splitter.py
```

راه اندازی node گیرنده که در ادامه خود نیز فرستنده است

noura@tesseract: ~/Desktop/catkin_ws... - □ ×

File Edit View Search Terminal Help

```
noura@tesseract:~$ cd Desktop/catkin_ws00
noura@tesseract:~/Desktop/catkin_ws00$ . devel/
setup.bash
noura@tesseract:~/Desktop/catkin_ws00$ rosrn s
tudent_filter software.py
```

راه اندازی node گیرنده

noura@tesseract: ~/Desktop/catkin_ws... - □ ×

File Edit View Search Terminal Help

```
noura@tesseract:~$ cd Desktop/catkin_ws00
noura@tesseract:~/Desktop/catkin_ws00$ . devel/
setup.bash
noura@tesseract:~/Desktop/catkin_ws00$ rosrn s
tudent_filter hardware.py
```

راه اندازی node گیرنده

```
roscore http://tesseract:11311/
File Edit View Search Terminal Help
noura@tesseract:~/Desktop/catkin_ws00$ roscore
... logging to /home/noura/.ros/log/376809ee-ad4a-11ec-87a
a-742f68b5bbf5/roslaunch-tesseract-18944.log
Checking log directory for disk usage. This may take a whi
le.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://tesseract:44655/
ros_comm version 1.14.13

SUMMARY
=====

PARAMETERS
* /rostdistro: melodic
* /rosversion: 1.14.13

NODES

auto-starting new master
process[master]: started with pid [18957]
ROS_MASTER_URI=http://tesseract:11311/

setting /run_id to 376809ee-ad4a-11ec-87aa-742f68b5bbf5
process[rosout-1]: started with pid [18971]
started core service [/rosout]
```

```
noura@tesseract: ~/Desktop/catkin_ws00
File Edit View Search Terminal Help
[INFO] [1648329619.743107]: SEND DATA:
Name: Ramin, Last_name: Karimi, Age: 66, Departement: Software
```

داده از node مستر به node تفکیک کننده فرستاده می شود

```
noura@tesseract: ~/Desktop/catkin_ws00
File Edit View Search Terminal Help
[INFO] [1648329619.748780]: RECEIVE DATA: 96 x 5
Name: Ramin, Last_name: Karimi, Age: 66, Departement: Software
```

تفکیک کننده داده گرفته شده را به node مختص departmentش می فرستد

```
noura@tesseract: ~/Desktop/catkin_ws...
File Edit View Search Terminal Help
[INFO] [1648329618.754688]: S
-----
Student Info:
Name: Fatemeh
LastName: Sheikhi
Age: 30
Departement: Software
-----
```

پیام داده گرفته شده در فرمت خود نمایش داده می شود

```
noura@tesseract: ~/Desktop/catkin_ws...
File Edit View Search Terminal Help
[INFO] [1648329615.753342]: H
-----
Student Info:
Name: Ramin
LastName: Sheikhi
Age: 49
Departement: Hardware
-----
```

```
noura@tesseract: ~/Desktop/catkin_ws...
File Edit View Search Terminal Help
[INFO] [1648329619.753716]: S
-----
Student Info:
Name: Ramin
LastName: Karimi
Age: 66
Departement: Software
-----
```

