Moving in a Straight Line

Description: This tutorial is based on Turtlesim Video Tutorials

Tutorial Level: INTERMEDIATE

Next Tutorial: Rotating Left/Right

Conținut

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In this tutorial series, we will create python scripts to move our turtle, in order to practice the ROS basics.

You can find the complete package at: https://github.com/clebercoutof/turtlesim_cleaner

Preparing for work

First of all, we have to create a new package.

```
$ cd ~/catkin_ws/src
$ catkin_create_pkg turtlesim_cleaner geometry_msgs rospy
```

Now, build your workspace

```
#At your catkin workspace
$ cd ~/catkin_ws
$ catkin_make
```

And now, create a a src folder for your scripts

```
$ cd ~/catkin_ws/src/turtlesim_cleaner
$ mkdir src
$ cd ~/catkin_ws
$ catkin_make
```

Understanding the code

Our code will receive as inputs the desired speed, distance and a variable which defines if the movement is forwards or backwards. Since we can just publish a velocity to the topic ***/turtle1/cmd_vel***, our logic will have to calculate the distance specified.

The code

Create your move.py (or any name you want) file and save it in your ***~/catkin_ws/src/turtlesim_cleaner/src***, our code will look like this:

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

def move():
    # Starts a new node
    rospy.init_node('robot_cleaner', anonymous=True)
    velocity_publisher = rospy.Publisher('/turtle1/cmd_vel', Twist,
queue_size=10)
    vel_msg = Twist()

    #Receiveing the user's input
    print("Let's move your robot")
    speed = input("Input your speed:")
    distance = input("Type your distance:")
    isForward = input("Foward?: ")#True or False

    #Checking if the movement is forward or backwards
    if(isForward):
        vel_msg.linear.x = abs(speed)
    else:
        vel_msg.linear.x = -abs(speed)
    #Since we are moving just in x-axis
    vel_msg.linear.y = 0
    vel_msg.linear.z = 0
    vel_msg.angular.x = 0
    vel_msg.angular.y = 0
    vel_msg.angular.z = 0

    while not rospy.is_shutdown():

        #Setting the current time for distance calculus
        t0 = rospy.Time.now().to_sec()
        current_distance = 0

        #Loop to move the turtle in an specified distance
        while(current_distance < distance):
            #Publish the velocity
            velocity_publisher.publish(vel_msg)
            #Takes actual time to velocity calculus
            t1=rospy.Time.now().to_sec()
            #Calculates distancePoseStamped
            current_distance= speed*(t1-t0)
        #After the loop, stops the robot
        vel_msg.linear.x = 0
        #Force the robot to stop
        velocity_publisher.publish(vel_msg)

if __name__ == '__main__':
    try:
        #Testing our function
        move()
    except rospy.ROSInterruptException: pass
```

Don't forget to make your node executable:

```
$ chmod u+x ~/catkin_ws/src/turtlesim_cleaner/src/move.py
```

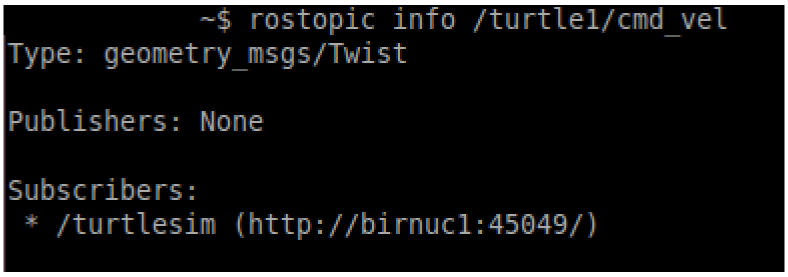
First we need to import the packages used on our script.The rospy library is the ros python library, it contains the basic functions, like creating a node, getting time and creating a publisher.The geometry_msgs contains the variable type **Twist** that will be used: Error: No code_block found

Now we declare our function, initiate our node, our publisher and create the **Twist** variable. Error: No code_block found

The **Twist** is necessary because our topic **'/turtle1/cmd_vel'** uses the Twist message, you can check with the following command:

```
$ rostopic info /turtle1/cmd_vel
```

You should see the following screen:

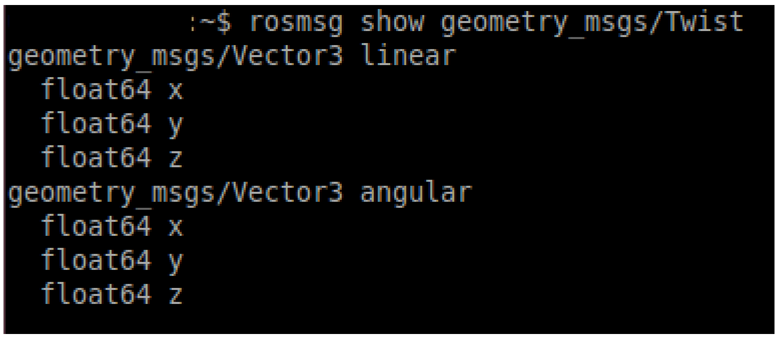


