

# 22AIE442 – ASSIGNMENT 1

Name : Anuvind M P

Roll no: AM.EN.U4AIE22010

- Download and install the turtlesim package

- o Open a terminal and start the roscore

*roscore*

- o Open another terminal and type

*sudo apt-get install ros-\$(rosversion -d)-turtlesim*

- o Run turtlesim

*roslaunch turtlesim turtlesim\_node*

- o Open another terminal and type

*roslaunch turtlesim turtle\_teleop\_key*

- Use the keypad arrow keys to move the turtle around and check how the data is getting published in **/cmd\_vel** topic

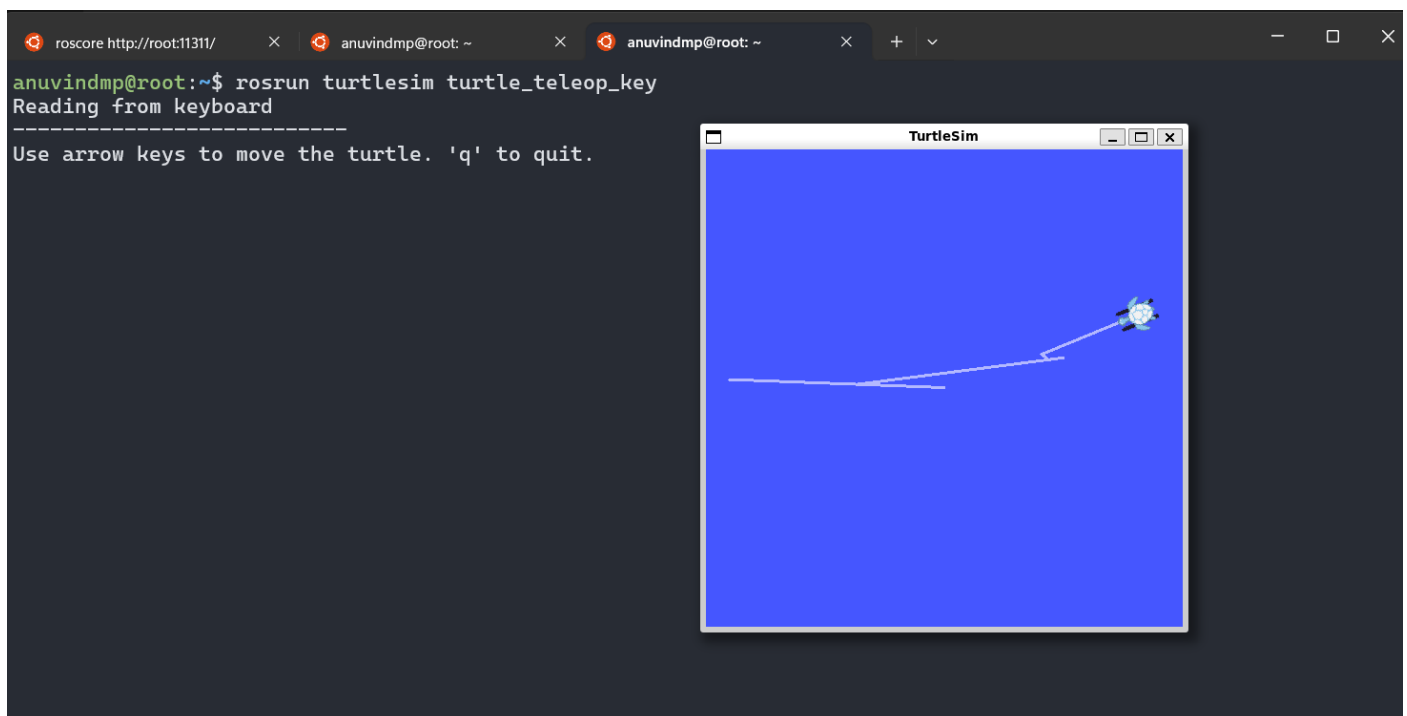
```
roslaunch http://root:11311/ x anuvindmp@root: ~ catkin_ws x anuvindmp@root: ~ x + v
anuvindmp@root:~$ roscore
... logging to /home/anuvindmp/.ros/log/0f68c1a-7bc9-11ef-b429-35137215f8c9/roslaunch-root-1484.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://root:41881/
ros_comm version 1.16.0

SUMMARY
=====
PARAMETERS
 * /roscpp: noetic
 * /rosversion: 1.16.0

NODES
auto-starting new master
process[master]: started with pid [1492]
ROS_MASTER_URI=http://root:11311/

setting /run_id to 0f68c1a-7bc9-11ef-b429-35137215f8c9
process[roscout-1]: started with pid [1582]
started core service [/roscout]
```



