Upcoming

Special Issue Proposal on "Prescribed-Time Control: The First Decade and Beyond"

Since the seminal work by Song et al. on prescribed-time stabilization of nonlinear systems published in 2017, nearly a decade has passed. This theoretical paradigm has since evolved into a flourishing frontier field within automatic control, whose research output and theoretical depth are now on par with the long-established classical subfields of the discipline. Distinct from conventional control strategies, prescribed-time control (PTC) uniquely permits users to arbitrarily predefine the convergence time of a dynamical system, irrespective of the system's initial conditions. This remarkable property marks a fundamental breakthrough relative to classical asymptotic, finite-time, and fixed-time stabilization frameworks.

Despite its rapid growth and significant theoretical achievements over the past decade, the field of PTC faces critical challenges that hinder its widespread deployment in real-world cybernetic systems. These include: Robustness to Noise and Perturbations: Most existing PTC designs involve controller gains that grow unbounded as time approaches the prescribed limit, making them highly sensitive to measurement noise and unmodeled dynamics. Scalability and Complexity: Designing PTC for large-scale, interconnected, or high-order nonlinear systems remains mathematically complex, often leading to control laws that are difficult to implement. Bridging Theory and Application: There is a notable gap between sophisticated PTC theory and its practical adoption in domains like connected autonomous systems, cyber-physical systems, and human-robot interaction.

The convergence of PTC with advanced methodologies such as learning-based control, event-triggered mechanisms, and distributed optimization presents a powerful new paradigm to address these limitations. For example, in the context of multi-agent systems, PTC can prescribe the exact consensus time for a fleet of UAVs, independent of their starting positions. In safety-critical control, it can ensure a robot's state converges to a safe set within a hard, pre-defined time limit. Accordingly, this special issue aims to celebrate a decade of foundational contributions while charting a course for the next generation of robust, practical, and intelligent prescribed-time control for complex cybernetic systems.

Guest Editors

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