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Sinopsis

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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 MATLAB® 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.