L1 Adaptive Control Theory: Guaranteed Robustness with Fast Adaptation (Advances in Design and Control)

Naira Hovakimyan, Chengyu Cao

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This book presents a comprehensive overview of the recently developed L1 adaptive control theory, including detailed proofs of the main results. The key feature of the L1 adaptive control theory is the decoupling of adaptation from robustness. The architectures of L1 adaptive control theory have guaranteed transient performance and robustness in the presence of fast adaptation, without enforcing persistent excitation, applying gain-scheduling, or resorting to high-gain feedback.

The book covers detailed proofs of the main results and also presents the flight test results that have used this theory and contains results not yet published in technical journals and conference proceedings.

The material is organized into six chapters and concludes with an appendix that summarizes the mathematical results used to support the proofs. Software is available on a supplementary Web page.

Audience: *L1 Adaptive Control Theory* is intended for graduate students; researchers; and aerospace, mechanical, chemical, industrial, and electrical engineers interested in pursuing new directions in research and developing technology at reduced costs.

Contents: Foreword; Preface; Chapter 1: Introduction; Chapter 2: State Feedback in the Presence of Matched Uncertainties; Chapter 3: State Feedback in the Presence of Unmatched Uncertainties; Chapter 4: Output Feedback; Chapter 5: L1 Adaptive Controller for Time-Varying Reference Systems; Chapter 6: Applications, Conclusions, and Open Problems; Appendix A: Systems Theory; Appendix B: Projection Operator for Adaptation Laws; Appendix C: Basic Facts on Linear Matrix Inequalities; Bibliography

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