COMP3766 Lab 2
Forward Kinematics and URDF
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Lab repository

All the tools required for Lab 2 are in the course repository: `https://github.com/vncprado/COMP3766`. If required, go to Lab 1 instructions on how to run the VSCode Dev container. Make sure to:

```
$ git pull main
```

This will ensure you have the most recent changes in the repo.

Objectives

- Before this lab, we built a structure like the one in Figure 1 below.

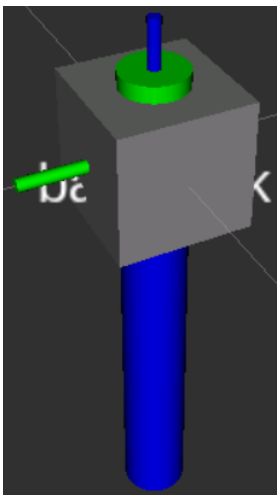

Figure 1: Maybe a Puma robot.

- In this lab, we will derive the transformations between the robot links of the robot in Figure 2 below (not the same model as the Puma in the textbook but the same model as Assignment-3). In other words, we will build the robot from Assignment-3.
- We will identify the origin and calculate the RPY values for the joints.
- Update the provided files.
- Launch the robot model on ROS.
- Run some tests on ROS to verify our model.

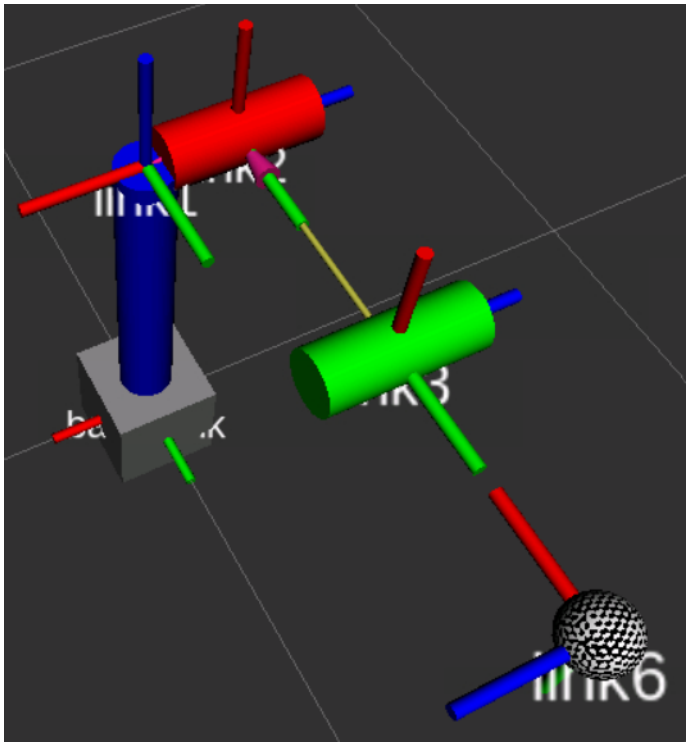

Figure 2: A Puma robot.

Pre-lab

You should arrive with Assignment-3 done before the lab.

Lab

Step 1: Update the URDF File

The URDF file is provided under **src/lab2/urdf/puma_lab2.urdf** The file already includes links (map, base_link, link1, link2, link3, link4, link5, link6) and joints (map_to_base, joint1, jont2, joint3, joint4, joint5, joint6) required.

A joint configuration should look like this:

```
<!-- Joint 1 -->
<joint name="joint1" type="revolute">
    <parent link="base_link"/>
    <child link="link1"/>
<!-- xyz is p in the homogeneous transform/RPY
   calculated followin Section B.1.1 -->
<origin xyz="0 0 0" rpy="0 0 0"/>
<axis xyz="0 0 1"/>
<limit lower="-1.57" upper="1.57" effort="10"
   velocity="1.0"/>
</joint>
```

The joint between map and base_link is fixed. For joint1, joint2, joint3, joint4, joint5 and joint6 you will update the RPY angles and XYZ values (sample seen below) from T_{01}, T_{12}, and T_{23}, respectively.

```
<origin xyz="0 0 0" rpy="0 0 0"/>
```

Step 2: Build the Workspace
Before testing, build and source the workspace to ensure all updates are applied:

```
$ cd /workspaces/COMP3766
$ catkin_make
$ source devel/setup.bash
```

Step 3: Launch the Project
Run the launch file to visualize your robot in RViz:

```
$ roslaunch lab2 lab2.launch
```

Step 4: Verify Your Robot in RViz
Open `http://localhost:6080/` on your browser. This page shows the GUI applications from the lab. In RViz:

1. Ensure the robot's structure matches your design.
2. Use the `joint_state_publisher_gui` to manipulate the joints and observe their movement.

Step 5: With the robot running, answer the Lab 2 quiz questions on d2l.