

Nonlinear Dynamical Systems And Control For Large-scale Hybrid And Network Systems


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Summary : Free nonlinear dynamical systems and control for large-scale hybrid and network systems pdf download - in this dissertation we present several main research thrusts involving thermodynamic stabilization via energy dissipating hybrid controllers and nonlinear control of network systems specifically a novel class of fixed-order energy-based hybrid controllers is presented as a means for achieving enhanced energy dissipation in euler-lagrange lossless and dissipative dynamical systems these dynamic controllers combine a logical switching architecture with continuous dynamics to guarantee that the system plant energy is strictly decreasing across switching in addition we construct hybrid dynamic controllers that guarantee the closed-loop system is consistent with basic thermodynamic principles in particular the existence of an entropy function for the closed-loop system is established that satisfies a hybrid clausius-type inequality special cases of energy-based hybrid controllers involving state-dependent switching are described and the framework is applied to aerospace system models the overall framework demonstrates that energy-based hybrid resetting controllers provide an extremely efficient mechanism for dissipating energy in nonlinear dynamical systems next we present finite-time coordination controllers for multiagent network systems recent technological advances in communications and computation have spurred a broad interest in autonomous adaptable vehicle formations distributed decision-making for coordination of networks of dynamic agents addresses a broad area of applications including cooperative control of unmanned air vehicles microsatellite clusters mobile robotics and congestion control in communication networks in this dissertation we focus on finite-time consensus protocols for networks of dynamic agents with undirected information flow the proposed controller architectures are predicated on the recently developed notion of system thermodynamics resulting in thermodynamically consistent continuous controller architectures involving the exchange of information between agents that guarantee that the closed-loop dynamical network is consistent with basic thermodynamic principles

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