## Catkin workspace setup + publisher and subscriber :

```
anuvindmp@root:~/catkin_ws$ mkdir -p ~/catkin_ws/src
anuvindmp@root:~/catkin_ws$ cd ~/catkin_ws
anuvindmp@root:~/catkin_ws$ catkin_init_workspace src
File "/home/anuvindmp/catkin_ws/src/CMakeLists.txt" already exists
anuvindmp@root:~/catkin_ws$ catkin_make
Base path: /home/anuvindmp/catkin_ws
Source space: /home/anuvindmp/catkin_ws/src
Build space: /home/anuvindmp/catkin_ws/build
Devel space: /home/anuvindmp/catkin_ws/devel
Install space: /home/anuvindmp/catkin_ws/install
####
#### Running command: "make cmake_check_build_system" in "/home/anuvindmp/catkin_ws/build"
####
####
#### Running command: "make -j8 -l8" in "/home/anuvindmp/catkin_ws/build"
####
anuvindmp@root:~/catkin_ws$ gedit ~/.bashrc

** (gedit:1749): WARNING **: 11:12:55.138: Could not load theme icon text-x-generic: Icon 'text-x-generic' not present in theme Adwaita

(gedit:1749): Tepl-WARNING **: 11:13:19.910: GVfs metadata is not supported. Fallback to TeplMetadataManager. Either GVfs is not correctly installed or GVfs metadata are not supported on this platform. In the latter case, you should configure Tepl with --disable-gvfs-metadata.
anuvindmp@root:~/catkin_ws$ source ~/catkin_ws/devel/setup.bash
anuvindmp@root:~/catkin_ws$ cd ~/catkin_ws/src
anuvindmp@root:~/catkin_ws/src$ catkin_create_pkg lab_1 std_msgs rospy roscpp
usage: catkin_create_pkg [-h] [--meta] [-s [SYS_DEPS [SYS_DEPS ...]]] [-b [BOOST_COMPS [BOOST_COMPS ...]]]
                        [-V PKG_VERSION] [-D DESCRIPTION] [-l LICENSE] [-a AUTHOR] [-m MAINTAINER]
                        [--rosdistro ROSDISTRO]
                        name [dependencies [dependencies ...]]
catkin_create_pkg: error: File exists: /home/anuvindmp/catkin_ws/src/lab_1/package.xml
anuvindmp@root:~/catkin_ws/src$ cd lab_1
anuvindmp@root:~/catkin_ws/src/lab_1$ mkdir scripts
mkdir: cannot create directory 'scripts': File exists
anuvindmp@root:~/catkin_ws/src/lab_1$ cd scripts
anuvindmp@root:~/catkin_ws/src/lab_1/scripts$ touch subscriber.py
anuvindmp@root:~/catkin_ws/src/lab_1/scripts$ code subscriber.py
anuvindmp@root:~/catkin_ws/src/lab_1/scripts$ touch publisher.py
anuvindmp@root:~/catkin_ws/src/lab_1/scripts$ code publisher.py
anuvindmp@root:~/catkin_ws/src/lab_1/scripts$ chmod +x subscriber.py
```

```
publisher.py 2 subscriber.py 2 X
Ubuntu-20.04 > home > anuvindmp > catkin_ws > src > lab_1 > scripts > subscriber.py > ...
1 #!/usr/bin/env python3
2 import rospy
3 from std_msgs.msg import String
4
5 def callback(data):
6     rospy.loginfo(rospy.get_caller_id() + "I heard %s", data.data)
7
8 def listener():
9
10     # In ROS, nodes are uniquely named. If two nodes with the same
11     # name are launched, the previous one is kicked off. The
12     # anonymous=True flag means that rospy will choose a unique
13     # name for our 'listener' node so that multiple listeners can
14     # run simultaneously.
15     rospy.init_node('listener', anonymous=True)
16
17     rospy.Subscriber("chatter", String, callback)
18
19     # spin() simply keeps python from exiting until this node is stopped
20     rospy.spin()
21
22 if __name__ == '__main__':
23     listener()
24
```

```
publisher.py X
Ubuntu-20.04 > home > anuvindmp > catkin_ws > src > lab_1 > scripts > publisher.py
1 #!/usr/bin/env python
2 # license removed for brevity
3 import rospy
4 from std_msgs.msg import String
5
6 def talker():
7     pub = rospy.Publisher('chatter', String, queue_size=10)
8     rospy.init_node('talker', anonymous=True)
9     rate = rospy.Rate(10) # 10hz
10     while not rospy.is_shutdown():
11         hello_str = "hello world %s" % rospy.get_time()
12         rospy.loginfo(hello_str)
13         pub.publish(hello_str)
14         rate.sleep()
15
16 if __name__ == '__main__':
17     try:
18         talker()
19     except rospy.ROSInterruptException:
20         pass
21
```

## Output (publisher.py) :

```
anuvindmp@root:~/catkin_ws/src/lab_1/scripts$ rosrunc lab_1 publisher.py
[INFO] [1727330092.751162]: hello world 1727330092.7509758
[INFO] [1727330092.851949]: hello world 1727330092.851694
[INFO] [1727330092.951784]: hello world 1727330092.9515224
[INFO] [1727330093.051820]: hello world 1727330093.0515463
[INFO] [1727330093.151891]: hello world 1727330093.151615
[INFO] [1727330093.252092]: hello world 1727330093.251815
[INFO] [1727330093.351947]: hello world 1727330093.3516705
[INFO] [1727330093.452005]: hello world 1727330093.451745
[INFO] [1727330093.551852]: hello world 1727330093.5515757
[INFO] [1727330093.651914]: hello world 1727330093.6515322
[INFO] [1727330093.751739]: hello world 1727330093.7515697
[INFO] [1727330093.851651]: hello world 1727330093.851444
[INFO] [1727330093.951981]: hello world 1727330093.9517968
[INFO] [1727330094.051684]: hello world 1727330094.0514953
[INFO] [1727330094.151699]: hello world 1727330094.1514478
[INFO] [1727330094.251866]: hello world 1727330094.2516203
[INFO] [1727330094.351960]: hello world 1727330094.3516839
[INFO] [1727330094.451860]: hello world 1727330094.4515862
[INFO] [1727330094.551915]: hello world 1727330094.5516334
[INFO] [1727330094.651904]: hello world 1727330094.6516273
[INFO] [1727330094.751846]: hello world 1727330094.7515693
[INFO] [1727330094.851906]: hello world 1727330094.8516288
[INFO] [1727330094.951878]: hello world 1727330094.951598
[INFO] [1727330095.052027]: hello world 1727330095.0517716
[INFO] [1727330095.151774]: hello world 1727330095.1515362
[INFO] [1727330095.251732]: hello world 1727330095.2514868
```

