Robotics

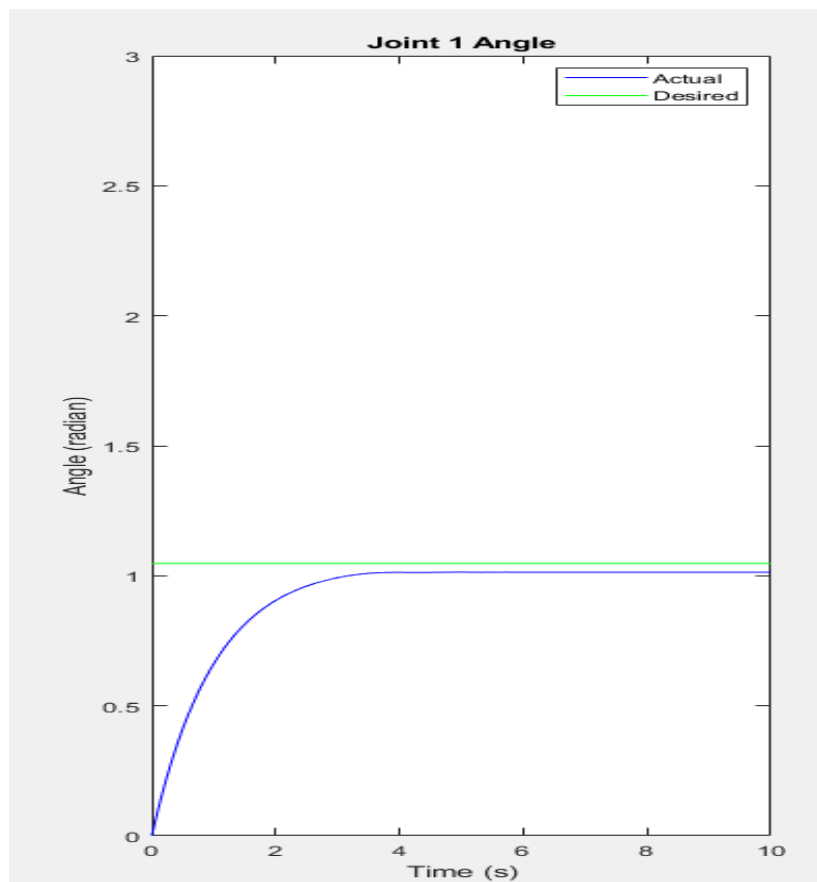## Assignment-1

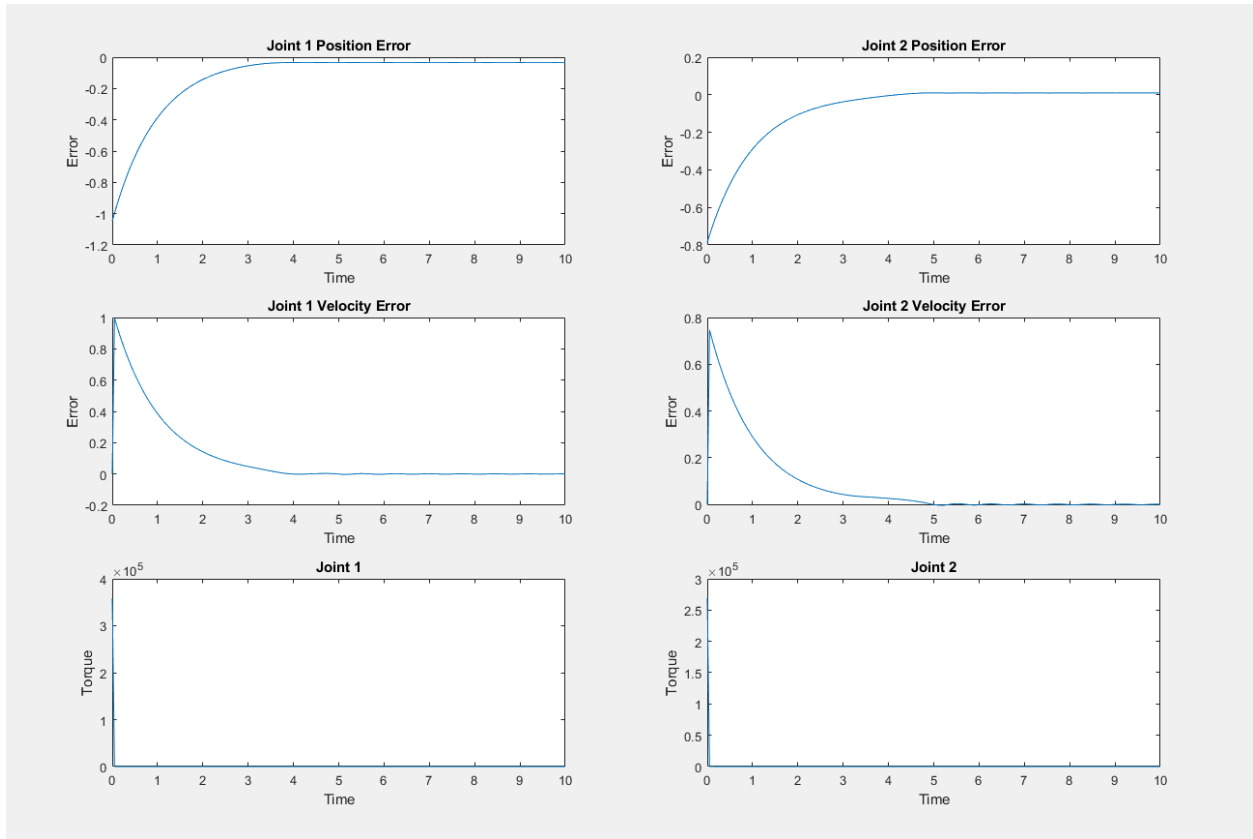Submitted By

Arnav Singh
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Case A

Plots

Joint 2 Angle
