

Stability of interconnected impulsive systems with and without time-delays using Lyapunov methods

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We consider large-scale networks of impulsive systems with and without time-delays and investigate such systems in view of input-to-state stability (ISS). We provide conditions on the size of the time intervals between impulses (dwell-time condition) and on the interconnection structure (small-gain condition) that guarantee ISS of the overall system, where Lyapunov and Lyapunov-Razumikhin functions for the subsystems are used. Furthermore we introduce the Lyapunov-Krasovskii methodology for single impulsive systems with time-delays as another tool to check whether a system has the ISS property. This methodology is also used for large-scale networks to verify the ISS property under dwell-time and small-gain conditions. The small-gain condition allows us to construct a Lyapunov function and the corresponding gain for the whole system without time-delays and a Lyapunov-Razumikhin function or a Lyapunov-Krasovskii functional and the corresponding gains for the whole system with time-delays.

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