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PRACTICAL STABILITY RESULTS FOR JUMP MARKOVIAN NONLINEAR HYBRID SYSTEMS

S. Sathananthan[1]

[1]Center for System Science Research(CSSR)
330, 10th Avenue N., Campus Box 139
Tennessee State University, Nashville, TN 39203, U.S.A.

ABSTRACT: In this paper, the concept of practical stability is investigated for continuous-time nonlinear systems with Markovian jumps. Using the practical stability results one can study the qualitative behaviour of the system as well as the quantitative data, such as the specific trajectory bounds and transient behavior of the system. The concept of vector Lyapunov-like function techniques coupled with differential inequalities are utilized to develop a comparison principle and, sufficient conditions are established for various types of practical stability criteria in the p-th mean of the solution processes of the system under the Markovian jump perturbations. A numerical example is given to show the fruitfulness of our results.

AMS(MOS) subject classifications : 93E15,93E20,93A15,34D20.

1 INTRODUCTION

The class of jump linear systems(JLS)was introduced by Krasovskii and Lidskii(see [8])in the early sixties. Since then we have seen an increasing interest for this class of systems. It has been applied to model various dynamical systems, such as manufacturing systems, power systems, socio-economic systems,etc. For more information regarding the application of such systems, we refer the reader to Mariton [8], Sethi and Zhang [13] and the references therein.

The jump nonlinear system is a hybrid system with state vector that has two components $x(t)$ and $\eta(t)$. Here $x(t)$ is referred to as the state and $\eta(t)$ is referred as the mode. During the operation, the system can jump from one mode to another in a random way, which makes this class of systems a stochastic one. The switching between the modes is governed by a Markov process with discrete and finite state space. When the system mode is fixed it evolves like a deterministic nonlinear system. This kind of system can be used to describe abrupt phenomena, such as component and interconnection failures. There is a vast literature available in this field(see Mariton[8], Anabtawi and Sathananthan[1,2], Boukas et.al[3], and references therein).

In practice, for a dynamic system, one is frequently interested not only in the qualitative type of information obtainable from the Lyapunov stability, but