Stability and $\mathcal{L}_2$ Gain Analysis for a Class of Switched Symmetric Systems

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Abstract: In this paper, we study stability and $\mathcal{L}_2$ gain properties for a class of switched systems which are composed of a finite number of linear time-invariant symmetric subsystems. We focus our attention mainly on discrete-time systems. When all subsystems are Schur stable, we show that the switched system is exponentially stable under arbitrary switching. Furthermore, when all subsystems are Schur stable and have $\mathcal{L}_2$ gains smaller than a positive scalar γ, we show that the switched system is exponentially stable and has an $\mathcal{L}_2$ gain smaller than the same γ under arbitrary switching. The key idea for both stability and $\mathcal{L}_2$ gain analysis in this paper is to establish a general Lyapunov function for all subsystems in the switched system.

Keywords: *Switched symmetric system; exponential stability; $\mathcal{L}_2$ gain; arbitrary switching; general Lyapunov function; linear matrix inequality (LMI).*

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