```
noura@tesseract: ~/Desktop/catkin_ws...
File Edit View Search Terminal Help
[INFO] [1648329617.752268]: H
-----
Student Info:
Name: Karim
LastName: Kazemi
Age: 56
Departement: Hardware
-----
```

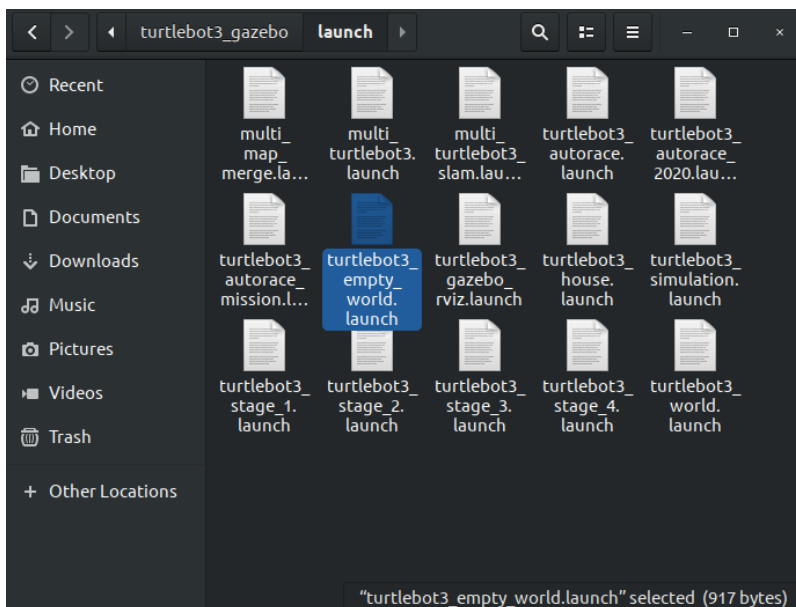
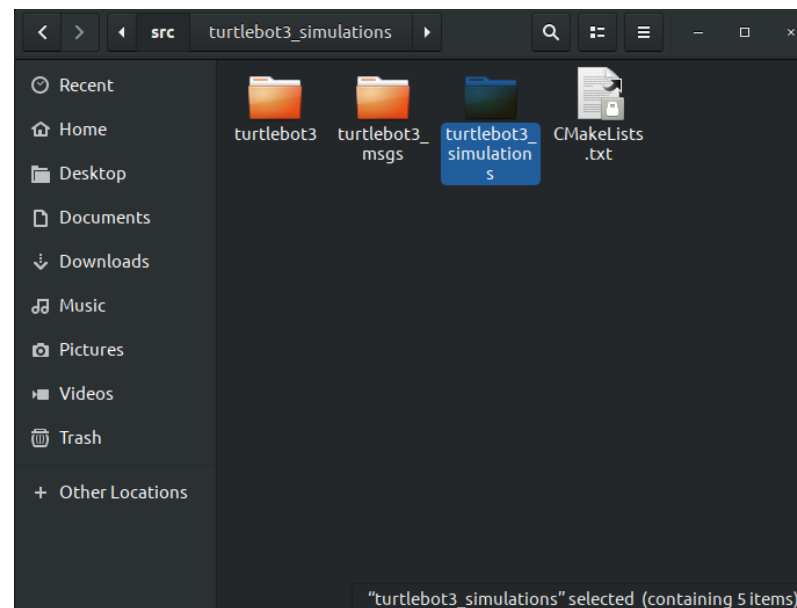
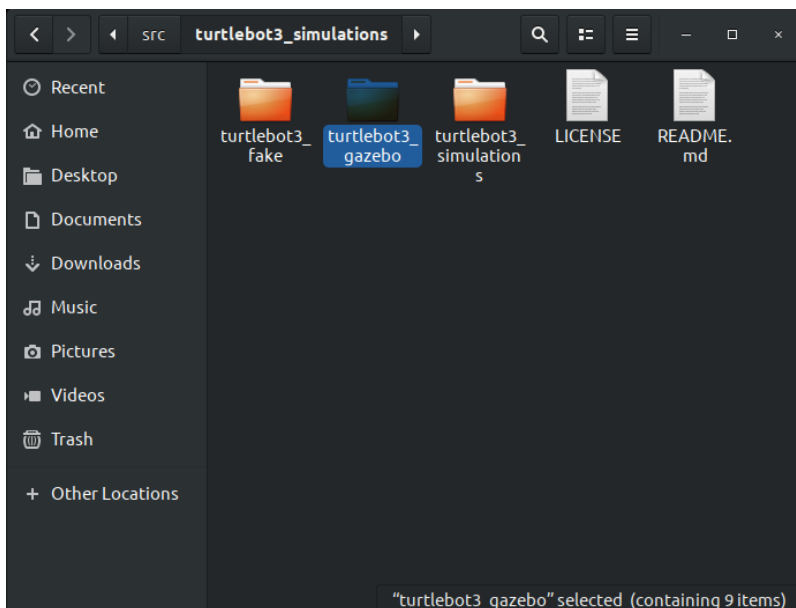

بخش عملی - گام دوم:

قسمت 1 و 2:

```
noura@tesseract: ~/Desktop/catkin_ws00gz/src
File Edit View Search Terminal Help
noura@tesseract:~$ cd Desktop
noura@tesseract:~/Desktop$ mkdir catkin_ws00gz/src
mkdir: cannot create directory 'catkin_ws00gz/src': No such file or directory
noura@tesseract:~/Desktop$ mkdir catkin_ws00gz/src -p
noura@tesseract:~/Desktop$ cd catkin_ws00gz/src/
noura@tesseract:~/Desktop/catkin_ws00gz/src$ ls
noura@tesseract:~/Desktop/catkin_ws00gz/src$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_simulations.git
Cloning into 'turtlebot3_simulations'...
remote: Enumerating objects: 2959, done.
remote: Counting objects: 100% (572/572), done.
remote: Compressing objects: 100% (241/241), done.
remote: Total 2959 (delta 317), reused 511 (delta 286), pack-reused 2387
Receiving objects: 100% (2959/2959), 15.36 MiB | 1008.00 KiB/s, done.
noura@tesseract:~/Desktop/catkin_ws00gz/src$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_msgs.git
Cloning into 'turtlebot3_msgs'...
remote: Enumerating objects: 394, done.
remote: Counting objects: 100% (152/152), done.
remote: Compressing objects: 100% (65/65), done.
remote: Total 394 (delta 56), reused 125 (delta 37), pack-reused 242
Receiving objects: 100% (394/394), 88.16 KiB | 590.00 KiB/s, done.
Resolving deltas: 100% (157/157), done.
noura@tesseract:~/Desktop/catkin_ws00gz/src$ git clone https://github.com/ROBOTIS-GIT/turtlebot3.git
Cloning into 'turtlebot3'...
remote: Enumerating objects: 6160, done.
remote: Counting objects: 100% (430/430), done.
remote: Compressing objects: 100% (302/302), done.
remote: Total 6160 (delta 244), reused 211 (delta 103), pack-reused 5730
Receiving objects: 100% (6160/6160), 119.88 MiB | 1.96 MiB/s, done.
Resolving deltas: 100% (3819/3819), done.
noura@tesseract:~/Desktop/catkin_ws00gz/src$
```

