Sharif University of Technology Department of Electrical Engineering Assignment #2 for Robot Control 1

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Problem 1: Consider the manipulator of Assignment 1. Implement the adaptive Slotine controller for the same tracking problem. Investigate the effect of Γ in parameter convergence. (Choose Γ as diagonal). Investigate the effect of changing frequency and amplitude of q_d on parameter convergence. Choose all initial parameter estimates 50% off their true values. $\|\tau\|_{max}$ should not surpass 50Nm.

Problem 2: Consider the manipulator of Problem 1 with the actuator dynamics given by

 $\dot{\tau}=-a\tau+au$

Assume that manipulator model is known.

- a) Set u as the Slotine control law calculated in Assignment 1 and test its performance for $1 \le a \le 10$.
- b) Design a new control law by considering the effect of actuator dynamics and demonstrate its performance.

Problem 3: (optional) Implement a nonlinear observer for estimation of \dot{q} for your manipulator and demonstrate its performance by simulation. Assume that manipulator dynamics is known.

Plot all error signals. Plot q, \dot{q} versus $\hat{q}, \dot{\hat{q}}$. Note: Compute the domain of attraction and choose $\dot{\hat{q}}(0)$ appropriately (different than $\dot{q}(0)$).