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Finite-Time Stability of Nonlinear Systems with Delays

Over the past decades, extensive research within the control community has concentrated on finite-time stability (FTS) of dynamical systems. Unlike asymptotic stability, which ensures the convergence of a system to a Lyapunov stable equilibrium state over an infinite time horizon, FTS guarantees convergence within a finite timeframe. The faster convergence and enhanced robustness of FTS make it critical in various engineering domains, including proportional navigation guidance, robotic control, and spacecraft attitude tracking. However, analyzing the stability of delayed systems presents significant challenges. These challenges primarily arise from the lack of effective tools to manage delays within a finite-time horizon and the complexities in estimating the settling time when delays are present. Motivated by these challenges, this talk will delve into finite-time stability issues in different types of delayed systems, with a particular focus on two cases: (i) systems with state-dependent delays and (ii) systems with time-varying delays. Several Lyapunov-based sufficient conditions for the FTS of delayed systems will be provided, along with the corresponding estimations of settling time.

Ort: Mathematik Ost, 40.01.003	Zeit: Freitag, 19.07.2024 14:15

Zu diesem Vortrag laden wir Sie herzlich ein.

gez. Sergey Dashkovskiy