```
             ~$ rostopic info /turtle1/cmd_vel
Type: geometry_msgs/Twist

Publishers: None

Subscribers:
 * /turtlesim (http://birnuc1:45049/)
```

The Twist message is composed by 3 linear components and 3 angular components,you can see the message description with the following command:

```
$ rosmsg show geometry_msgs/Twist
```

You should see the following screen:



```
           :~$ rosmsg show geometry_msgs/Twist
geometry_msgs/Vector3 linear
  float64 x
  float64 y
  float64 z
geometry_msgs/Vector3 angular
  float64 x
  float64 y
  float64 z
```

Since we are moving the turtle in a straight line, we just need the x component, and, depending on the user's input we decide if the movement is forwards or backwards. Error: No code_block found

The following statement guarentee that if we press **crtl + c** our code will stops Error: No code_block found

Now , with the **rospy.Time.now().to_sec()**. we get the starting time **t0**, and the time **t1** to calculate the distance and while the actual distance is less than the user's input, it will keep publishing: Error: No code_block found

After we get to the specified distance , we order our robot to stop: Error: No code_block found

And then, we have our main loop which calls our function: Error: No code_block found

Now , you can test and move your robot!

Testing the code

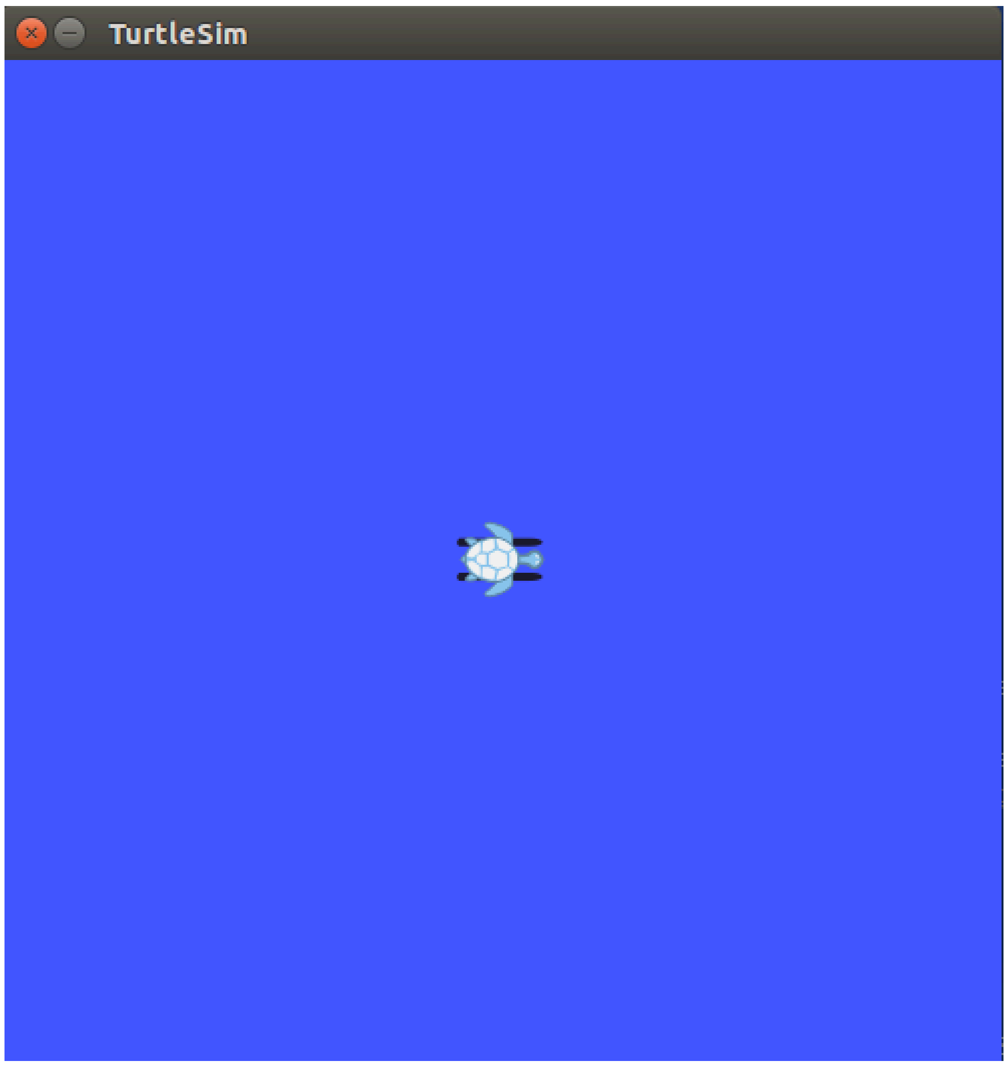
In a **new terminal**, run:

```
$ roscore
```

In a **new terminal**, run:

