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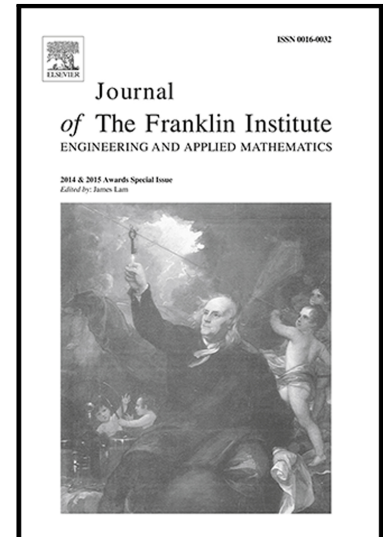
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## Asynchronous switching for switched nonlinear input delay systems with unstable subsystems<sup>☆</sup>

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### Abstract

We study the input-to-state stability (ISS) of switched nonlinear input delay systems under asynchronous switching. Our results apply to cases where some subsystems of the switched systems are not necessarily stable under the influence of input delay. By making a compromise among the matched-stable period, the matched-unstable period, and the unmatched period and allowing the increase of the Lyapunov-Krasovskii functional (LKF) on all the switching times, the extended stability criteria for switched delay systems in generally nonlinear setting are derived first. Then, we focus on switched nonlinear input delay systems where the presence of the input delay leads to the instability of some subsystems of it. By explicitly constructing input-to-state stable LKF, the sufficient conditions for ISS of switched nonlinear input delay systems under asynchronous switching are presented. Finally, two examples are given to illustrate the effectiveness of the proposed theory.

**Keywords:** Switched nonlinear systems, nonlinear delay systems, input-to-state stability (ISS), asynchronous switching

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