## Output (publisher.py) :

```
roscore http://root:11311/ x anuvindmp@root: ~/catkin_ws x anuvindmp@root: ~/catkin_w x + v
-bash: /home/anuvinidmp/catkin_ws/src/lab_1/: Is a directory
anuvinidmp@root:~/catkin_ws$ roslaunch lab_1 subscriber.py
[1727330730.370426]: /listener_2156_1727330730195I heard hello world 1727330730.3674803
[INFO] [1727330730.471284]: /listener_2156_1727330730195I heard hello world 1727330730.4674597
[INFO] [1727330730.570624]: /listener_2156_1727330730195I heard hello world 1727330730.5674136
[INFO] [1727330730.670659]: /listener_2156_1727330730195I heard hello world 1727330730.6674743
[INFO] [1727330730.770725]: /listener_2156_1727330730195I heard hello world 1727330730.7676573
[INFO] [1727330730.870737]: /listener_2156_1727330730195I heard hello world 1727330730.8674698
[INFO] [1727330730.970327]: /listener_2156_1727330730195I heard hello world 1727330730.9674644
[INFO] [1727330731.070972]: /listener_2156_1727330730195I heard hello world 1727330731.0675788
[INFO] [1727330731.171889]: /listener_2156_1727330730195I heard hello world 1727330731.167405
[INFO] [1727330731.271167]: /listener_2156_1727330730195I heard hello world 1727330731.2675538
[INFO] [1727330731.370625]: /listener_2156_1727330730195I heard hello world 1727330731.367433
[INFO] [1727330731.472109]: /listener_2156_1727330730195I heard hello world 1727330731.4677339
[INFO] [1727330731.571639]: /listener_2156_1727330730195I heard hello world 1727330731.5675747
[INFO] [1727330731.671518]: /listener_2156_1727330730195I heard hello world 1727330731.6673977
[INFO] [1727330731.770369]: /listener_2156_1727330730195I heard hello world 1727330731.7677746
[INFO] [1727330731.870269]: /listener_2156_1727330730195I heard hello world 1727330731.86758
[INFO] [1727330731.971009]: /listener_2156_1727330730195I heard hello world 1727330731.9676073
[INFO] [1727330732.070115]: /listener_2156_1727330730195I heard hello world 1727330732.0675976
[INFO] [1727330732.171021]: /listener_2156_1727330730195I heard hello world 1727330732.1675158
[INFO] [1727330732.271133]: /listener_2156_1727330730195I heard hello world 1727330732.267629
[INFO] [1727330732.370867]: /listener_2156_1727330730195I heard hello world 1727330732.3680444
[INFO] [1727330732.470316]: /listener_2156_1727330730195I heard hello world 1727330732.46755
[INFO] [1727330732.571356]: /listener_2156_1727330730195I heard hello world 1727330732.567658
[INFO] [1727330732.670382]: /listener_2156_1727330730195I heard hello world 1727330732.66761
[INFO] [1727330732.770096]: /listener_2156_1727330730195I heard hello world 1727330732.767519
```

```
roscore http://root:11311/ x anuvindmp@root: ~/catkin_v x anuvindmp@root: ~/catkin_v x anuvindmp@root: ~ x + v - □ x
anuvinidmp@root:~$ ~/catkin_ws/src/lab_1/
-bash: /home/anuvinidmp/catkin_ws/src/lab_1/: Is a directory
anuvinidmp@root:~$ rqt_graph

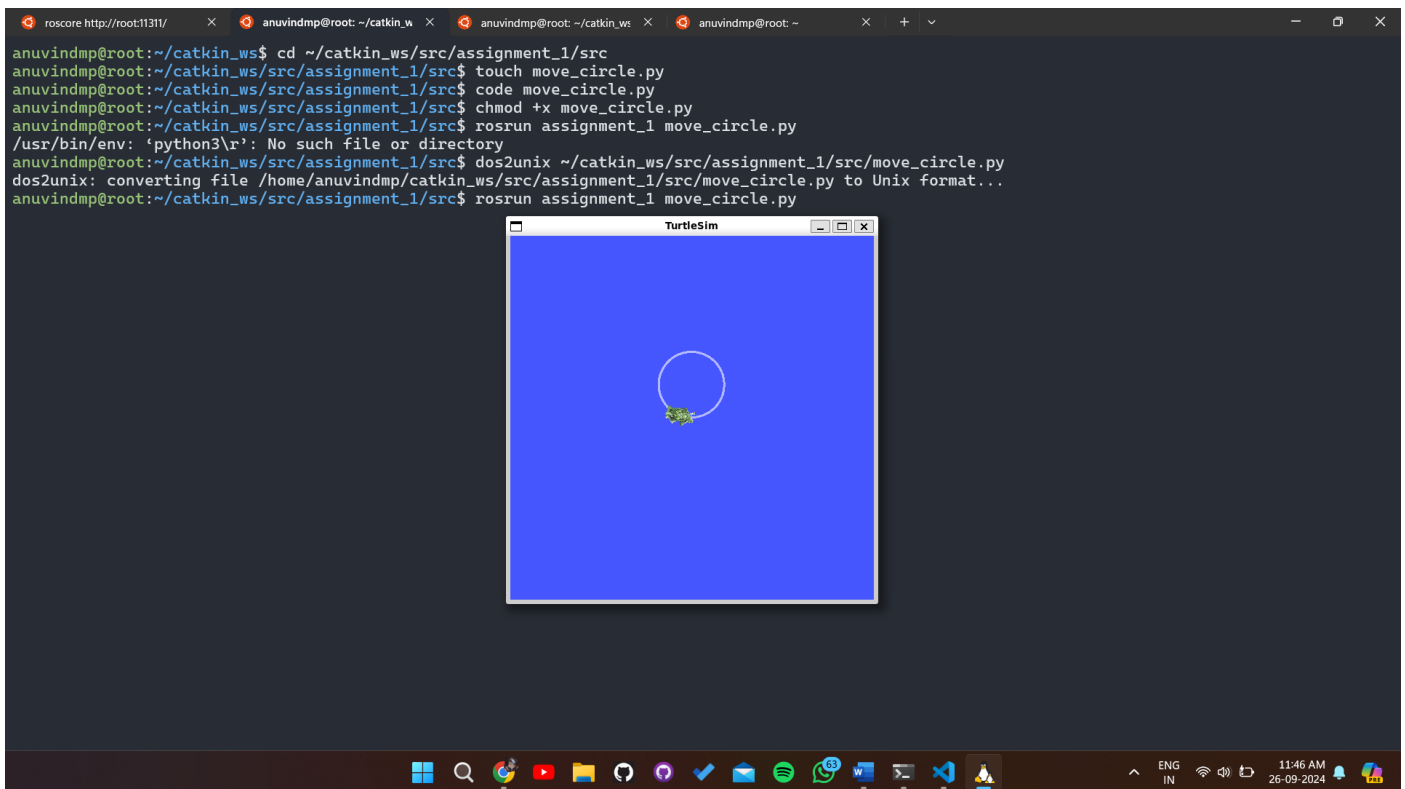
rqt_graph_RosGraph - rqt
Node Graph
Nodes only / /
Group: 2 Namespaces Actions tf Images Highlight Fit
Hide: Dead sinks Leaf topics Debug tf Unreachable Params

graph LR
    /talker_2086_172733055738 -- chatter --> /listener_2156_1727330730195
```

