

# RBE 500 : FINAL ASSIGNMENT - PART 2 REPORT

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For this part we first modified our urdf file so that the first two joints in the robot will be “fixed” and only the last joint “Joint 3” (prismatic) can move. The limits for Joint 3 are from -3 cms to +3 cms. There are two python scripts for this part of the assignment: B1\_PC\_Server.py and B2\_Set\_Reference.py.

- 1) B1\_PC\_Server.py: This has a server node with service “SCARA\_T7/Joint3\_Ref” that receives position input (Float64) for the joint 3 and publishes the received input to the position controller topic “/SCARA\_T7/joint3\_position\_controller/command”. The position controller is initiated using the config file “B\_SCARA\_config.yaml”. The gains in the PD controller have been tuned using sequential trial and error to {p: 6000.0, d: 40.0}. The controller used by Joint 3 is the “effort\_controllers/JointPositionController”. This controller sends the required joint efforts to the joint 3 so that it reaches the reference position.
- 2) B2\_Set\_Reference.py: This node gets user input for the required joint position and then calls the service “SCARA\_T7/Joint3\_Ref” to set the reference position. This script also records the reference position from “/SCARA\_T7/joint3\_position\_controller/state” and the current position of the joint from “/SCARA\_T7/joint\_states” and creates a graphical plot.

PD Tuning for the Joint : The “d-gain” was set to zero and the “p-gain” was increased until the system had a quick rise time, was considerable stable and then the “d-gain” was increased to reduce the overshoot. Following set of graphs show the tuning process and how the system behaved for different set of parameters.

