

Department of Engineering Cybernetics
TTK4215 Adaptive Control
Assignment 7

- 4.13 Consider the equation of the motion of the mass-spring-damper system given in Problem 4.9, i.e.,

$$m\ddot{y} + \beta\dot{y} + ky = u$$

This system may be written in the form:

$$y = \rho^*(u - m\ddot{y} - \beta\dot{y})$$

where $\rho^* = \frac{1}{k}$ appears in a bilinear form with the other unknown parameters m, β . Use the adaptive law based on the bilinear parametric model to estimate ρ^*, m, β when u, y are the only signals available for measurement. Because $k > 0$, the sign of ρ^* may be assumed known. Simulate your adaptive law using the numerical values given in (d) and (e) of Problem 4.9.

- (d) Simulate your algorithms in (b) and (c) on a digital computer by assuming that $m = 20$ kg, $\beta = 0.1$ kg/sec, $k = 5$ kg/sec² and inputs u of your choice.
- (e) Repeat (d) when $m = 20$ kg for $0 \leq t \leq 20$ sec and $m = 20(2 - e^{-0.01(t-20)})$ kg for $t \geq 20$ sec.