

Consistent Lyapunov Methodology: Non-Differentiable Non-Linear Systems

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This invited paper is dedicated to late Professor Wolfgang Hahn and to late Professor Jose P. LaSalle, who contributed fundamentally to the stability theory and supported author's early research on stability domains.

Abstract: The consistent Lyapunov methodology enables us, after its single application, to solve completely the asymptotic (or, exponential) stability problem, to construct a system Lyapunov function and to determine accurately the domain of asymptotic stability. This is achieved in the paper for invariant sets of non-differentiable time-varying non-linear systems. The results (proved in details) present the necessary and sufficient conditions for: asymptotic stability, for a determination of a system Lyapunov function and for a set to be the asymptotic stability domain. They are not expressed in terms of existence of a system Lyapunov function. They determine well the procedure how to resolve all the relevant problems.

Keywords: *Asymptotic stability domains; Lyapunov method; Lyapunov functions; non-linear systems; sets; uniform asymptotic stability.*

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