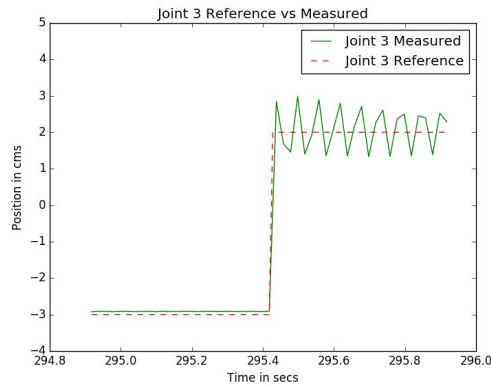


Figure 1(a) : P:1000 D:0

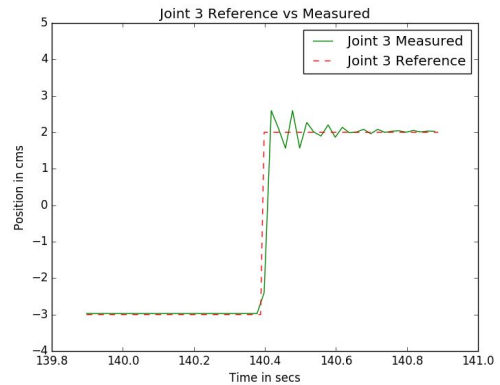


Figure 1(b) : P:3000 D:0

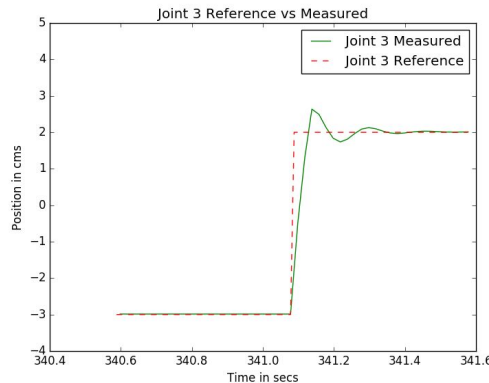


Figure 1(c) : P:6000 D:0

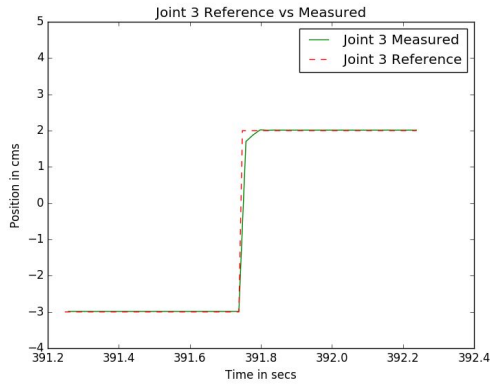


Figure 2(a) : P:6000 D:20

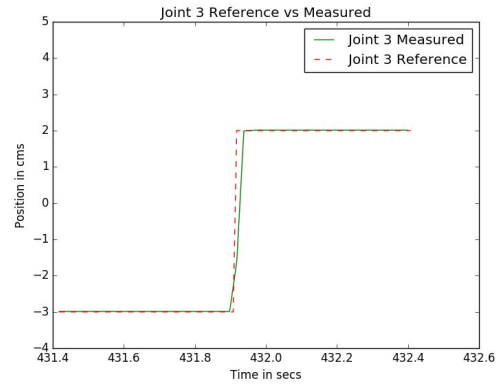


Figure 2(b) : P:6000 D:40

Following sets of graphs show show the system behaviour for different test cases with P:6000 and D:40

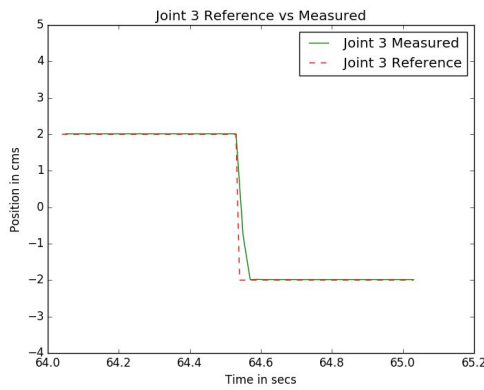


Figure 3(a) : +2 cms to -2 cms

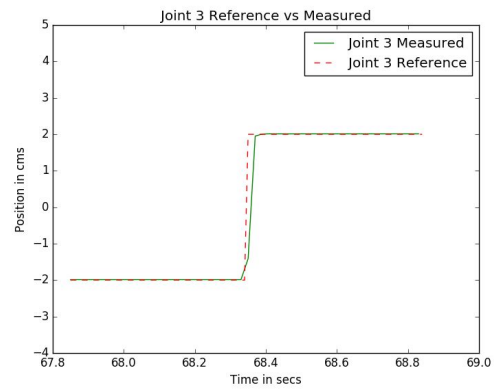


Figure 3(b) : -2 cms to +2 cms

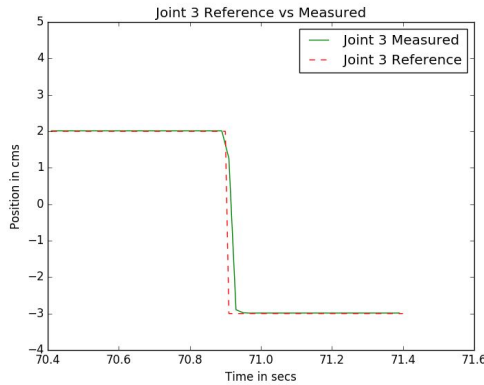


Figure 3(c) : +2 cms to -3 cms

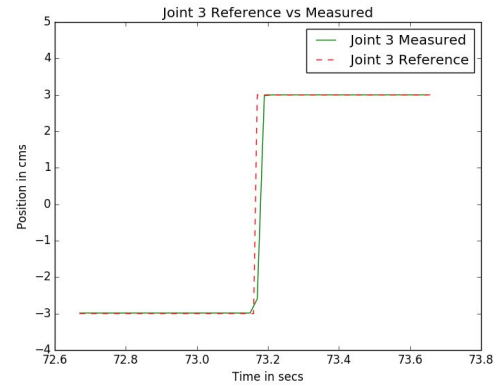


Figure 3(d) : -3 cms to +3 cms

Attachments : final\_project.zip

- 1) Scripts - B1\_PC\_Server.py, B2\_Set\_Reference.py
- 2) Robots - B\_SCARA.urdf.xacro
- 3) Config - B\_SCARA\_config.yaml
- 4) Launch - B\_Load\_SCARA.launch
- 5) Srv - PC\_srv.srv