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ROBUST STABILITY OF PERTURBED LARGE-SCALE MULTIDELAY STOCHASTIC SYSTEMS

Lirong Huang and Feiqi Deng

Department of Automatic Control Engineering
South China University of Technology, Guangzhou 510640, P.R.China
Phone: 86-020-87110630(O), Fax: 86-020-85511266
E-mail: aufqdeng@scut.edu.cn

Abstract. In this paper, robust stability of perturbed multidelay stochastic systems is investigated, criteria for the robust stability of the systems are established by using the comparison principle for stochastic differential equations and stability criteria for delay systems, based on algebraic Lyapunov-like equations and assumptions on the growth bounds of the perturbations, which basically show that time delays in the interconnections introduce no additional difficulty to the stability analysis of large-scale systems and bring with no additional condition to the result. What dominates the results in literatures is that the assumption for the isolated subsystems is just the necessary and sufficient condition for the mean-square stability and given in explicit express by eigenvalues of related matrices.
Keywords. large-scale stochastic systems; delay-independent stability; robustness; algebraic Lyapunov-like equations; delay systems

1 Introduction

As is well known that the real systems are often subject to various complicated factors such as parameter uncertainties viz. internal uncertainties, disturbances viz. external uncertainties, and time delay etc. In many cases, for the purpose of effective control design, the effect of these factors can not be ignored. As the scales of the systems increase, the analysis and control design for the systems become more and more difficult. In these cases, we are asked to present more advanced design control schemes than those we applied to the simplified models of the systems so that we can achieve the desired performance for the systems, such as stability, various robustness etc. This consideration motivates our research interest in robust stability and robust stabilization of large-scale delay stochastic systems. In the past years, this problem has received considerable attention and a lot of results have been obtained, see, i.g. [1]-[5],[7]-[10] etc. The case for general large-scale linear stochastic systems without uncertain coefficient or time delay was investigated by L. Socha &J.L.Willems in [3] etc, the case for general large-scale linear stochastic systems with time delay was investigated by Feng and Liu