- Create a package called **assignment\_1** with dependencies **rospy** in your catkin workspace

```
roscore http://root:11311/ x anuvindmp@root: ~/catkin_ x anuvindmp@root: ~/catkin_v x anuvindmp@root: ~ x + v - □ x
anuvinidmp@root:~/catkin_ws/src$ catkin_create_pkg assignment_1 rospy
Created file assignment_1/package.xml
Created file assignment_1/CMakeLists.txt
Created folder assignment_1/src
Successfully created files in /home/anuvinidmp/catkin_ws/src/assignment_1. Please adjust the values in package.xml.
anuvinidmp@root:~/catkin_ws/src$ ls
CMakeLists.txt assignment_1 lab_1
```

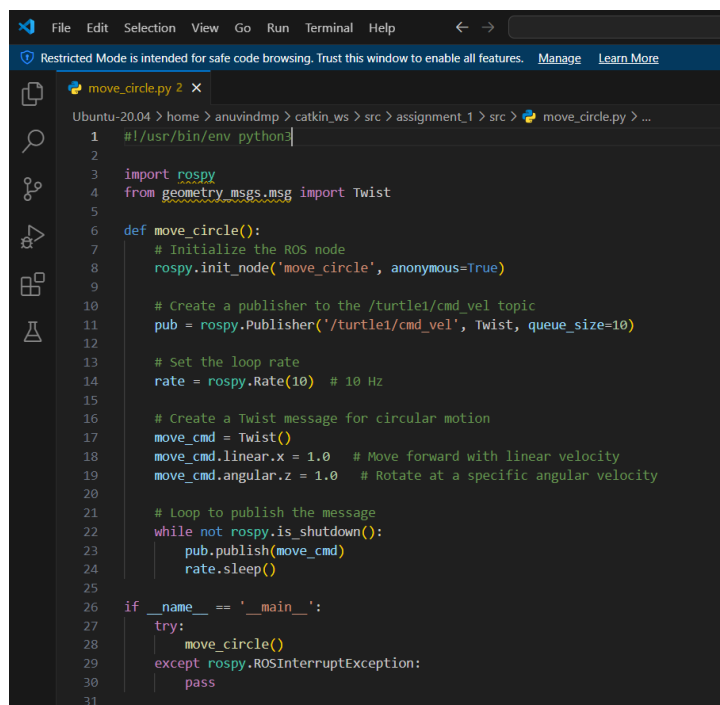
- In the source folder of your package assignment\_1 create a publisher python file **move\_circle.py** which makes the turtlesim to execute a single circular(approximate) trajectory.



```
anuvindmp@root:~/catkin_ws$ cd ~/catkin_ws/src/assignment_1/src
anuvindmp@root:~/catkin_ws/src/assignment_1/src$ touch move_circle.py
anuvindmp@root:~/catkin_ws/src/assignment_1/src$ code move_circle.py
anuvindmp@root:~/catkin_ws/src/assignment_1/src$ chmod +x move_circle.py
anuvindmp@root:~/catkin_ws/src/assignment_1/src$ rosrn assignment_1 move_circle.py
/usr/bin/env: 'python3\r': No such file or directory
anuvindmp@root:~/catkin_ws/src/assignment_1/src$ dos2unix ~/catkin_ws/src/assignment_1/src/move_circle.py
dos2unix: converting file /home/anuvindmp/catkin_ws/src/assignment_1/src/move_circle.py to Unix format...
anuvindmp@root:~/catkin_ws/src/assignment_1/src$ rosrn assignment_1 move_circle.py
```

The Turtlesim window shows a green turtle on a blue background, moving in a circular path as indicated by a white circle.

