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Linear programming based Lyapunov function computation for differential inclusions. (English) [Zbl 1235.93222](#)

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Summary: We present a numerical algorithm for computing Lyapunov functions for a class of strongly asymptotically stable nonlinear differential inclusions which includes spatially switched systems and systems with uncertain parameters. The method relies on techniques from nonsmooth analysis and linear programming and constructs a piecewise affine Lyapunov function. We provide necessary background material from nonsmooth analysis and a thorough analysis of the method which in particular shows that whenever a Lyapunov function exists then the algorithm is in principle able to compute it. Two numerical examples illustrate our method.

Reviewer: [Reviewer \(Berlin\)](#)

MSC:

- [93D30](#) Lyapunov and storage functions
- [93D20](#) Asymptotic stability in control theory
- [34D20](#) Stability of solutions to ordinary differential equations
- [34A60](#) Ordinary differential inclusions
- [34A36](#) Discontinuous ordinary differential equations

Cited in **18** Documents

Keywords:

Lyapunov functions; stability of nonlinear systems; numerical construction of Lyapunov functions; invariance principle; differential inclusions; switched systems; piecewise affine functions

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