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Special Issue Reprint

Adaptive and Nonlinear Control of Robotics

Edited by: Aman Behal

This Reprint of a Special Issue on “Adaptive and Nonlinear Control of Robotics” brings together nine original research contributions exploring state-of-the-art control strategies for robotic systems operating under nonlinear dynamics, uncertain parameters, reconfiguration, or complex physical constraints. The platforms considered in this work—including cable-driven parallel robots, underactuated manipulators, soft continuum arms, industrial manipulators, teleoperation systems, and bio-inspired swimmers—reflect the diversity of modern robotics and the need for robust, adaptive, and energy-efficient control beyond classical linear paradigms. Collectively, these contributions highlight the maturation of nonlinear and adaptive control from theoretical research into practical, application-ready methodologies. They illustrate how modern control design—through parameter estimation, optimization, sliding-mode control, Lyapunov methods, and metaheuristic tuning—can address real-world challenges in reconfigurable robots, underactuated systems, soft manipulators, energy-efficient motion, human–robot interaction, teleoperation under delays, and dynamic task execution. At the same time, they underscore ongoing challenges: achieving rapid adaptation without compromising stability, balancing precision with transient response, ensuring safe human–robot interaction, reducing computational load for real-time control, and integrating control with higher-level planning and perception.

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