TABLE OF CONTENTS

Preface i
Acknowledgement iii
Editor iv
Table of Content v

1. Computational Intelligence in Robust Control: A Review 1
   R. Akemiawati and S. M. Raafat

2. Real-Coded Moga For Intelligent Control Of A Flexible
   Manoeuvring System 28
   S. F. Toha and M. O. Tokhi

3. Optimized LQR Controller Synthesis For 3DOF Helicopter Using
   Multi-Objective Differential Evolution (MODE) 57
   I. B. Tijani, R. Akemiawati, A. Legowo, A. G.A. Muthalif

4. PSO-Based Robust Controller Design For A Rotary Inverted
   Pendulum Stabilization 89
   M. I. Solihin, R. Akemiawati, A. Legowo

5. Design And Application Of Intelligent Fuzzy Controller On A
   Quarter Car Suspension System 113
   Md. Mahbubur Rashid

6. Intelligent Robust Control for Precise Tracking Performance of
   X-Y Positioning System 147
   S. M. Raafat and R. Akemiawati
Chapter 6

INTELLIGENT ROBUST CONTROL FOR PRECISE TRACKING PERFORMANCE OF X-Y POSITIONING SYSTEM

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Abstract

In this chapter, design and implementation of an intelligent $H_\infty$-based precision control system is presented for AC induction servo motor drive X-Y Table positioning mechanism. The system works with a robust feedback control, which is enhanced by an outer loop integral control. Model error modeling identification technique is modified using an adaptive neuro fuzzy inference system (ANFIS) to estimate the uncertainties precisely. $\nu$-gap metric is used to quantify and validate the resulted uncertainty weighting function and to ensure the largest possible stability margin. Meanwhile, the effect of crosstalk between the two axes is considered as disturbance that is treated by intelligent identified disturbance weighting functions using ANFIS. The developed controller is implemented experimentally using host target PCs. From the simulated and experimental results system’s uncertainties and disturbances are precisely located, and robust stability and performance are obtained. Moreover, the tracking and contouring