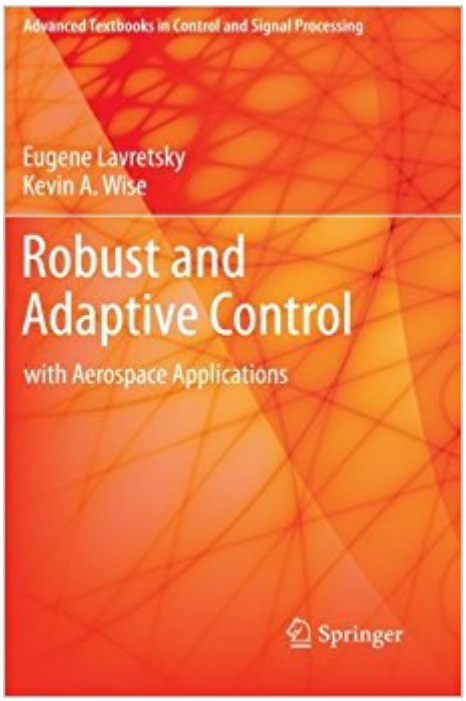
Robust And Adaptive Control: With Aerospace Applications (Advanced Textbooks In Control And Signal Processing)



Synopsis

Robust and Adaptive Control shows the reader how to produce consistent and accurate controllers that operate in the presence of uncertainties and unforeseen events. Driven by aerospace applications the focus of the book is primarily on continuous-dynamical systems.Ã Â The text is a three-part treatment, beginning with robust and optimal linear control methods and moving on to a self-contained presentation of the design and analysis of model reference adaptive control (MRAC) for nonlinear uncertain dynamical systems. Recent extensions and modifications to MRAC design are included, as are guidelines for combining robust optimal and MRAC controllers. Features of the text include:Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â case studies that demonstrate the benefits of robust and adaptive control for piloted, autonomous and experimental aerial platforms;Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â detailed background material for each chapter to motivate theoretical developments;Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â realistic examples and simulation data illustrating key features of the methods described; andÃ Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â Ã Â problem solutions for instructors and MATLABÃ Â® code provided electronically.Ã Â The theoretical content and practical applications reported address real-life aerospace problems, being based on numerous transitions of control-theoretic results into operational systems and airborne vehicles that are drawn from the authorsÃ¢â ¬â„¢ extensive professional experience with The Boeing Company. The systems covered are challenging, often open-loop unstable, with uncertainties in their dynamics, and thus requiring both persistently reliable control and the ability to track commands either from a pilot or a guidance computer.Readers are assumed to have a basic understanding of root locus, Bode diagrams, and Nyquist plots, as well as linear algebra, ordinary differential equations, and the use of state-space methods in analysis and modeling of dynamical systems.Robust and Adaptive Control is intended to methodically teach senior undergraduate and graduate students how to construct stable and predictable control algorithms for realistic industrial applications. Practicing engineers and academic researchers will also find the book of great instructional value.

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Customer Reviews

From the book reviews:Ã¢â ¬Å“Robust and adaptive control is a well written and self-contained book, driven by aerospace applications. This book is very rich in both control theory and examples. Ã¢â ¬Â¦ the authors succeed in establishing a good trade-off between theoretical background and developments and practical aspects related to flight system applications. The book can be used as a textbook for senior undergraduate students, graduate students, practicing engineers and academic researchers. It is recommended to all major libraries.Ã¢â ¬Â• (Ali Zolghadri, Mathematical Reviews, July, 2014)

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The authors did a great job with this book. It is easy to read, and, while the details are available, it focusses on the key points important to the application of the control methods and the requirements of the systems necessary to implement them. It also has some unique perspectives on control design compared to other books. Key equations are summarized at the end of the chapter.Too many books on robust control are just full of algebraic manipulation, proofs, and the real meaning of what is going on is lost in math. This book not only describes the derivation at a digestible level, but also describes what you can do with the control itself (such as loop shaping and Bode's sensitivity integral which is not covered in other texts), and is full of good examples as well.A particular section I like is the comparison of various control approaches taken (LQR, LTR, LTR-LM, and H-infinity). I also like how the authors talk about the constraints in the H-infinity formulation. Many other texts just say the problem isn't feasible due to the Ricatti equations not having a solution, but here they mention the practical aspects of those particular formulations, having the requirement to be able to separate out the disturbance and the control, and describing how certain programs modify constraints by not requiring that D'*D be identity. There is a lot more meaning in that kind of description than just saying the solution doesn't exist.This book is one I am currently referring to for professional applications of these techniques.

