Feedback Control of Dynamic Bipedal Robot Locomotion

Eric R. Westervelt

The Ohio State University, Columbus, USA

Christine Chevallereau

IRCCyN, Nantes Atlantic University, CNRS, France

Benjamin Morris

University of Michigan, Ann Arbor, USA

Jessy W. Grizzle

University of Michigan, Ann Arbor, USA

Jun Ho Choi

Korea Institute of Science and Technology, Seoul, South Korea

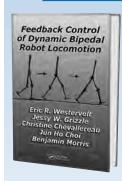
Explore Walking Robots from a Truly Dynamic Perspective



A volume in the series **Control and Automation** Series edited by

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National University of Singapore

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Bipedal locomotion is among the most difficult challenges in control engineering. Most books treat the subject from a quasi-static perspective, overlooking the hybrid nature of bipedal mechanics. Feedback Control of Dynamic Bipedal Robot Locomotion is the first book to present a comprehensive and mathematically sound treatment of feedback design for achieving stable, agile, and efficient locomotion in bipedal robots.

In this unique and groundbreaking treatise, expert authors lead you systematically through every step of the process, including:

- Mathematical modeling of walking and running gaits in planar robots
- Analysis of periodic orbits in hybrid systems
- Design and analysis of feedback systems for achieving stable periodic motions
- Algorithms for synthesizing feedback controllers
- Detailed simulation examples
- Experimental implementations on two bipedal test beds

The elegance of the authors' approach is evident in the marriage of control theory and mechanics, uniting control-based presentation and mathematical custom with a mechanics-based approach to the problem and computational rendering. Concrete examples and numerous illustrations complement and clarify the mathematical discussion. A supporting Web site offers links to videos of several experiments along with MAT-LAB® code for several of the models. This one-of-a-kind book builds a solid understanding of the theoretical and practical aspects of truly dynamic locomotion in planar bipedal robots.

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FEATURES

- Covers the gamut of topics in bipedal robot locomotion, from models to theoretical control analysis, feedback synthesis, detailed simulations, and experimental implementations
- Includes a "Getting Started" appendix that helps you quickly begin using the concepts developed in the book
- Provides an extensive chapter devoted to background material, making the book largely self-contained
- Presents an unparalleled in-depth theoretical analysis of stable bipedal locomotion
- Contains more than 150 figures along with examples ranging from simple to complex

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