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DYNAMIC OUTPUT FEEDBACK H_∞ CONTROL FOR A CLASS OF SWITCHED LINEAR SYSTEMS WITH EXPONENTIAL UNCERTAINTY

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Abstract. *The dynamic output feedback robust H-infinity control problem is investigated for switched linear systems with exponential uncertainties in this note. Aiming at the effect of exponential uncertainties, we firstly treats the uncertain exponential terms as polynomial uncertainty with an additive norm bounded uncertainty based on Taylor series approximation and convex polytopic technique. Secondly, a switching strategy and dynamic output feedback controllers are designed to guarantee the H-infinity performance of whole switched system by using switched Lyapunov function technology and LMI approach. Finally, a numerical example is presented to illustrate our results.*
Keywords: Switched systems, Exponential uncertainty, Dynamic output feedback

1. **Introduction.** In order to design a computer based control for switched linear system $\dot{x}(t) = M_\sigma x(t) + N_\sigma u(t)$, Hetel et al. [1,2] show that sampled model of linear system is derived and discrete time control methods are applied. Under the case that sampling and actuation are periodic and synchronous with the periodicity, the model is given by $x(k+1) = A_\sigma(\rho(k))x(k) + B_\sigma(\rho(k))u(k)$, where $A_\sigma(\rho(\mathrm{k})) = e^{M_\sigma \rho(k)}$, $B_\sigma(\rho(k)) = \left(\int_0^{\rho(k)} e^{M_\sigma s} ds\right) N_\sigma$. $\rho(k)$ is sampling periodicity; k denotes sampling step. It is well know that, in many control problems, the sampling periodicity of system is often affected by some delays. Furthermore, these delays are often unknown, time-varying and bounded [3]. Therefore, exponential uncertainty is inevitable in the process of modeling system. Hence, the control synthesis problem of switched linear system subject to exponential uncertainties is a very important and challenging problem. Generally speaking, exponential uncertainty is represented as $e^{M\rho}$ or $\int_0^\rho e^{M\tau} d\tau$ that depends on a possibly unknown, time-varying and bounded parameter ρ. In the literature [4], exponential uncertainty is treated by assuming estimable delay uncertainties. Balluchi et al. [5] treats the uncertain exponential terms as bounded uncertainties. Hetel et al. [1,2] introduces exponential uncertainties to switched linear system and treats the uncertain exponential terms as polytopic uncertainties. Under the arbitrary switching rule, Hetel, et al. design state feedback controller to stabilize a class of exponentially uncertain switched linear systems in the case where the switching and sampling are synchronous [1]. And then the obtained results in the literature [1] are extended to cope with network controlled systems [2]. However the above methods have considerable conservatism to deal with systems with exponentially uncertainty. In order to reduce conservatism by these methods and improve physical implementation of systems, motivated by [1,2], we have discussed the state-feedback stabilization and H_∞