MTRN4230 Lab 03

1. Aim

Lab 3 aims to familiarise you with the scripting interface and Peter Corke's robotic toolbox (i.e., RVC toolbox) using MATLAB, which provides a more powerful and convenient way to control the UR5e. We will go through examples on how to establish a TCP/IP connection with the UR5e, send commands, and receive motion data. You are welcome to use the scripting interface for the ROBOT-2 assessment as well.

There are a lot of new toolboxes that are introduced this week, so ensure you take your time and go through all the examples provided to familiarise yourself with them.

2. Pre-lab

You must have completed the ROBOT-1 assessment and installed Peter Corkes RVC Toolbox in MATLAB.

3. Lab Activities

During the lab you should complete the tasks below. You may test your program on the UR5e in the Lab today.

3.1 RVC ToolBox

- Follow along with your lab demonstrator's presentation of the example code provided
    - RVC: Geometry_2D
    - RVC: Geometry_3D

3.2. Scripting

- Follow along with your lab demonstrator's presentation of the example code provided and how to connect to the UR5e.
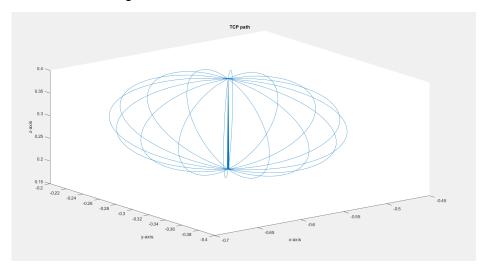
3.3. Rotations are non-commutative

1. What does the term "rotations are not commutative in 3D" mean?
2. Demonstrate this using the RVC Toolbox (rotx,roty,rotz functions)

3.4. Draw a Sphere

Using the RTDE interface, send commands to the UR5e to draw a sphere of your own chosen dimensions and plot the TCP path.

- You should use movec.
- Rotate a point around the centre of the sphere to generate via-points using the RVC toolbox.
- Have a look at the "rotz()" function in the RVC toolbox.
- You may need to revise 2D and 3D geometry to remember how to perform pose transformations, please refer to the following videos if you need a refresher!
    - https://robotacademy.net.au/masterclass/2d-geometry/
    - https://robotacademy.net.au/masterclass/3d-geometry/

You output should look something like:

4. Post-lab

- Practice implementing tasks in URSim and the scripting interface for the ROBOT-2 assessment (due in week 4).
- Further Reading:
    - RVC Textbook: Chapter 2, Representing Position and Orientation
    - Robot Academy Videos: 2D and 3D geometry videos