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Analysis and control of deterministic and stochastic dynamical systems with time delay. (English) [Zbl 1248.93004]

Summary: This chapter presents a comprehensive summary of recent advances in the analysis and control of time-delayed deterministic and stochastic systems. The studies of numerical methods for time-delayed systems in the mathematical literature are reviewed including a discussion of the abstract Cauchy problem for delayed differential equations. Several numerical methods for computing the response of and designing controls for time-delayed systems are presented. These include semidiscretization, continuous time approximation, lowpass filter based continuous time approximation, and continuous time approximation with Chebyshev nodes. A large number of examples are presented including optimal feedback gain design, stability domains in the feedback gain space of linear time-invariant and periodic systems, optimal control, Lyapunov stability, supervisory control of systems with uncertain time delay, moment stability, Fokker-Planck-Kolmogorov equation and reliability formulation of stochastic systems.

For the entire collection see [Zbl 1229.93002].

MSC:
93-02 Research exposition (monographs, survey articles) pertaining to systems and control theory
93C15 Control/observation systems governed by ordinary differential equations
60H10 Stochastic ordinary differential equations (aspects of stochastic analysis)
93B40 Computational methods in systems theory (MSC2010)
93E25 Computational methods in stochastic control (MSC2010)
93D15 Stabilization of systems by feedback

Keywords:
time-delayed deterministic systems; time-delayed stochastic systems; numerical methods; semidiscretization; continuous time approximation; lowpass filter based continuous time approximation; continuous time approximation with Chebyshev nodes

Full Text: DOI