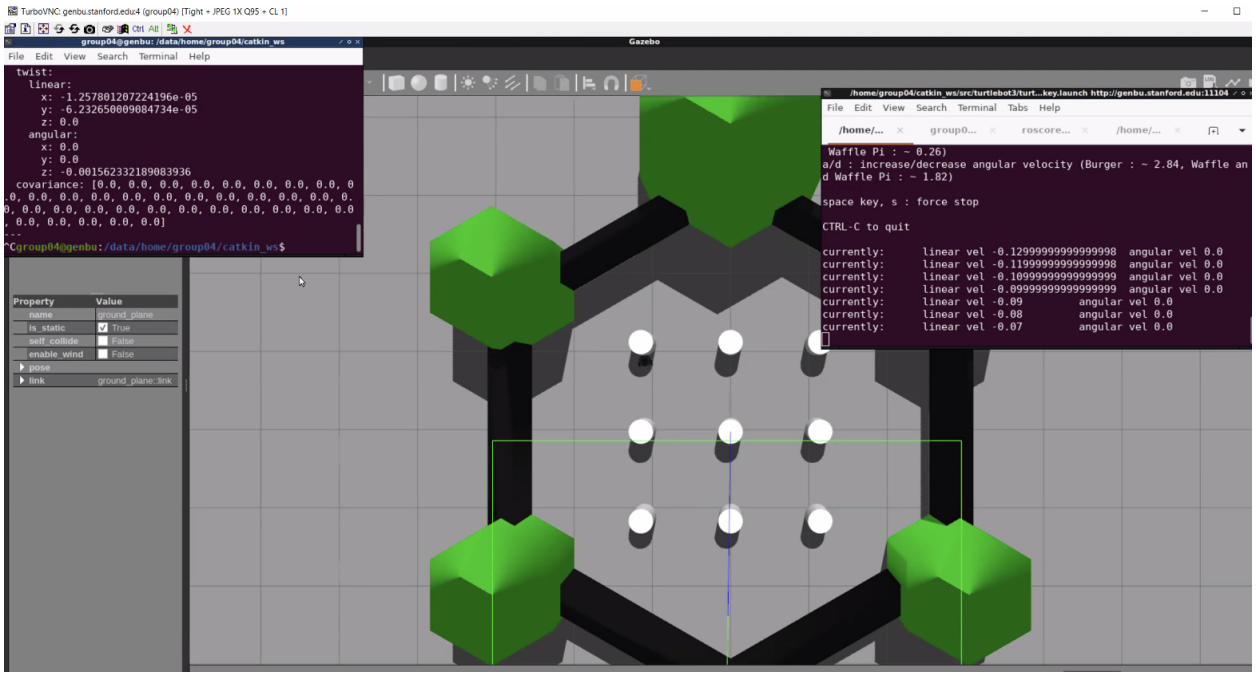
AA 274: Principles of Robotic Autonomy
Section 3 (Virtual): Introduction to Turtlebot and Gazebo

Contributor: Karthik Pythireddi
Group 05: Erin Hong, Josie Oetjen
SU#: 06734162
Email: karthik9@stanford.edu

Problem 1: Once this is all running, which rostopics are available? Paste this list in your submission.

```
group04@genbu:~/catkin_ws$ rostopic list
/clock
/cmd_vel
/gazebo/link_states
/gazebo/model_states
/gazebo/parameter_descriptions
/gazebo/parameter_updates
/gazebo/performance_metrics
/gazebo/set_link_state
/gazebo/set_model_state
/imu
/joint_states
/odom
/rosout
/rosout_agg
/scan
/tf
```

Problem 2: What is the message type being published to `odom` and what information is contained within these messages?




```
group04@genbu:~/catkin_ws$ rostopic info odom
Type: nav_msgs/Odometry

Publishers:
 * /gazebo (http://genbu.stanford.edu:37021/)
---
header:
  seq: 9376
  stamp:
    secs: 312
    nsecs: 851000000
  frame_id: "odom"
child_frame_id: "base_footprint"
pose:
  pose:
    position:
      x: -2.000050301646176
      y: -0.49981880329192696
      z: -0.0010013932136207597
    orientation:
      x: -1.254889747021662e-05
      y: 0.0038530897860490085
      z: 0.001424382267720488
```

```
    w: 0.9999915623027934
  covariance: [1e-05, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1e-05, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1000000000000.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1000000000000.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1000000000000.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.001]
twist:
  twist:
    linear:
      x: 6.093972417846138e-08
      y: 7.56394662659636e-07
      z: 0.0
    angular:
      x: 0.0
      y: 0.0
      z: 1.1232333373419443e-05
  covariance: [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]
---
```

Problem 3: Paste your code in your submission, as well as any of its running output.

vel_publisher.py

```python
#!/usr/bin/env python3
import rospy
from geometry_msgs.msg import Twist

def publisher():
    pub = rospy.Publisher('cmd_vel',Twist,queue_size=10)
    rospy.init_node('group04_node',anonymous=True)
    rate = rospy.Rate(10)    # units are Hz
    while not rospy.is_shutdown():
        twist = Twist()
        print(twist)
        twist.linear.x = 0; twist.linear.y = 0; twist.linear.z = 0
        twist.angular.x = 0; twist.angular.y = 0; twist.angular.z = 0
        pub.publish(twist)
        #rate.sleep()

if __name__ == '__main__':
    try:
        publisher()
    except rospy.ROSInterruptException:
```

```
        Pass
```

```
Console Output for vel_publisher.py:

linear:
  x: 0.0
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: 0.0
linear:
  x: 0.0
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: 0.0
```

Problem 4: Paste your code in your submission, as well as any of its running output.

odom_subscriber.py

```
#!/usr/bin/env python3
import rospy
from nav_msgs.msg import Odometry

def callback(msg: Odometry):
    rospy.loginfo(rospy.get_caller_id()+ "I heard %s, %s", msg.pose, msg.twist)
    # rospy.loginfo(rospy.get_caller_id()+ msg)

def subscriber():
    rospy.init_node('group04_node', anonymous=True)
    rospy.Subscriber("odom", Odometry, callback)
```

```
    rospy.spin()


if __name__ == '__main__':
    subscriber()
```

Console output for Subscriber.py:

[INFO] [1666060447.162885, 220.705000]: /group04_node_3652420_1666060442886I heard pose:
  position:
    x: -2.0000410231379333
    y: -0.49987259735493367
    z: -0.001001393126649753
  orientation:
    x: -1.0914216478330613e-05
    y: 0.003853094018473287
    z: 0.00100004046700857
    w: 0.9999920767018251
covariance: [1e-05, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1e-05, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1000000000000.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1000000000000.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1000000000000.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.001], twist:
  linear:
    x: 6.598944149055076e-08
    y: 7.240159546075365e-07
    z: 0.0
  angular:
    x: 0.0
    y: 0.0
    z: 1.0739424210334068e-05
covariance: [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]