

Floquet Theory and Exponential Stabilization of Impulsive Second-Order Delay Differential Equations

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Abstract

We present a new approach to the exponential stabilization of impulsive second-order delay differential equations based on a finite-dimensional Floquet theory. The proposed framework preserves equality between the order of the equation and the dimension of the associated monodromy matrix, making it possible to extend several classical results of Floquet theory for ordinary differential equations to impulsive delay equations. We establish new criteria for exponential stability and instability and demonstrate how suitable choices of periodic coefficients, delays, and impulsive actions can stabilize systems that are unstable within the standard nonimpulsive setting. The approach also provides explicit representations of solutions and constructive algorithms for stability analysis.

References

- [1] Martin Bohner, Alexander Domoshnitsky, Sergey Malev, Tsahi Shavit and Cemil Tunc *Exponential Stability of Impulsive Second-Order Delay Differential Equations through Floquet Theory* Preprint (2026).