Nonlinear Dynamics and Systems Theory, **4**(3) (2004) 333–356

Robust $\mathcal{H}_\infty$ Analysis and Synthesis for Jumping Time-Delay Systems using Transformation Methods

Peng Shi[1], M.S. Mahmoud[2] and A. Ismail[3]

[1] *School of Technology, University of Glamorgan, CF37 1DL, United Kingdom*
[2] *Canadian International College (CIC), Al Tagamao Al-Khamis, New Cairo City, Egypt*
[3] *College of Engineering, UAE University , P. O. Pox 17555, Al-Ain, United Arab Emirates*

Received: September 29, 2004; Revised: October 27, 2004

Abstract: A new transformation method is developed for the $\mathcal{H}_\infty$ analysis and synthesis of a class of uncertain time-delay systems with Markovian jump parameters. In these systems, the jumping parameters are modelled as a continuous-time, discrete-state Markov process and the parametric uncertainties are assumed to be real, time-varying and norm-bounded. The time-delay factor is constant. Complete results for delay dependent stochastic stability and stabilization criteria are developed for all admissible uncertainties. Then a dynamic output feedback controller is designed such that the closed-loop stochastic stability and a prescribed $\mathcal{H}_\infty$-performance are guaranteed. All the developed results are cast in the format of linear matrix inequalities

Keywords: *Time-delay systems; Markovian jump parameters; $\mathcal{H}_\infty$ analysis; $\mathcal{H}_\infty$ synthesis; uncertain parameters.*

Mathematics Subject Classification (2000): 93B52, 93B35, 93C57.