Series Editor: Quan Min Zhu

Control of Underactuated Mechanical Systems Stabilization and Limit Cycle Generation

Afef Hfaiedh and Ahmed Chemori



ISBN: 9780443240201 VOLUME: EDITION: 1 PUB DATE: June 2025 LIST PRICE: £129.99 / \$160.00 / €151.99 FORMAT: Paperback PAGES: c. 216 PRIMARY AUDIENCE: Engineers in

mechanics, mechatronics, control, and robotics, Researchers and teachers (from academia) in control engineering, mechanics, mechatronics, and robotics, PhD and Master Students, Graduate and undergraduate students from various engineering fields, including, but not limited to, robotics, control engineering, and mechatronics

Thema Value: Mechanical engineering, Industrial chemistry & manufacturing technologies, Materials science

Control of Underactuated Mechanical Systems

Stabilisation and Limit Cycle Generation

Afef Hfaiedh, University of Tunis El Manar, National Engineering School of Tunis, LR16ES07, RISC Lab, Tunis, Tunisia. and **Ahmed Chemori**, LIRMM, University of Montpellier, CNRS, Montpellier, France.

Updates on the modeling and stabilization/tracking control of underactuated mechanical systems with real-time experiments on a real UMS subject

DESCRIPTION

Control of Underactuated Mechanical Systems: Stabilization and Limit Cycle Generation

clearly explains stabilization and limit cycle generation in underactuated mechanical systems (UMS), addressing control design challenges and demonstrating concepts through real-time experiments.

The book begins with advancements in UMS, introducing key concepts such as stabilization and limit

cycle generation, supported by literature examples. It then focuses on the inertia wheel inverted

pendulum, presenting a detailed discussion. The second part tackles stabilization, offering various

control solutions validated through numerical simulations and real-time experiments. The final

part addresses stable limit cycle generation, detailing three proposed control solutions and their

validation through different case studies.

This book is a valuable resource for PhD and Master students, engineers, researchers, and educators.

It provides guidance in robotics and automatic control, utilizing a simplified methodology for

controlling underactuated mechanical systems.

KEY FEATURES

• Addresses stabilization and stable limit cycle generation in underactuated mechanical systems

amid perturbations

• Explores the design, development, and validation of robust control solutions

• Illustrates concepts through case studies

• Validates control solutions with numerical simulations and real-time experiments

*Prices are subject to change without notice. All Rights Reserved.

