Book Review

Linear Control System Analysis and Design*

John D'Azzo and Constantine H. Houpis

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This book tries to combine the classical methods of analysis and synthesis of linear control systems and the so-called modern methods. While it gives a fairly complete coverage of the classical methods leaning on the authors' well-known previous book (Feedback Control System Analysis and Synthesis), it deals with the modern methods in a less systematic way, leaving open some important problems, such as some aspects of optimal control theory, stability of digital control systems, and their analysis and synthesis in the time domain. It is understandable that such a book cannot be complete, however, the main problems should be dealt with instead of other less important ones.

After a short motivating introduction, the book deals with writing the system equations for different types of systems, such as electrical, mechanical, thermal, hydraulic ones using physical laws, and gives a short description of the Lagrange method. The solution of the system equations and determining the steady-state response using classical methods, state equations and Laplace transformation is dealt with in the next two chapters.

System representation is explained using block diagrams, simulation diagrams, signal flow graphs, state transition signal flow graphs and transformation to diagonal and companion forms. The determination of system types, steady-state error coefficients, stability using Routh criteria, root locus frequency response representation using Bode, Polar and Nichols plots, stability using Nyquist criteria and the correlation between time response, root locus and frequency response, and compensation using root locus and frequency response plots is explained in detail in Chapters 7-11, where a great part is based on the old book.

From Chapters 12 to 18 modern control theory is introduced in the form of state variable feedback, controllability and observability, observers, Lyapunov second method, algebraic Riccati equation, determination of the weighting matrices in the performance index, transformation to the control canonical form, and eigenstructure assignment in the controller and observer design of MIMO systems.

It is mentioned that some of the material given in the chapter on Lyapunov stability is not exact, e.g. the definition of stability in the sense of Lyapunov. On the other hand, the material on eigenstructure assignment appears, as far as I know, for the first time in a book and is given a fairly good treatment.

The chapter on digital control systems is relatively short and leaves open many important problems. The book should either have been restricted to linear continuous systems or digital control systems should have been adequately dealt with.

A book which can be considered as directed to the same level is Analysis and Synthesis of Linear Control Systems by C. T. Chen (1975). However, a direct comparison between the two books is difficult, because of the difference in size. In my opinion, while Chen's book deals with modern control theory in a good way, D'Azzo and Houpis' book includes some recent material such as eigenstructure assignment.

In spite of the criticism, the book is valuable for undergraduate students, especially because of the nice treatment of classical control theory and the numerous examples given throughout the text.

About the reviewer
M. Mansour was born in Damietta, Egypt. He received B.Sc. and M.Sc. degrees in electrical engineering from Alexandria University, Alexandria, and a Dr.sc.techn. degree in electrical engineering from ETH Zürich, Switzerland, when he was awarded the silver medal of ETH. He was assistant professor in electrical engineering at Queen's University, Canada. He has been professor and head of the Department of Automatic Control at ETH Zürich since 1968, dean of electrical engineering 1976-1978 and director of the Institute of Automatic Control and Industrial Electronics, ETH Zürich 1976-1978 and 1980-1982. He was visiting professor at the IBM Research Laboratories, San Jose, California, at the University of Florida, Gainesville, and at the University of Illinois, Urbana. He is also president of the Swiss Federation of Automatic Control, member of the Council and Treasurer of IFAC. His fields of interest are control systems, especially stability theory and digital control, stability of power systems, and digital filters.

Preface to Linear Control System Analysis PDF Book. The technological advances that were made during the twentieth century have necessitated the design of advanced control systems in a concurrent engineering design. Which requires that control engineers play a central role from the very beginning of the project. Many of today’s control system designs are of a multidisciplinary nature that require applying control concepts to understand the interactions of the subsystems in the entire system. They also require coordinating the different disciplines in order to achieve better system dynamics and Linear control system analysis and design: conventional and modern. Item Preview. remove-circle. Thoroughly classroom-tested and proven to be a valuable self-study companion, Linear Control System Analysis and Design: Sixth Edition provides an intensive overview of modern control theory and conventional control system design using in-depth explanations, diagrams, calculations, and tables. Keeping mathematics to a minimum, the book is designed with the undergraduate in mind, first building a foundation, then bridging the gap between control theory and its real-world application. