Special Issue

Adaptive Fault-Tolerant Control Strategies for Uncertain Nonlinear Systems: Mitigating Actuator Faults

Message from the Guest Editors

With the rapid technological advancements in modern engineering control, the demands for performance and reliability have been escalating in complex systems such as aerospace vehicles, robotic systems, and industrial process controls. These systems often exhibit high degrees of nonlinearity and inevitably encounter various uncertainties (e.g., variations in model parameters and external disturbances) during their operations. More critically, actuators, as the direct control elements of system outputs, frequently experience failures, which have emerged as one of the pivotal factors impacting the stable operation and safety of these systems. Distinct from traditional uncertain nonlinear systems, when considering the diverse actuator failure models, it remains a formidable challenge to automatically adjust controller parameters or structures based on real-time system states during operation in order to counter the uncertainties in system parameters and external disturbances and to ensure that the system maintains a certain level of performance even in the face of failures.

Guest Editors

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Deadline for manuscript submissions

31 August 2025

Actuators

an Open Access Journal by MDPI

Impact Factor 2.3
CiteScore 4.3

mdpi.com/si/221046

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About the Journal

Message from the Editorial Board

We are just entering the Next Wave of Technology (NWT) where actuators will play the same role as the computer chip did for computers/social media approximately four decades ago. Just in the U.S., production of $1 trillion year of electromechanical systems (vehicles, orthotics, manufacturing cells, freight trains, aircraft, etc.) will be impacted by the NWT, all driven by actuators. Five key trends can be found for the future perspectives: “Performance to Reliability”, “Hard to Soft”, “Macro to Nano”, “Homo to Hetero” and “Single to Multi functional”. We invite papers that primarily impact these economic sectors; those illustrating basic scientific principles are also welcome.

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