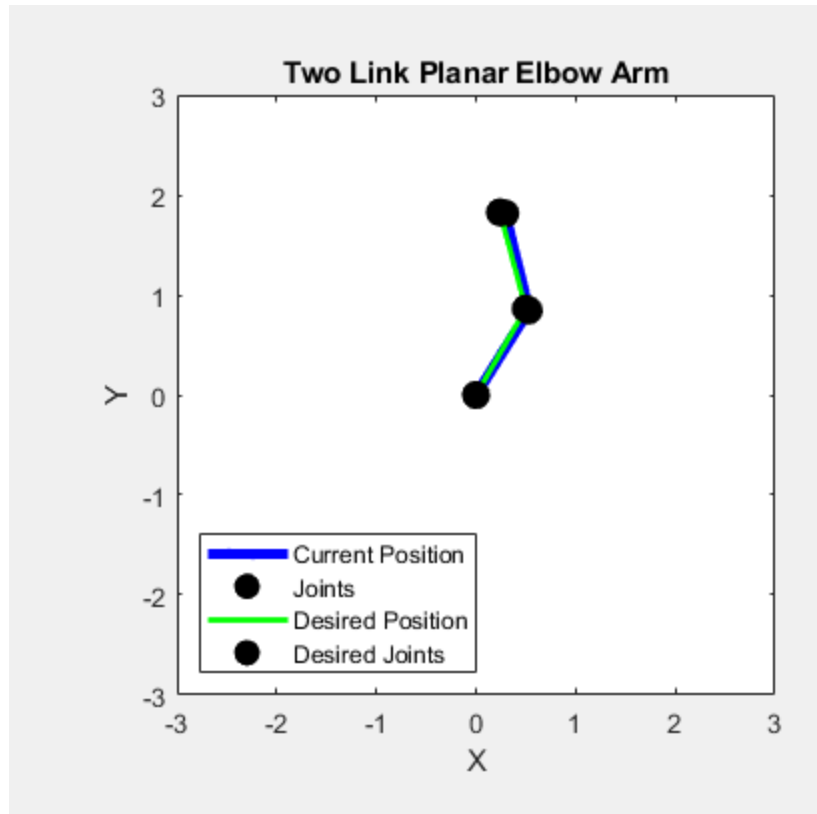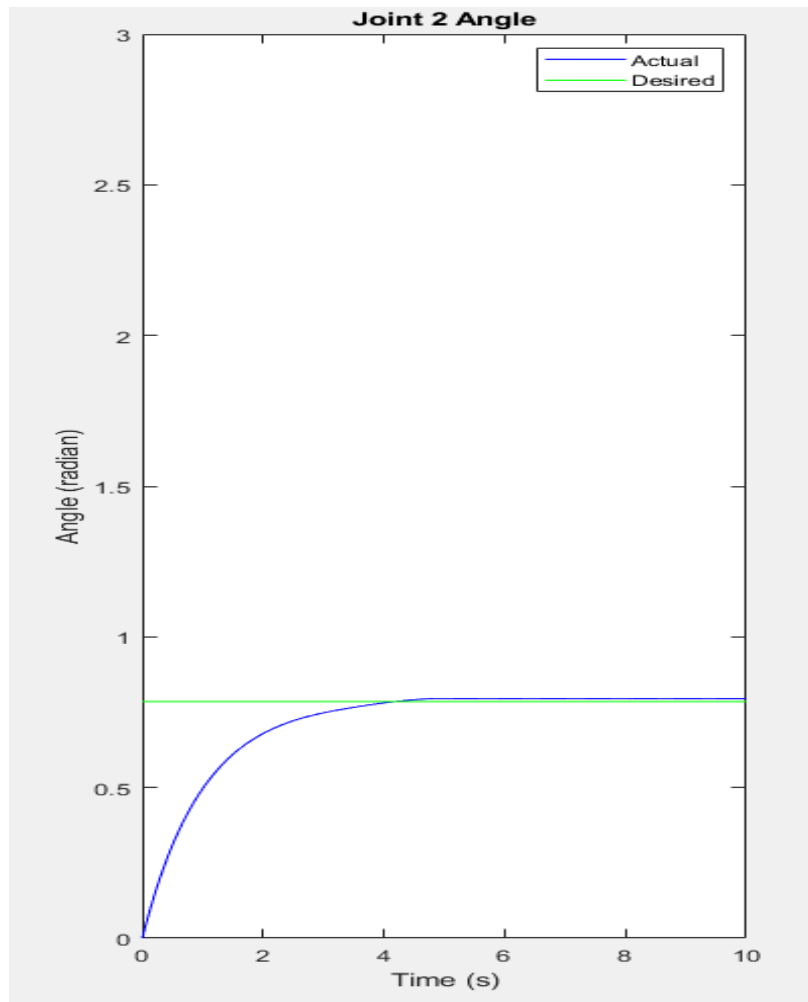
The plots showcase that at the given learning rate, the joint angles closely approach the desired final destination at ~2-3 seconds after the manipulator is turned on.

