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STABILITY OF A CLASS OF SWITCHED LINEAR SYSTEMS WITH UNCERTAINTIES AND AVERAGE DWELL TIME SWITCHING

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Abstract. *In this paper, the problems of stability for continuous and discrete-time polytopic uncertain switched linear systems with average dwell time switching are investigated. Firstly, the exponential stability result of general continuous-time switched systems using a discontinuous piecewise Lyapunov function approach is revisited, and the discrete-time counterpart is then presented by the following similar lines in continuous-time case. Based on these and by further constructing a discontinuous piecewise parameter-dependent Lyapunov function, the exponential stability criteria for both uncertain continuous and discrete-time polytopic uncertain switched linear systems with average dwell time switching are derived and formulated in terms of a set of linear matrix inequalities, respectively. Furthermore, the minimal average dwell time is obtained from the corresponding stability conditions for a given decay degree, and the admissible switching signals are consequently found such that the underlying system is robustly exponentially stable. Numerical examples are included to demonstrate the effectiveness and less conservativeness of the developed theoretical results.*

Keywords: Average dwell time, Exponential stability, Linear matrix inequalities, Switched linear systems

1. **Introduction.** Within the past decade, the switched systems have received considerable attention from many scholars in the area of hybrid dynamic systems. A hybrid system is meant a dynamic system comprising continuous and discrete dynamics, which are described by differential (or difference) equations and finite automaton (or other discrete event system), respectively. Switched systems, which often ignore the details of corresponding discrete dynamics, assume that the switching signals belong to a certain class and be determined either by time or by system state, or both, or other supervisory decision procedures [5,16,19]. The studies on switched systems are motivated by the fact that many physical systems and man-made systems are often modeled based on such a framework exhibiting switching features, see for example, [9,12,22]. The applications using switched systems theory or switched control scheme include wind turbine regulation [15], stirred tank reactor [8], VSTOL aircraft with several system modes [20], etc. For more details on the theory of switched systems, we refer readers to [7,16,24] and the references therein.