Stability Analysis and Synthesis of Systems Subject to Norm Bounded, Bounded Rate Uncertainties.

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Abstract: In this paper we consider a linear system subject to norm bounded, bounded rate time-varying uncertainties. Necessary and sufficient conditions for quadratic stability and stabilizability of such class of uncertain systems are well known in the literature. Quadratic stability guarantees exponential stability in presence of arbitrary time-varying uncertainties; therefore it becomes a conservative approach when, as it is the case considered in this paper, the uncertainties are slowly-varying in time. The first contribution of this paper is a sufficient condition for the exponential stability of the zero input system; such condition, which takes into account the bound on the rate of variation of the uncertainties, results to be a less conservative analysis tool than the quadratic stability approach. Then the analysis result is used to provide an algorithm for the synthesis of a controller guaranteeing closed loop stability of the uncertain forced system.

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