Mathematics of Control, Signals, and Systems (2022) 34:215–216
https://doi.org/10.1007/s00498-021-00302-1

EDITORIAL

Input-to-state stability for infinite-dimensional systems

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Published online: 14 August 2021

The notion of input-to-state stability (ISS) was introduced by E. D. Sontag for nonlinear finite-dimensional systems in the late 1980s. ISS unified the Lyapunov and input–output stability theories and influenced the constructive nonlinear control theory for finite-dimensional systems. It has played a major role in the robust stabilization of nonlinear systems, design of robust (in terms of errors in measurements and/or quantization) nonlinear observers, nonlinear detectability, stability of nonlinear large-scale networks, nonlinear sample data and event-triggered control, stability of networked control systems, supervisory adaptive control, and many other areas.

An infinite-dimensional system is a system which can be formulated mathematically as an equation on an infinite-dimensional vector space. In particular, partial differential equations, partial differential algebraic equations, stochastic partial differential equations, delay equations, integro-differential equations and combinations thereof are in this class. Thus, a wide variety of phenomena such as heat transfer, acoustics, electrostatics, electrodynamics, fluid dynamics, population dynamics, elasticity, or quantum mechanics can be formalized in terms of infinite-dimensional systems.

This topical collection presents recent progress in input-to-state stability for infinite-dimensional systems and provides an overview of various techniques employed in

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this field. These encompass methods from nonlinear control, operator and semigroup theory, Lyapunov theory, nonlinear networks, and partial differential equations (PDEs).

Funding Open Access funding enabled and organized by Projekt DEAL.