```
noura@tesseract: ~/Desktop/catkin_ws00gz
File Edit View Search Terminal Help
[ 75%] Generating Lisp code from turtlebot3_example/Turtlebot3Feedback.msg
Scanning dependencies of target turtlebot3_example_generate_messages_cpp
[ 77%] Generating Lisp code from turtlebot3_example/Turtlebot3Goal.msg
[ 79%] Generating C++ code from turtlebot3_example/Turtlebot3ActionGoal.msg
[ 80%] Generating C++ code from turtlebot3_example/Turtlebot3ActionResult.msg
[ 80%] Built target turtlebot3_example_generate_messages_lisp
Scanning dependencies of target turtlebot3_fake_node
Scanning dependencies of target turtlebot3_drive
[ 82%] Generating C++ code from turtlebot3_example/Turtlebot3Result.msg
[ 83%] Generating C++ code from turtlebot3_example/Turtlebot3ActionResult.msg
[ 85%] Building CXX object turtlebot3_simulations/turtlebot3_gazebo/CMakeFiles/turtlebot3_drive.dir/src/turtlebot3_drive.cpp.o
[ 87%] Building CXX object turtlebot3_simulations/turtlebot3_fake/CMakeFiles/turtlebot3_fake_node.dir/src/turtlebot3_fake.cpp.o
[ 88%] Generating C++ code from turtlebot3_example/Turtlebot3ActionFeedback.msg
[ 91%] Linking CXX executable /home/noura/Desktop/catkin_ws00gz/devel/lib/turtlebot3_slam/flat_world_imu_node
[ 91%] Generating C++ code from turtlebot3_example/Turtlebot3Feedback.msg
[ 93%] Generating C++ code from turtlebot3_example/Turtlebot3Goal.msg
[ 93%] Built target turtlebot3_example_generate_messages_cpp
Scanning dependencies of target turtlebot3_msgs_generate_messages
[ 93%] Built target turtlebot3_msgs_generate_messages
Scanning dependencies of target turtlebot3_diagnostics
[ 95%] Building CXX object turtlebot3/turtlebot3_bringup/CMakeFiles/turtlebot3_diagnostics.dir/src/turtlebot3_diagnostics.cpp.o
[ 95%] Built target flat_world_imu_node
Scanning dependencies of target turtlebot3_example_generate_messages
[ 95%] Built target turtlebot3_example_generate_messages
