

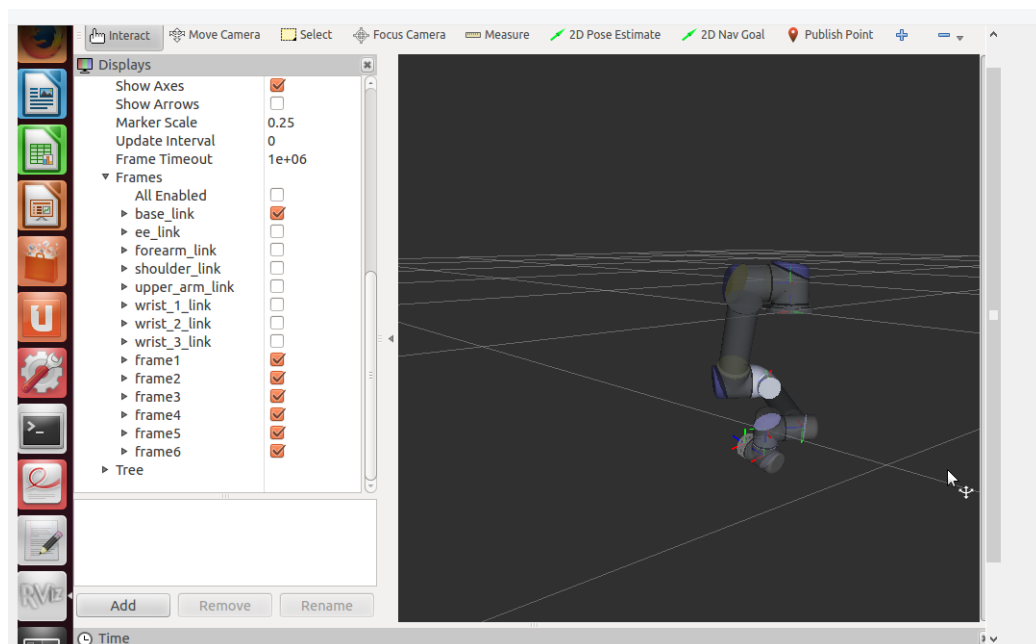
Lab 3 Answers

The sketches for Question2 and Question4 have been already provided, so are not attached here. Three configurations of q_1 have been chosen to show the frames, which are: $\{1, 1, 2, 3, 1, 0\}$, $\{0.5, 0.3, 0.9, 1.3, 1.2, 1\}$ and $\{3, 2, 1.5, 2.5, 1.3, 1.2\}$.

1. Question 7

a. $q_1 = \{1, 1, 2, 3, 1, 0\}$

Below is the screenshot of the RViz window, showing the robot position and the DH frames got by the function `plotframes` (same for b and c).



