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DELAY-DEPENDENT EXPONENTIAL STABILITY OF UNCERTAIN STOCHASTIC SYSTEMS WITH DISCRETE AND DISTRIBUTED DELAYS

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Abstract. In this paper, the problem of exponential stability in mean square for uncertain stochastic systems with discrete and distributed delays is investigated. A delay-dependent sufficient conditions for robust stability is formulated in terms of linear matrix inequalities (LMIs) by using a combination of integral inequality technique and descriptor model transformation approach. A numerical example is given to indicate the effectiveness of the developed techniques.

Keywords. stochastic systems; distributed delay; discrete delay; exponential stability; linear matrix inequality(LMIs)

AMS subject classification:T93E15,34K50,34K20

1 Introduction

The stability analysis of time-delay systems can be divided into two categories, that is, delay-independent stability criteria and delay-dependent stability criteria. Delay-dependent stability conditions are less conservative than delay-independent stability conditions for small delays[1-4]. The delay-dependent robust stability and control problems of time-delay systems have attracted lots of attentions over decades. Delay-dependent stability conditions via Lyapunov functionals are often based on a fixed model transformation technique[1]. The descriptor system transformation method is first introduced in [2]. The model transformation methods are classified into four basic types in [3], and among these methods the descriptor system transformation method is the least conservative one[3]. It is well known that stochastic perturbations are unavoidable in many practical systems, the research on stochastic systems becomes more and more important. On the other hand, distributed-delay are often encountered in various practical systems[12][13]. The descriptor system approach has been extended to the uncertain stochastic systems with multiple discrete delays in [4]. However, the