[ 96%] Linking CXX executable /home/noura/Desktop/catkin_ws00gz/devel/lib/turtlebot3_gazebo/turtlebot3_drive
[ 96%] Built target turtlebot3_drive
[ 98%] Linking CXX executable /home/noura/Desktop/catkin_ws00gz/devel/lib/turtlebot3_bringup/turtlebot3_diagnostics
[ 98%] Built target turtlebot3_diagnostics
[100%] Linking CXX executable /home/noura/Desktop/catkin_ws00gz/devel/lib/turtlebot3_fake/turtlebot3_fake_node
[100%] Built target turtlebot3_fake_node
noura@tesseract:~/Desktop/catkin_ws00gz$
```

موفقیت آمیز بودن catkin_make و build
شدن رپوهای turtlebot3



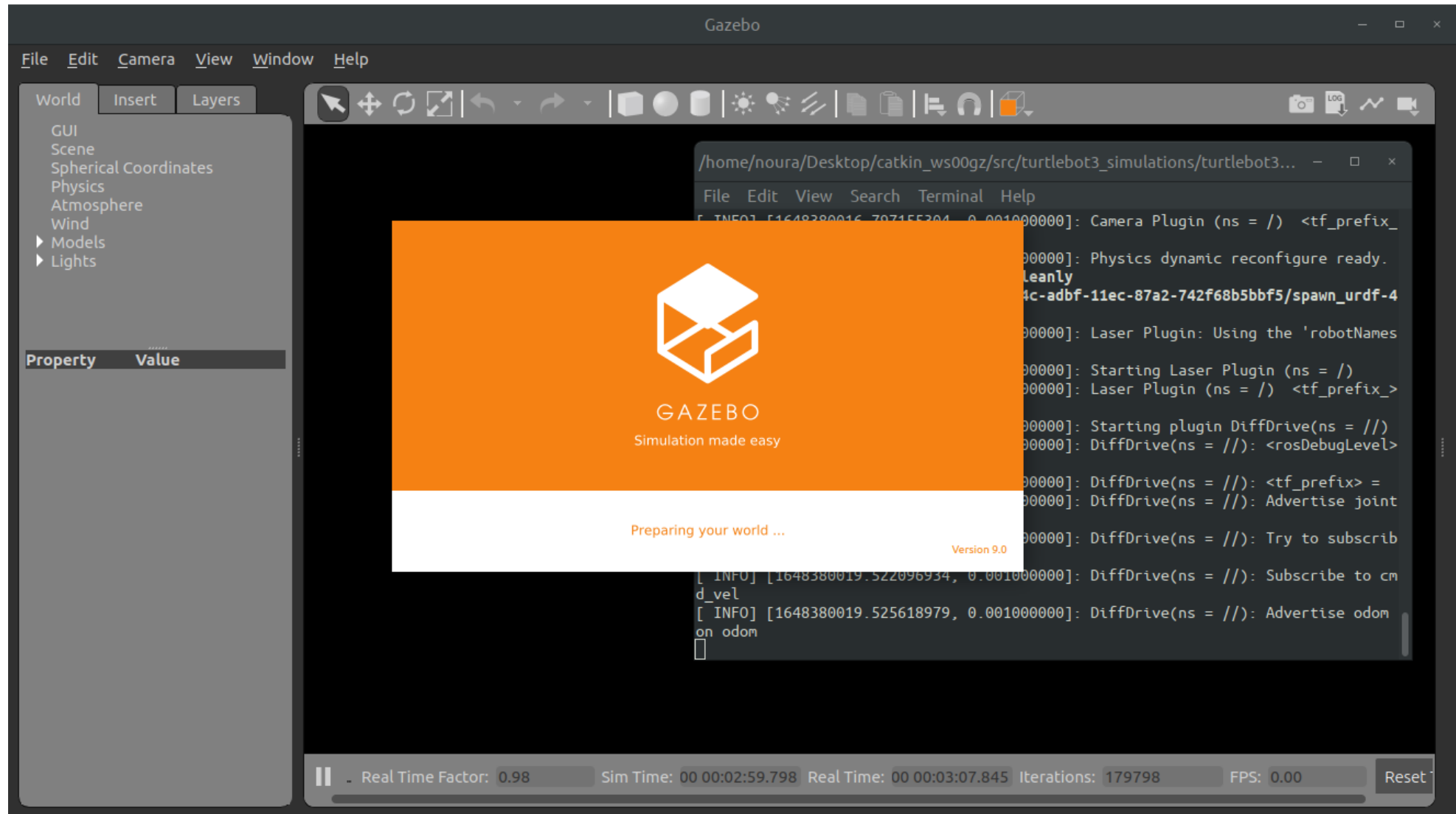
مسیری که ربات از آنجا لانچ می شود و شمای قرار گیری پوشه ها نسب به هم و محیط ها

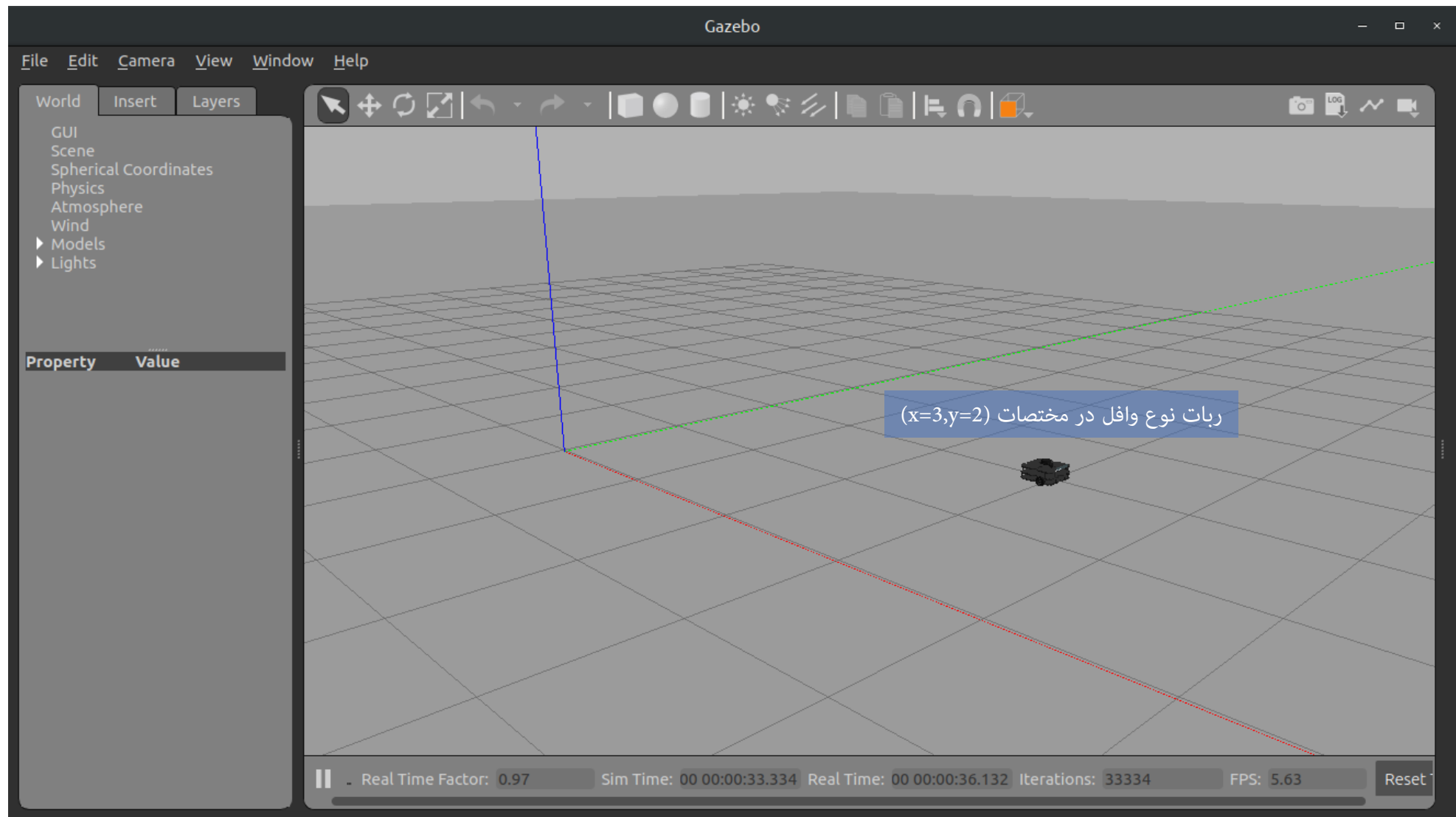
◀ ▶ turtlebot3_empty_world.launch x + ▼

1 <launch>
2 <arg name="model" default="waffle" doc="model type [burger, waffle, waffle_pi]" />
3 <arg name="x_pos" default="3.0" />
4 <arg name="y_pos" default="2.0" />