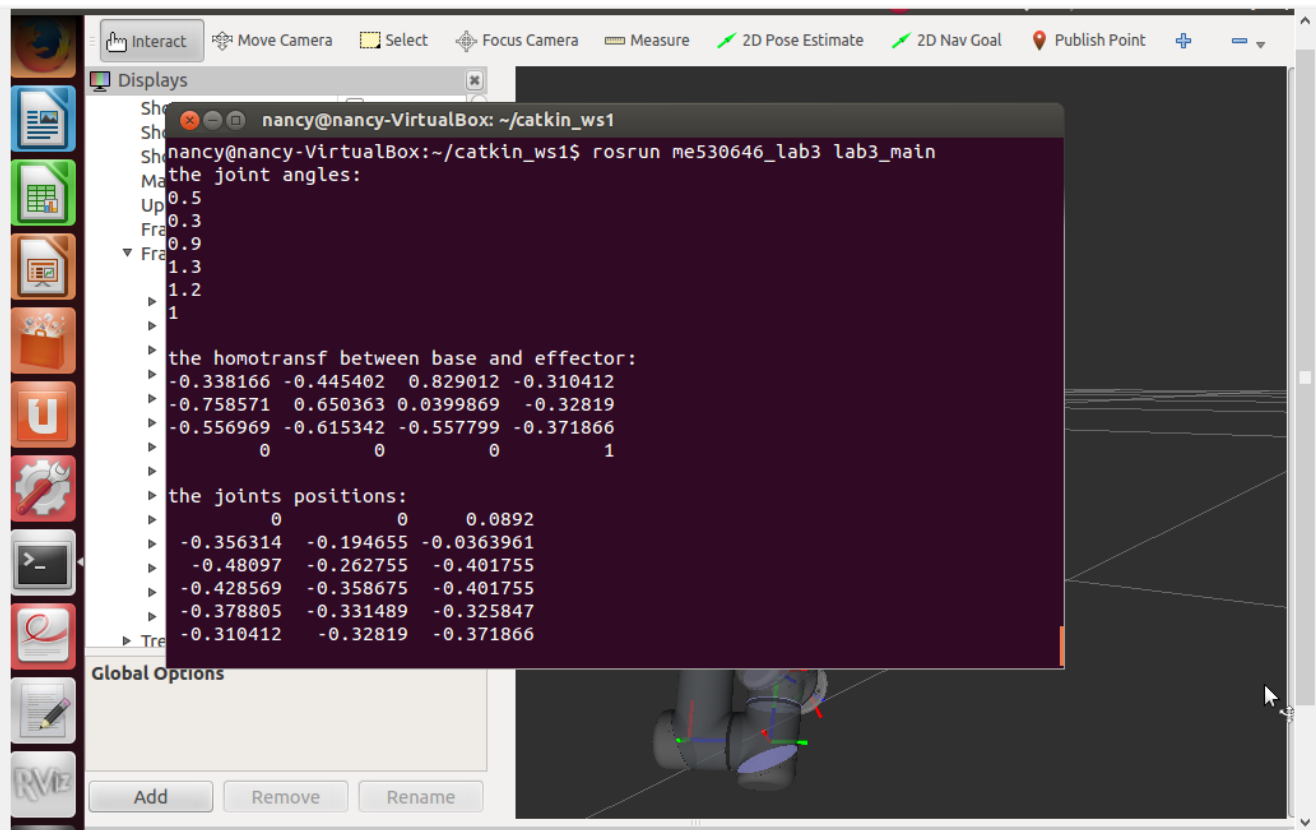
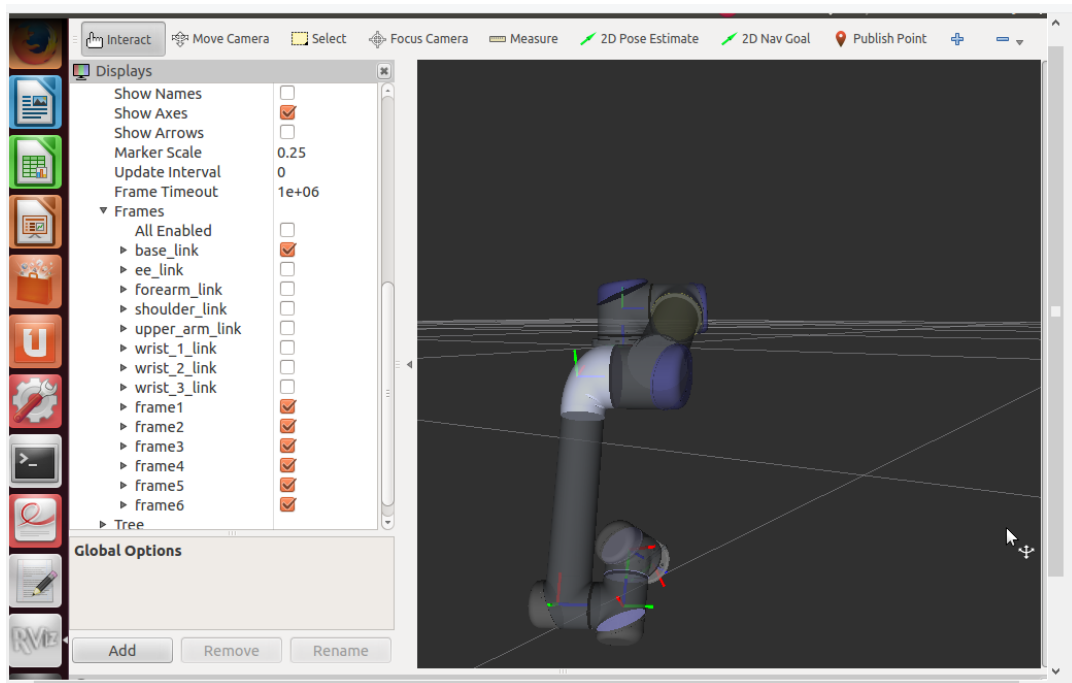
Below is the screenshot showing the configurations (q1), the transformation from the base of the robot to its end-effector, and the origins of the frames. The joints positions are approximately the origin of the transformation frames, and each column represents the position of a joint, starting from the 2nd joint to the end-effector (same for b and c).

The screenshot shows a ROS environment with a terminal window displaying the following output:

```
nancy@nancy-VirtualBox: ~/catkin_ws1
[100%] Building CXX object me530646labs/me530646_lab3/CMakeFiles/me530646_lab3.
tr/src/lab3.cpp.o
Linking CXX shared library /home/nancy/catkin_ws1/devel/lib/libme530646_lab3.so
[100%] Built target me530646_lab3
nancy@nancy-VirtualBox:~/catkin_ws1$ rosrn me530646_lab3 lab3_main
Show the joint angles:
Show 1
Mark 1
Upda 2
Fram 3
Fram 1
Fram 0
Al
the homotransf between base and effector:
0.988373  0.150969  0.0181085  0.164773
-0.0181085  0.23512  -0.971798  -0.0281761
-0.150969  0.96017  0.23512  -0.395323
0  0  0  1
the joints positions:
0  0  0.0892
-0.124069  -0.193226  -0.268425
0.0856101  0.13333  -0.323744
0.177583  0.0742748  -0.323744
0.163279  0.0519972  -0.41472
0.164773  -0.0281761  -0.395323
```

The terminal output shows the successful building and linking of the `me530646_lab3` package. It then displays the joint angles and the homotransformation matrix between the base and the end-effector. The joint positions are also listed, showing the origin of the transformation frames.

b. $q_1 = \{0.5, 0.3, 0.9, 1.3, 1.2, 1\}$



c. $q_1 = \{3, 2, 1.5, 2.5, 1.3, 1.2\}$

