AMES 282

Adaptive Control Prof. M. Krstic

Homework 4

1. Ioannou & Sun, Problem 7.5, Parts (a) and (b).
   Take all filter poles and desired closed-loop poles to be at $s = -2$.

2. Consider the plant

$$G(s) = g\frac{s-b}{(s^2+p)^2+q},$$

   where the parameters are all positive and unknown.

   (a) Design an identifier based on a gradient update law.

   (b) Design a pole placement controller for tracking a sinusoid of frequency 1 rad/sec.

   (c) Simulate the plant with the adaptive controller for

$$g = p = q = 1, \quad b = 2\,.$$

   Make sure to choose the initial conditions for the parameter estimator that give destabilizing initial control gains. (Set the adaptation gain to zero and try a few initial conditions for the parameter estimates until you find some for which the plant output is growing unbounded. Then turn on the adaptation for the subsequent simulations.) Are you achieving stabilization and tracking? Are your parameter estimates converging?

   (d) Add some measurement noise at the plant output. This will make your parameter estimator prone to drifting. Apply a deadzone in the update law. Tune its threshold to prevent the drifting.