5 <arg name="z_pos" default="0.0" />
6
7 <include file="\$(find gazebo_ros)/launch/empty_world.launch">
8 <arg name="world_name" value="\$(find turtlebot3_gazebo)/worlds/empty.world" />
9 <arg name="paused" value="false" />
10 <arg name="use_sim_time" value="true" />
11 <arg name="gui" value="true" />
12 <arg name="headless" value="false" />
13 <arg name="debug" value="false" />
14 </include>
15
16 <param name="robot_description" command="\$(find xacro)/xacro --inorder \$(find turtlebot3_description)/urdf/turtlebot3_\$(arg
model).urdf.xacro" />
17
18 <node pkg="gazebo_ros" type="spawn_model" name="spawn_urdf" args="-urdf -model turtlebot3_\$(arg model) -x \$(arg x_pos) -y \$(arg y_pos)
-z \$(arg z_pos) -param robot_description" />
19 </launch>
20

تغییر مختصات ابتدایی و تعیین نوع ربات

1 master 1 Spaces: 2 Plain Text



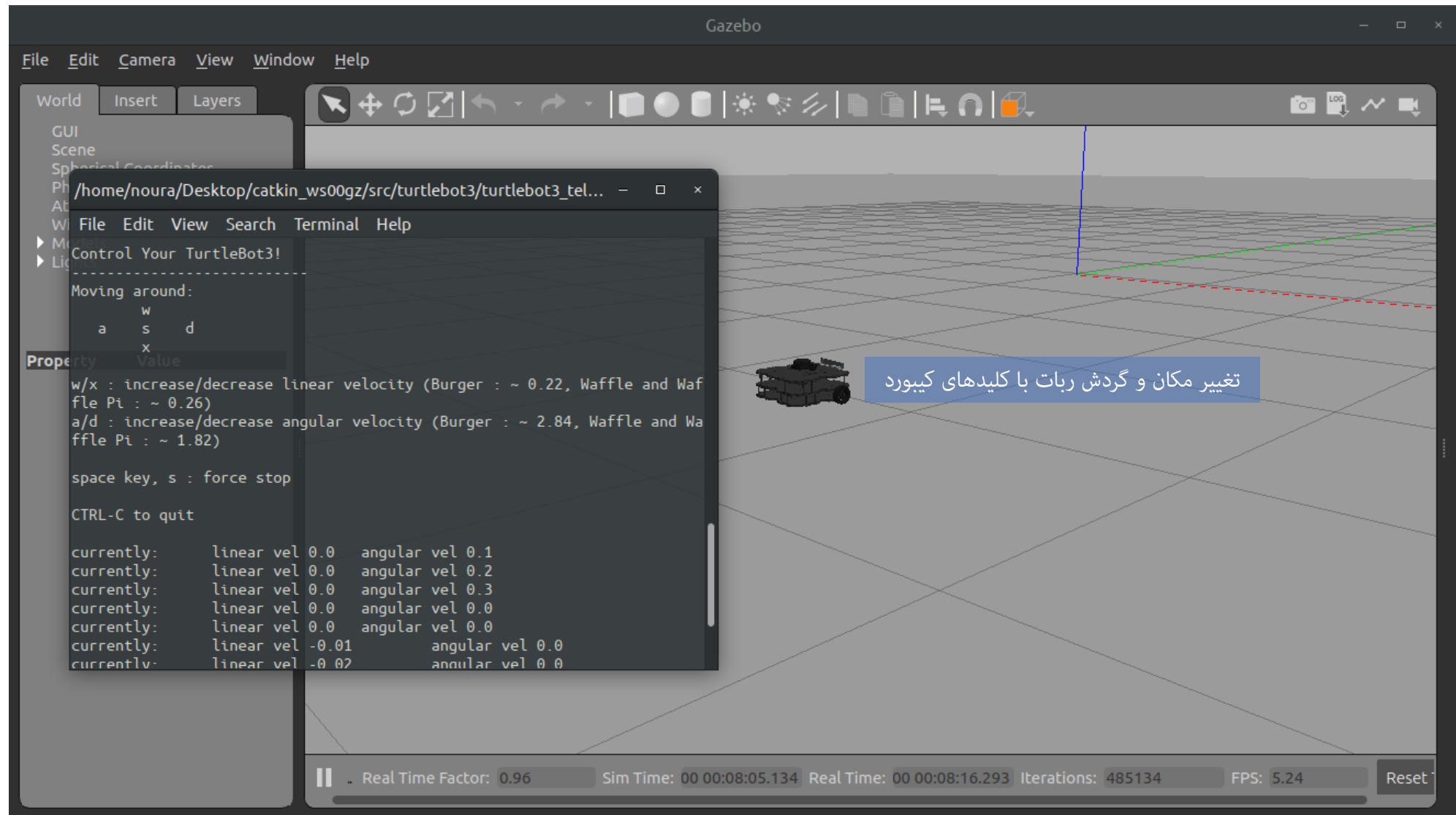


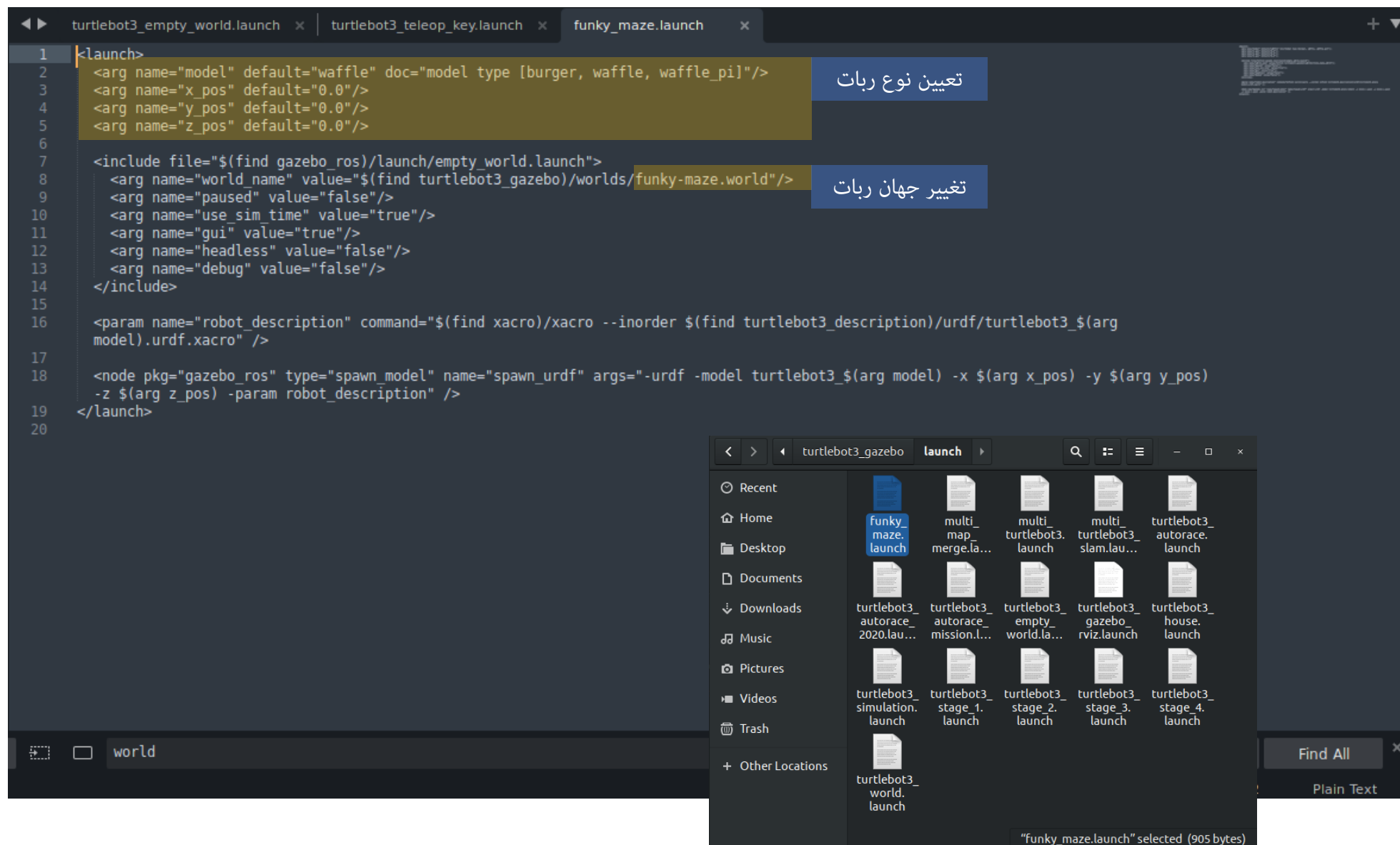
• قسمت 3:

