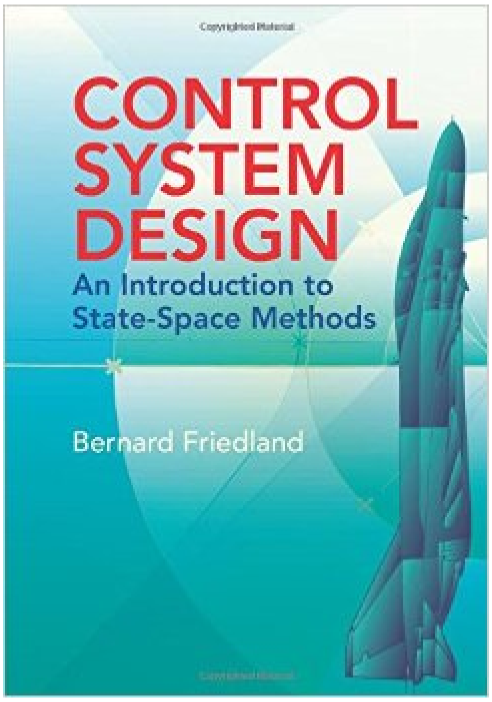
Control System Design: An Introduction To State-Space Methods (Dover Books On Electrical Engineering)



Synopsis

Addressed not only to students but also to professional engineers and scientists, this volume introduces state-space methods for direct applications to control system design, in addition to providing background for reading the periodical literature. Its presentation, therefore, is suitable both for those who require methods for achieving results and those more interested in using results than in proving them.Topics include feedback control; state-space representation of dynamic systems and dynamics of linear systems; frequency-domain analysis; controllability and observability; and shaping the dynamic response. Additional subjects encompass linear observers; compensator design by the separation principle; linear, quadratic optimum control; random processes; and Kalman filters.Concrete examples of how state-space methods can be used to advantage in several representative applications are woven into the fabric of the text and the homework problems. Many of the models are drawn from aerospace and inertial instrumentation; other examples are derived from chemical process control, maritime operations, robotics, and energy systems.

Book Information

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Customer Reviews

The purpose of this classic text is to clarify the newer State-space methods that eclipsed Frequency Domain methods before and during Apollo. At that time, State-space was purely about proofs, and only a handful of Engineers actually were using them for problem solving.To be honest, the math of State Space, pioneered by Russians like Liapunov and Pontryagin during and after Sputnik is daunting, as it substituted ordinary and partial differential equations for transfer functions, the calculus of variations for Wiener-Hopf in optimization, and Liapunov for Bode and Nyquist in stability (although Bode is certainly still used).Because of this, this wonderful classic text gratefully reprised by Dover is still one of the most intuitive explanations about the "practical" side of State-Space. If you're "experiencing" (read enduring) the typical Engineering career cut/sort series of systems and signals then state space courses, this book is a MUST along with the Schaum's problem/solution examples. This also is ideal for self study for folks who want to get a more intuitive and analogous approach to SS with the outstanding didactics and pedagogy of a bygone age where teachers were more concerned with us learners than strutting their mathematical prowess page after page.There are some daunting equations (not problems and solutions), but well explained and illustrated, and numerous diagrams and graphs (especially input/output diagrams for transfer functions) are given so we "get" the underlying concepts. Today we'd call these alogrithms, data structures, UML and parse control schematics, but they work regardless of nomenclature!

The most common way of introducing state-space methods is via linear matrix algebra. This of course is not a problem per se, on the contrary, linear matrix algebra provides the right tools and, besides, is of unsurpassed elegance... and that is precisely the danger. Most engineering students when taking a course on state-space methods expect to add to their toolbox analysis and design methods and also to increase their insight. Although liner state-space methods can reward the student with such benefits, a course on the topic provides a diversity of opportunities to drift away in "repulsive to look and tedious" (from the book, p. 428) algebra thus obscuring the practical implications of the methods.In Control System Design, Prof. Friedland provides a nice balance of various aspects, such as good physical motivation, engineering insight to most problems, a significant number of worked examples based on physical system models and a very nice, though brief, historical perspective of the related material. This is not to say that there is no matrix algebra, but it is certainly not the emphasis. This could mean that for a graduate course on the subject the reader might need another reference. The book, as admitted by the author, is intended for an undergraduate course and for practicing engineers. Hence, if you need a book at undergraduate level, here you have an excellent option. If, on the other hand, you are looking for a book at graduate level with a more mathematical approach, use Friedland's book as motivational and find some other book for the more mathematical aspects.Finally, I would like to point out what seems to me a very positive and very rare feature of this book.

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