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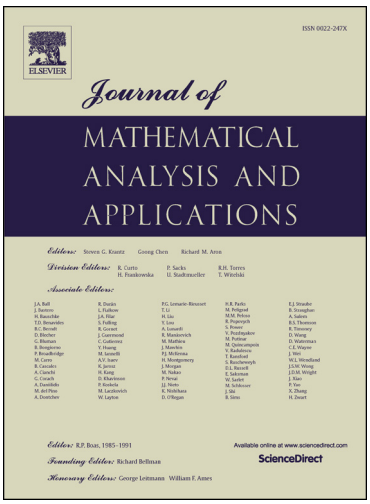


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# Singular Value Conditions for Stability of Dynamic Switched Systems

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**Abstract**

In this paper, the stability of a certain class of time-varying systems evolving over nonuniformly spaced discrete domains is analyzed. Switched systems, used here in the context of dynamic equations over time scale domains, arise naturally in applications when a continuous time system is discretized via a sample-and-hold method with multiple sample rates. The stability of switched systems is typically deduced by appealing to certain interrelated properties of the subsystems (such as pairwise commutativity [24], simultaneous diagonalization [7], simultaneous triangularizability [8], or other Lie algebraic conditions [1]) which imply the existence of a common quadratic Lyapunov function. A novel approach is used here to determine the existence of quadratic Lyapunov functions which does not rely on how the subsystems interact with each other. This new method instead examines the role they each play in the aggregate system by way of singular value conditions.

Results implying switch system stability and instability are developed under the two primary methods of examining such systems: how the system behaves during arbitrary switching and how it behaves under the influence of a particular switching signal. Several examples illuminating the results are provided

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