Code :



```
1 #!/usr/bin/env python3
2
3 import rospy
4 from geometry_msgs.msg import Twist
5
6 def move_circle():
7     # Initialize the ROS node
8     rospy.init_node('move_circle', anonymous=True)
9
10    # Create a publisher to the /turtle1/cmd_vel topic
11    pub = rospy.Publisher('/turtle1/cmd_vel', Twist, queue_size=10)
12
13    # Set the loop rate
14    rate = rospy.Rate(10) # 10 Hz
15
16    # Create a Twist message for circular motion
17    move_cmd = Twist()
18    move_cmd.linear.x = 1.0 # Move forward with linear velocity
19    move_cmd.angular.z = 1.0 # Rotate at a specific angular velocity
20
21    # Loop to publish the message
22    while not rospy.is_shutdown():
23        pub.publish(move_cmd)
24        rate.sleep()
25
26 if __name__ == '__main__':
27     try:
28         move_circle()
29     except rospy.ROSInterruptException:
30         pass
31
```

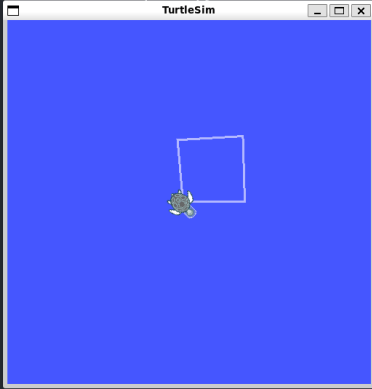
- In the source folder of your package assignment\_1 create a publisher python file **move\_square.py** which makes the turtlesim to execute a single square(approximate) trajectory.

```

anuvindmp@root:~/catkin_ws$ touch move_square.py
anuvindmp@root:~/catkin_ws$ chmod +x move_square.py
anuvindmp@root:~/catkin_ws$ gedit move_square.py

(gedit:2697): Tepl-WARNING **: 11:54:24.141: GVfs metadata is not supported. Fallback to TeplMetadataManager. Either GVfs is not correctly installed or GVfs metadata are not supported on this platform. In the latter case, you should configure Tepl with --disable-gvfs-metadata.
anuvindmp@root:~/catkin_ws$ chmod +x move_square.py
anuvindmp@root:~/catkin_ws$ dos2unix ~/catkin_ws/src/assignment_1/src/move_square.py
dos2unix: converting file /home/anuvindmp/catkin_ws/src/assignment_1/src/move_square.py to Unix format...
anuvindmp@root:~/catkin_ws$ chmod +x move_square.py
anuvindmp@root:~/catkin_ws$ rosrun assignment_1 move_square.py

```



Code :

```

File Edit Selection View Go Run Terminal Help
Restricted Mode is intended for safe code browsing. Trust this window to enable all features. Manage Learn More

move_circle.py 2 move_square.py 2 x
Ubuntu-20.04 > home > anuvindmp > catkin_ws > src > assignment_1 > src > move_square.py > move_square.py
1  #!/usr/bin/env python3
2  import rospy,time
3  from geometry_msgs.msg import Twist
4  def move_square():
5      rospy.init_node('move_square', anonymous=True)
6      pub = rospy.Publisher('/turtle1/cmd_vel', Twist, queue_size=10)
7      rate = rospy.Rate(10)
8      move_cmd = Twist()
9      side_length = 2.0
10     move_duration = side_length / 1.0
11     turn_duration = 1.57 / 1.0
12     for _ in range(4):
13         move_cmd.linear.x = 1.0
14         move_cmd.angular.z = 0.0
15         time_start = rospy.get_time()
16         while rospy.get_time() - time_start < move_duration:
17             pub.publish(move_cmd)
18             rate.sleep()
19         move_cmd.linear.x = 0.0
20         pub.publish(move_cmd)
21         rospy.sleep(1)
22         move_cmd.linear.x = 0.0
23         move_cmd.angular.z = 1.0
24         time_start = rospy.get_time()
25         while rospy.get_time() - time_start < turn_duration:
26             pub.publish(move_cmd)
27             rate.sleep()
28         move_cmd.angular.z = 0.0
29         pub.publish(move_cmd)
30         rospy.sleep(1)
31 if __name__ == '__main__':
32     try:
33         move_square()
34     except rospy.ROSInterruptException:
35         pass

```