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STABILITY AND STABILIZATION OF SWITCHED LINEAR TIME-DELAY SYSTEMS UNDER ARBITRARY SWITCHING

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Abstract. The problems of stability analysis and stabilization synthesis of switched linear systems with time delay are studied. In continuous-time domain, a linear-matrix-inequalities(LMI)-based condition is presented which ensure the existence of a common quadratic Lyapunov function for switched systems with time delay. Based on the stability analysis result, stabilization synthesis via state feedback and static output feedback are investigated,respectively. Sufficient conditions in LMI form are proposed. In discrete-time domain, similar results for stability analysis and stabilization synthesis are presented in LMI form. All the results are extended to the multiple time delays case directly. Numerical examples are given to illustrate the utility of the obtained results.

Keywords. Switched liner systems, Time delay, Stability, Stabilization, Linear matrix inequalities, Hybrid systems.

AMS (MOS) subject classification: 93C30,93D05,93D15.

1 Introduction

In recent years, the study of switched systems has received growing attention in control theory and its application(See [12] and the references therein). Switched systems are an important class of hybrid dynamic systems consisting of a family of linear time-invariant subsystems and a switching law specifying the switching between them. A survey of basic problems in stability and design of switched systems has been proposed in [4].

Stability analysis and stabilization synthesis of switched system under arbitrary switching law are some of these basic problems.

As to discrete-time switched linear systems, the stability analysis and control synthesis under arbitrary switching sequences was studied in [3]. The approach looks at the existence of a switched quadratic Lyapunov function to check asymptotic stability of the switched systems under consideration. Two different linear matrix inequality-based conditions were given to check the existence of such a Lyapunov function. Then the design of static output feedback controller for each subsystems such that the closed-loop switched