Nonlinear Dynamics and Systems Theory, **4**(3) (2004) 317–332

INFOR MATH Publishing Group

Robust Fuzzy Linear Control of a Class of Stochastic Nonlinear Time-Delay Systems

H.R. Karimi, B. Moshiri and C. Lucas

Control & Intelligent Processing, Center of Excellence,
Department of Electrical & Computer Engineering, University of Tehran,
P.O. Box: 14395/515, Tehran, Iran

Received: September 02, 2004; Revised: October 31, 2004

Abstract: This paper presents the fuzzy linear control design method for a class of stochastic nonlinear time-delay systems with state feedback. First, the Takagi and Sugeno fuzzy linear model is employed to approximate a nonlinear system. Next, based on the fuzzy linear model, a fuzzy linear controller is developed to stabilize the nonlinear system. The control law is obtained to ensure stochastical exponential stability in the mean-square, independent of the time-delay. The sufficient conditions for the existence of such a control are proposed in terms of a certain linear matrix inequality. Finally, a simulation example is given to illustrate the applicability of the proposed design method.

Keywords: *Fuzzy linear control; linear matrix inequality; time-delay systems; stochastic systems; exponential stability.*

Mathematics Subject Classification (2000): 93C42, 93E15, 34K50.