Robust Adaptive Dynamic Programming
Yu Jiang, Zhong-Ping Jiang

A comprehensive look at state-of-the-art ADP theory and real-world applications

This book fills a gap in the literature by providing a theoretical framework for integrating techniques from adaptive dynamic programming (ADP) and modern nonlinear control to address data-driven optimal control design challenges arising from both parametric and dynamic uncertainties.

Traditional model-based approaches leave much to be desired when addressing the challenges posed by the ever-increasing complexity of real-world engineering systems. An alternative which has received much interest in recent years are biologically-inspired approaches, primarily RADP. Despite their growing popularity worldwide, until now books on ADP have focused nearly exclusively on analysis and design, with scant consideration given to how it can be applied to address robustness issues, a new challenge arising from dynamic uncertainties encountered in common engineering problems.

Robust Adaptive Dynamic Programming zeros in on the practical concerns of engineers. The authors develop RADP theory from linear systems to partially-linear, large-scale, and completely nonlinear systems. They provide in-depth coverage of state-of-the-art applications in power systems, supplemented with numerous real-world examples implemented in MATLAB. They also explore fascinating reverse engineering topics, such how ADP theory can be applied to the study of the human brain and cognition. In addition, the book:

• Covers the latest developments in RADP theory and applications for solving a range of systems’ complexity problems
• Explores multiple real-world implementations in power systems with illustrative examples backed up by reusable MATLAB code and Simulink block sets

• Provides an overview of nonlinear control, machine learning, and dynamic control

• Features discussions of novel applications for RADP theory, including an entire chapter on how it can be used as a computational mechanism of human movement control

*Robust Adaptive Dynamic Programming* is both a valuable working resource and an intriguing exploration of contemporary ADP theory and applications for practicing engineers and advanced students in systems theory, control engineering, computer science, and applied mathematics.

### ABOUT THE AUTHOR

**Yu Jiang, PhD,** is a Software Developer of Simulink Control Design at MathWorks. In the past five years, he has published nearly 30 papers and one book chapter on the subject of ADP theory and its applications. He was the recipient of the Shimemura Young Author Prize (with Prof. Z.P. Jiang) at the 9th Asian Control Conference in Istanbul, Turkey, 2013.

**Zhong-Ping Jiang, PhD,** is a Professor of Electrical and Computer Engineering at New York University with a doctorate in automatic control and mathematics. He has authored three books and over 400 journal and conference papers on nonlinear systems and control, dynamic networks, and more.

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