As discussed in the previous para, the manipulator gets to an equilibrium position at roughly 3-4 seconds, when the derivative of the error curves limits to 0, thanks to a high learning rate. As for the Torque curve, It is in a sense a function of the squares of the errors in the joints' pos and
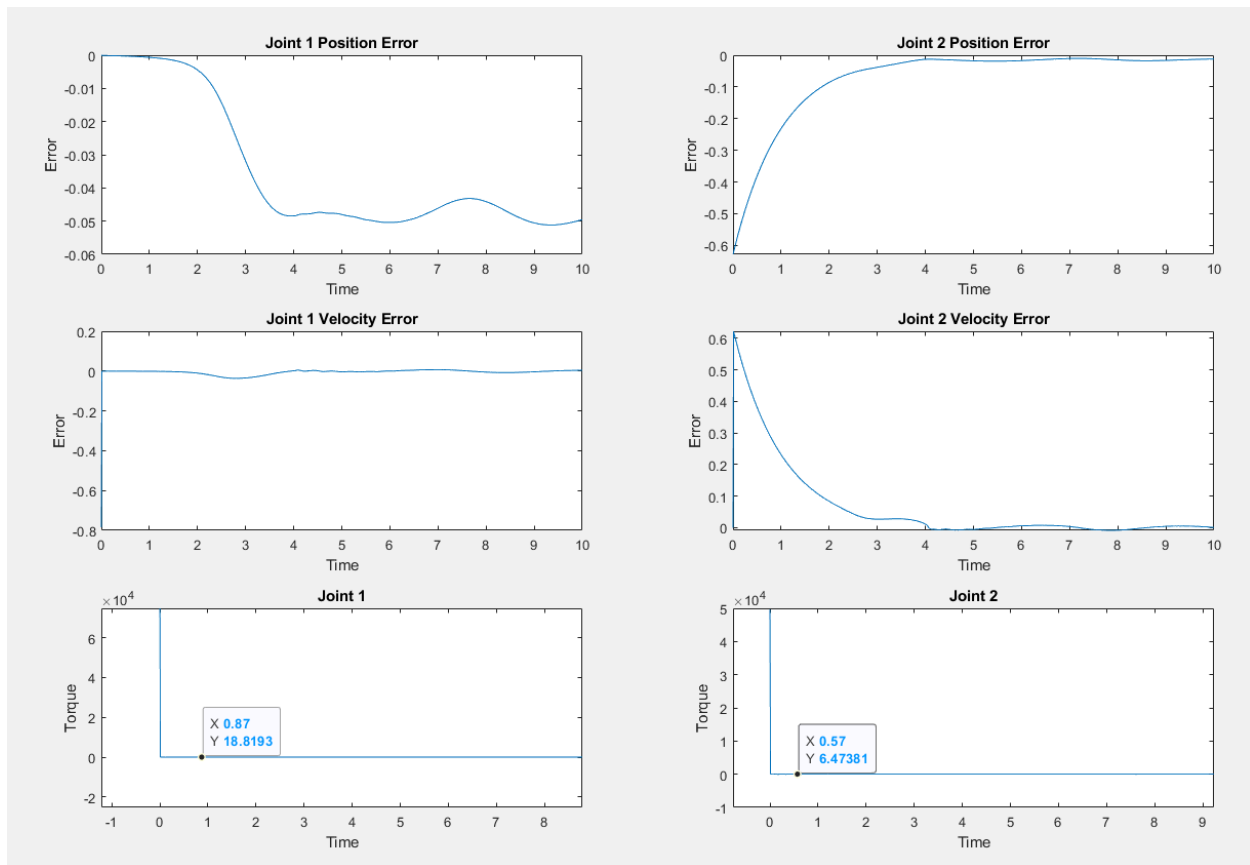
vel, but since a function of the square, the slope is a lot more "dramatic", falling significantly in first 0.1 seconds.

Case B

Plots
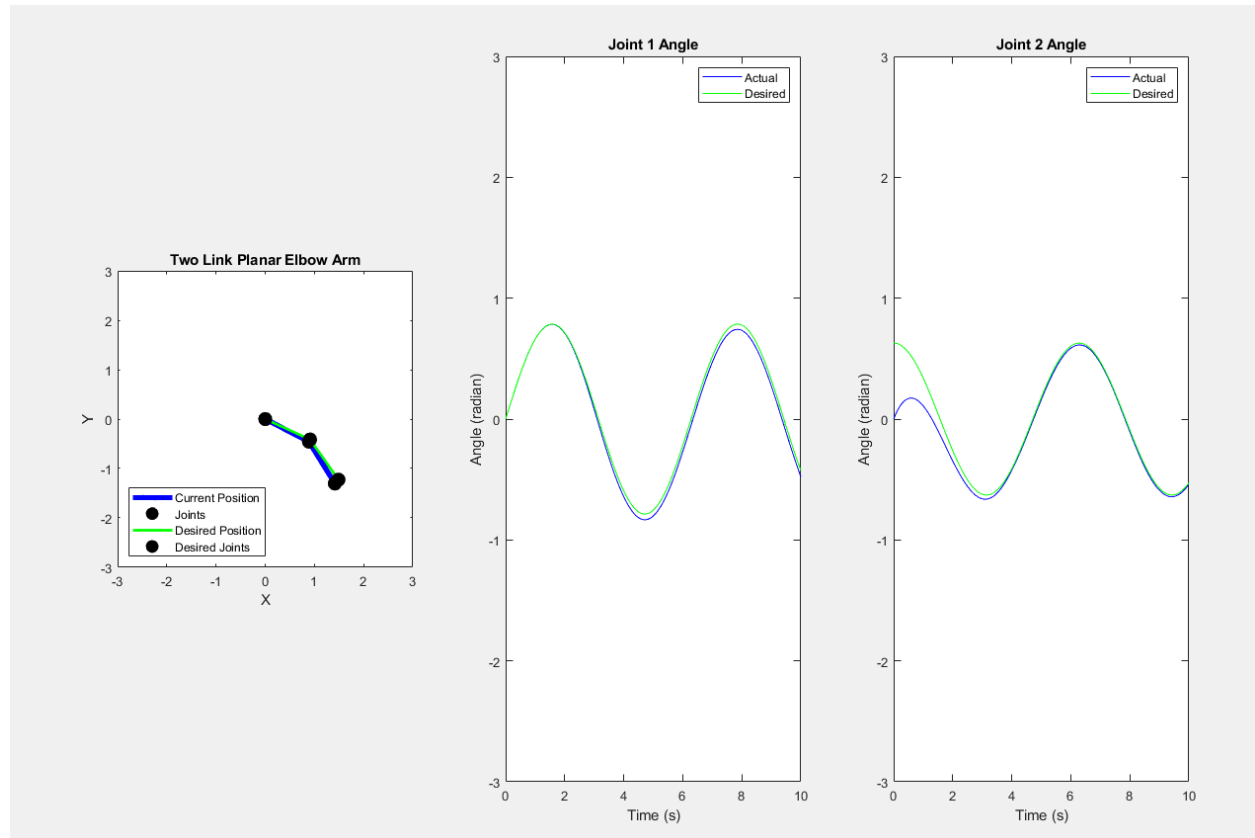
As opposed to the first part , the desired trajectory begins from the manipulator's starting pos, which obv would lead to a far lower standard deviation in the errors. The time period for both joints' oscillations is roughly 6 seconds.

Joint 1 Position Error

Joint 2 Position Error

Joint 1 Velocity Error

Joint 2 Velocity Error

Joint 1

X 0.87
Y 18.8193

Joint 2

X 0.57
Y 6.47381

Not a lot more to add here. The errors are still acceptable and the variation is smaller, as explained previously, but appears larger due to the smaller scale of the y axis. The torque tapers off the same way as in the last part but its upper bound is smaller by at least an order of 100. Attached below are the upper bounds for both joints.

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96986   49610   10^4
269154  358871  10^5
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