

Intelligently tuned weights based robust H_∞ controller design for pneumatic servo actuator system with parametric uncertainty

ABSTRACT

This paper presents a new method for tuning the weighing functions to design an H_∞ controller. Based on a particle swarm optimization (PSO) algorithm the, weighting functions are tuned. The PSO algorithm is used to minimize the infinity norm of the transfer functions matrix of the nominal closed loop system to obtain the optimal parameters of the weighting function. This method is applied to a typical industrial pneumatic servo actuator controlled by a jet pipe valve. The pneumatic system nonlinearity and system parameters uncertainty are the main problems in the design of a desired controller for this plant. A linear model of the plant at certain operating point is derived and the structured (parametric) perturbations in the plant coefficients are taken into account. This method ensures an optimal robust stability and robust performance for the pneumatic servo actuator system. Simulation results are presented to verify the objectives of this method.

Keyword: Robust control; H_∞ control; Pneumatic actuator; Nonlinear system; Uncertain system; PSO