```
$ rosrun turtlesim turtlesim_node
```

The turtlesim window will open:



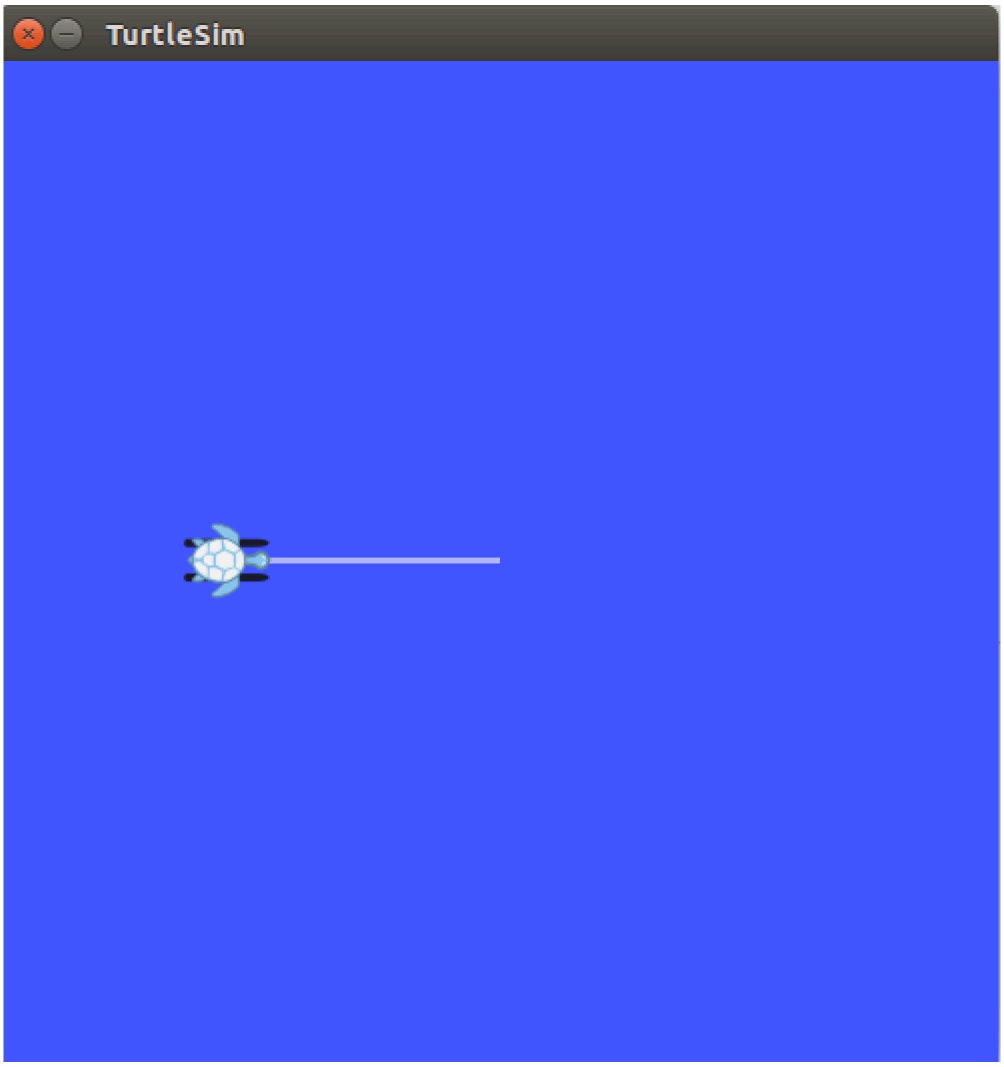
Now, in a **new terminal**, run our code:

```
$ rosrun turtlesim_cleaner move.py
```

Just type your inputs and the turtle will move! Here we have an example:

```
Let's move your robot
Input your speed:1
Type your distance:3
Foward?: 0
```

The turtle will move like this:

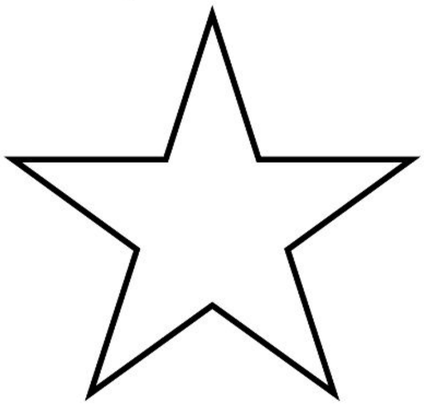


Now you can go to the next tutorial! Learn how to rotate your turtle.

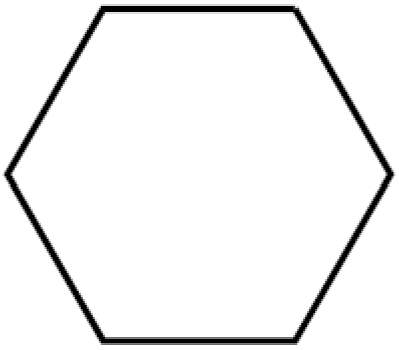
Source: https://wiki.ros.org/turtlesim/Tutorials/Moving%20in%20a%20Straight%20Line

Exercitii:

1. The first exercise is to make the TurtuleBot draw a star shape



2. The first exercise is to make the TurtuleBot draw a hexagon shape



3. The last part it should combine the 2 codes by selecting from keyboard what shape should the turtle bot to draw.
    i. Star - S
    ii. Hexagon - H

key - “H”	key - “S”