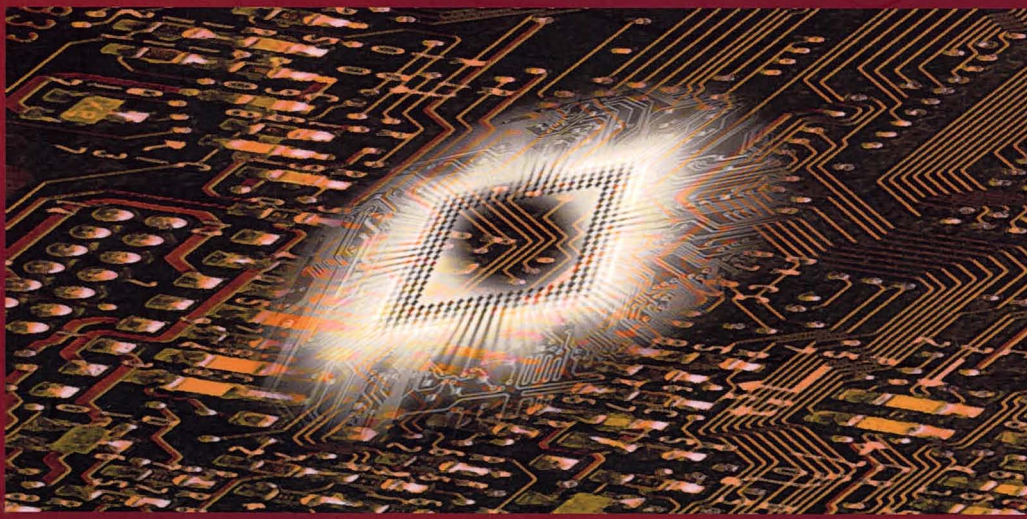
COMPUTATIONAL INTELLIGENCE IN ROBUST CONTROL

Theory and Applications



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Chapter 4

PSO-BASED ROBUST CONTROL DESIGN FOR A ROTARY INVERTED PENDULUM STABILIZATION

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Abstract

This chapter discusses the application of Particle Swarm Optimization (PSO) for robust feedback controller design of an inverted pendulum. In the proposed method, a set of robust feedback controller gain is tuned by PSO in a single-objective constrained optimization mode. The state-space model of the plant with structured parametric uncertainty is used to tune the feedback controller gains such that the closed-loop system would have maximum stability radius. Stability radius is a frequency-domain measure for system robustness to parametric perturbation. This optimization-based method is motivated by the necessity of robust controller design technique which does not involve trial-and-error approach and complicated mathematical formulation. The proposed PSO-based robust controller design is applied to stabilize a rotary inverted pendulum. The simulation results indicate that the proposed technique works effectively to obtain a robust feedback controller.