For those with a good grasp of dynamics and control theory, and the associated tools of linear algebra, this is an easily digested text. The presentation style is almost narrative, and therefore this book is well suited as a self study text. The Matlab code for the examples make for efficient study of the material.This book will work well after more specific senior and graduate texts in dynamics, non-linear systems, and adaptive control, like e.g. those by Khalil and Ioannou. Unlike fundamental

texts which demonstrate theoretical concepts with contrived examples, this work is based on real world examples that lead the theoretical development. The authors are perhaps unique in their position as subject matter experts in industry with strong ties to the leading academic figures in robust and adaptive control theory. Therefore, their examples are both insightful and compelling.For those interested in the state of the art in robust adaptive control, this book forms an excellent source for the interplay between robustness and dynamics of adaptive elements in control design. Whereas this text ties together developments of the past 3 decades with more classical notions, it is also a nice segue into the recent L1-adaptive control formulations.

The authors take a lot of time/space to describe intuition of concepts instead of simple diving into math proofs, unlike many other books on control. Additionally, it also doesn't sacrifice mathematical rigor and gives adaptive control a Lyapunov-based mathematical element.However, there are quite a few typos in the book, as it is the first edition. The good thing is, the typos are easy to catch.

Cool

I have the electronic copy of this book, and have spent 20+ years designing control systems using classical techniques augmented with a little modern and optimal control methods.For busy practicing engineers trying to improve through self-study their knowledge of modern control methods such as H infinity, there are not any good books on the subject. With this one exception, all the books I have seen tend to be overly theoretical, have a very steep learning curve, are exceptionally weak in the practical aspects, and are devoid of worthwhile examples.This particular book is less theoretical and is written for engineers in industry, and has some good examples, but has some serious flaws. One is the number of typos - many are listed in the errata at the end of the book, but as I have gone through the book I have found many additional typos. So many typos that I suggest no equation be accepted at face value and every equation should be derived and verified.Another flaw is that even though the book has some good examples, it sometimes glosses over important aspects of the examples. To the authors (who have spent their entire careers deep in this subject) these aspects are probably seen as trivial, but I find myself repeatedly hitting points which mystify me and I end up spending a lot of time working it out and in other books and papers tracking it down. This is good for my understanding, but extremely time consuming.In summary, its a decent book and has some valuable facts regarding air vehicle flight control.

Robust and Adaptive Control: With Aerospace Applications (Advanced Textbooks in Control and Signal Processing) Robotics: Modelling, Planning and Control (Advanced Textbooks in Control and Signal Processing) Discrete-Time Signal Processing (3rd Edition) (Prentice-Hall Signal Processing Series) Multidimensional Digital Signal Processing (Prentice-Hall Signal Processing Series) Discrete-Time Signal Processing (2nd Edition) (Prentice-Hall Signal Processing Series) Sampling in Digital Signal Processing and Control (Systems & Control: Foundations & Applications) Adaptive Signal Processing: Next Generation Solutions Health Monitoring of Aerospace Structures: Smart Sensor Technologies and Signal Processing Biomedical Signal Processing and Signal Modeling Cellular Signal Processing: An Introduction to the Molecular Mechanisms of Signal Transduction Applications of Space-Time Adaptive Processing (Iee Radar, Sonar, Navigation and Avionics) Probability and Random Processes, Second Edition: With Applications to Signal Processing and Communications Probability and Random Processes: With Applications to Signal Processing and Communications Digital Signal Processing, Second Edition: Fundamentals and Applications Digital Signal Processing: Principles, Algorithms and Applications (3rd Edition) IntAR, Interventions Adaptive Reuse, Volume 03; Adaptive Reuse in Emerging Economies Theory of Aerospace Propulsion, Second Edition (Aerospace Engineering) Theory of Aerospace Propulsion (Aerospace Engineering) Structural Analysis: With Applications to Aerospace Structures (Solid Mechanics and Its Applications) Number Theory Through Inquiry (Maa Textbooks) (Mathematical Association of America Textbooks)