```
turtlebot3_empty_world.launch x  turtlebot3_teleop_key.launch x
1 <launch>
2   <arg name="model" default="$waffle" doc="model type [burger, waffle, waffle_pi]"/>
3   <param name="model" value="$(arg model)"/>
4
5   <!-- turtlebot3_teleop_key already has its own built in velocity smoother -->
6   <node pkg="turtlebot3_teleop" type="turtlebot3_teleop_key" name="turtlebot3_teleop_keyboard" output="screen">
7     </node>
8 </launch>
9
```

تعیین نوع ربات

master 1 Spaces: 2 Plain Text





/home/noura/Desktop roslaunch turtlebot3_gazebo turtlebot3_empty_world.launch

File Edit View Search Terminal Help

```
/) <tf_prefix>, set to ""  
[ INFO] [1648384720.939605939, 316.384000000]: Starting plugin DiffDrive(ns = //):  
[ INFO] [1648384720.939983350, 316.384000000]: DiffDrive(ns = //):  
  <rosDebugLevel> = na  
[ INFO] [1648384720.942367214, 316.384000000]: DiffDrive(ns = //):  
  <tf_prefix> =  
[ INFO] [1648384720.944801911, 316.384000000]: DiffDrive(ns = //):  
  Advertise joint_states  
[ INFO] [1648384720.946032867, 316.384000000]: DiffDrive(ns = //):  
  Try to subscribe to cmd_vel  
[ INFO] [1648384720.949483068, 316.384000000]: DiffDrive(ns = //):  
  Subscribe to cmd_vel  
[ INFO] [1648384720.950783527, 316.384000000]: DiffDrive(ns = //):  
  Advertise odom on odom
```

/home/noura/Desktop/catkin_ws00gz/src/turtlebot3/turtle... - □ ×

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Control Your TurtleBot3!

Moving around:

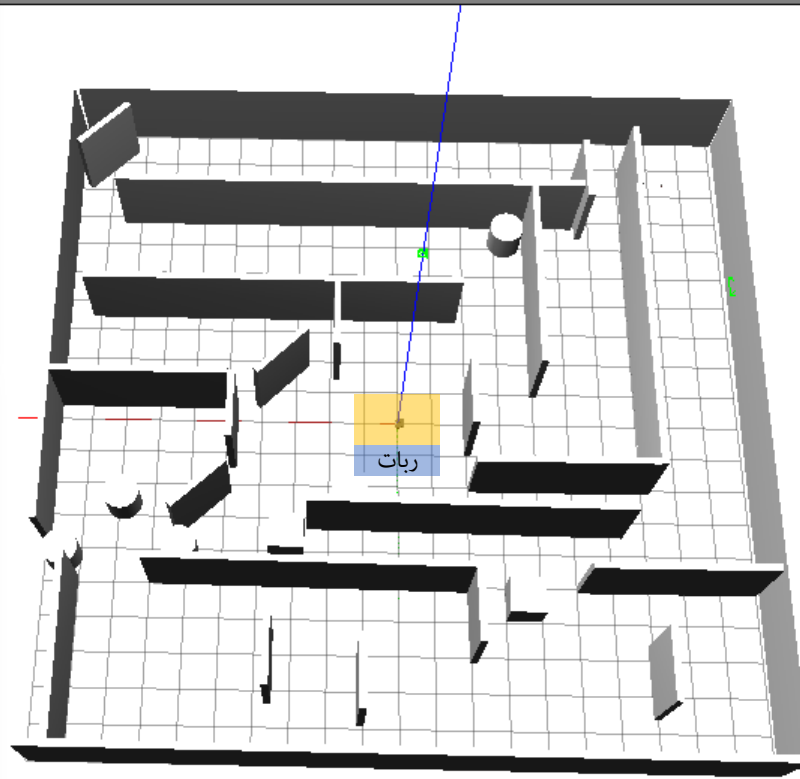
 w
a s d
 x

w/x : increase/decrease linear velocity (Burger : ~ 0.22, Waffle
and Waffle Pi : ~ 0.26)
a/d : increase/decrease angular velocity (Burger : ~ 2.84, Waffle
and Waffle Pi : ~ 1.82)

space key, s : force stop

CTRL-C to quit

roslaunch turtlebot3_teleop turtlebot3_teleop_key.launch



Real Time: 00 00:03:57.699 Iterations: 214568

FPS: 3.36

Reset