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ROBUST OUTPUT FEEDBACK STABILIZATION OF UNCERTAIN DISCRETE TIME-DELAY STOCHASTIC SYSTEMS WITH MULTIPLICATIVE NOISE

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Abstract. This paper considers the problem of robust output feedback controller design for uncertain discrete time-delay stochastic systems with multiplicative noise. The parameter uncertainty is assumed to be time-varying norm-bounded. Attention is focused on the design of a full-order dynamic output feedback controller such that the resulting closed-loop system is exponentially mean square stable for all

admissible uncertainties and time delays. A linear matrix inequality (LMI) approach is developed to solve this problem. The desired output feedback controller can be constructed by solving a certain LMI. Finally, an example is provided to demonstrate the effectiveness of the proposed approach.

Keywords. Discrete systems, linear matrix inequality, output feedback, robust stabilization, stochastic systems with multiplicative noise, time-delay systems, uncertain systems.

1 Introduction

Time delays are encountered in various physical and engineering systems, such as microwave oscillators, aircraft stabilization, electronics, hydraulic, chemical systems, and so on [5]. Since time delays in a dynamic system often result in instability and performance degradation, the study of delay systems has received considerable attention during the past years [3, 6, 18, 22]. When parameter uncertainties appear in a time-delay system, the problem of robust stabilization has been investigated by many researchers. For example, under the assumption that all the state variables are directly available, a memoryless state feedback, which guarantees the asymptotic stability of the closed-loop system, was designed via linear matrix inequality (LMI) approach and Riccati equation approach for uncertain systems with time-invariant delays in [8] and [17], respectively. A simple stabilization method was given in [7]. The robust stabilization results for uncertain systems with time-varying