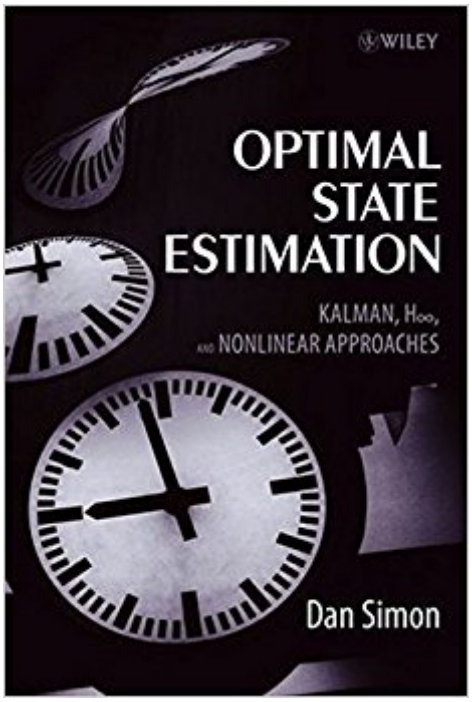
Optimal State Estimation: Kalman, H Infinity, And Nonlinear Approaches



Synopsis

A bottom-up approach that enables readers to master and apply the latest techniques in state estimation This book offers the best mathematical approaches to estimating the state of a general system. The author presents state estimation theory clearly and rigorously, providing the right amount of advanced material, recent research results, and references to enable the reader to apply state estimation techniques confidently across a variety of fields in science and engineering. While there are other textbooks that treat state estimation, this one offers special features and a unique perspective and pedagogical approach that speed learning: * Straightforward, bottom-up approach begins with basic concepts and then builds step by step to more advanced topics for a clear understanding of state estimation * Simple examples and problems that require only paper and pen to solve lead to an intuitive understanding of how theory works in practice * MATLAB(r)-based source code that corresponds to examples in the book, available on the author's Web site, enables readers to recreate results and experiment with other simulation setups and parameters Armed with a solid foundation in the basics, readers are presented with a careful treatment of advanced topics, including unscented filtering, high order nonlinear filtering, particle filtering, constrained state estimation, reduced order filtering, robust Kalman filtering, and mixed Kalman/H? filtering. Problems at the end of each chapter include both written exercises and computer exercises. Written exercises focus on improving the reader's understanding of theory and key concepts, whereas computer exercises help readers apply theory to problems similar to ones they are likely to encounter in industry. With its expert blend of theory and practice, coupled with its presentation of recent research results, Optimal State Estimation is strongly recommended for undergraduate and graduate-level courses in optimal control and state estimation theory. It also serves as a reference for engineers and science professionals across a wide array of industries.

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Customer Reviews

"This book is obviously written with care and reads very easily. A very valuable resource for students, teachers, and practitionersâ highly recommended." (CHOICE, February 2007) "The dozens of helpful step-by-step examples, visual illustrations, and lists of exercises proposed at the end of each chapter significantly facilitate a reader’s understanding of the book’s content." (Computing Reviews.com, December 4, 2006)

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theory. It also serves as a reference for engineers and science professionals across a wide array of industries.

This book seems to strike a good balance among the points I've been looking for in a state estimation book- coverage, explanation, derivation, and application.If you're a graduate student in control theory, this book probably won't serve as anything more than a primer. It does not contain exhaustive derivations or proofs of the various estimation algorithms. What it DOES offer is a nice explanation for an engineer who is interested in actually implementing an algorithm based on an evaluation of its relative strengths. The explanation of the strengths and drawbacks of the various estimation methods is where this book excels relative to some of the more applied texts, such as "Fundamentals of Kalman Filtering: A Practical Approach" by Zarchan, which I found to be lacking in explanation to the point of uselessness.In particular, I enjoyed the clear manner in which this author made the fundamental link between Kalman filtering, Least-squares estimation, and statistical propagation through linear systems. It made the "why?" of Kalman filtering understandable to somebody who isn't an applied mathematician.My only real issue with this book was raised by another reviewer. Appendix C seemed to start off as a tongue-in-cheek acknowledgment of the author's Christian faith using control terminology, but quickly grew uncomfortably long and earnest. The author would have been better served with something short in the acknowledgment. That said, this can be forgiven in light of the nice job the author does with the meat of the text.

I've got a fairly extensive background in applications of estimation, but I needed to learn about some of the extensions of the theory, so I bought this primarily for Chapters 7 and 11-12. It's easy to read and follow with lots of the all-important math to fill in the steps. That already gives it a leg up on many of the other books. The price point is excellent. (It's at the low end of the spectrum for hardback text books.) The notation he uses is probably the most common in the field. I'm used to a slightly different notation (from orbital mechanics courses), but it's close enough that I can easily adapt.For those that are complaining about Appendix C -- don't read it if it bothers you....sheeezzzz.... How narrow minded do you have to be to complain about an author's commentary in an Appendix?? Get over it.FYI, a really good book that applies some of the estimation techniques to orbital problems is "Modern Orbit Determination: Second Edition" by William Wiesel. It's less than $20 in paperback through and it walks you through some practical applications. If you are studying orbital mechanics or orbit determination, buy this book and Wiesel's.

I have gone through this entire book in detail. I think that it is a great blend of theory and practice based upon the author's teaching experience and practical experience. It is not difficult to read and understand provided you have some background in linear systems. It was very useful for me to catch up with most of the state-of-the art in this field. Since each author reflects his own expertise in his own book, I think it is not necessary to compare this to any other book on State Estimation as it stands out as a classic by itself.I recommend this book without any reservation and will use it to teach Optimal State Estimation and conduct research in this area.Dr.Humayun Akhtarhakhtar0027@gmail.com

I think this is currently the best text for optimal estimation. It is well written, clear and has excellent problems that help you absorb the key concepts. It is the textbook for an excellent grad level course at the U of MN.

This book relates control theory elegantly, to those with a scientific background, but not much control theory history. Dan uses well laid out algorithmic approaches, suitable for programming, and examples to explain the details and show the complexities in action. I especially like the non-linear filtering chapters, and the comparison s between the Kalman Filter and other approaches (Particle Filter, etc.) I have several estimation/control theory texts, and this is the one I carry around with me.

Good introductory book on the subject. It is very easy to understand and does not require much background from the reader. For the more technically advanced readers, the pace may be a bit too slow. But nevertheless, I think it's a good introductory/self-study book especially for engineers.I would also recommend Gelb's book ` Applied Optimal Estimation `.

I am a researcher and my background is in estimation, prediction modeling, and inferential models/methods. I found this book easy to follow (partly because of my background) in writing style.The book is true to the title and focuses on Kalman filter from several different perspectives (properties, implementation, modifications, etc.)I am still reading the book, so far I have read ch.3, 5 and 15. I have found a very good comparison of Kalman filter derivation through RLSE route, and Bayesian way. A good comparison of both approaches.Author is also good in consistently providing the references through out the book, if you choose you can take a deeper dive along the references to sort out details that may be relevant to implementation and research.I must have to say, a prior

applied background is necessary to really appreciate the contents of the book intuitively.

Overall I found the book to be very well written with plenty of proofs, which I really like. In the sections that I looked at (with one exception) I did not find any errors. For the more recent material, towards the end, I would highly recommend looking at the original papers in addition to what's in the book. Out of necessity some things are glossed over. In the case of the unscented Kalman filter the algorithm presented in the book has some issues. It is not exactly the same algorithm as in the original papers and will in fact produce a covariance matrix which is incorrect. However, on the whole I would highly recommend the book, especially for self learners.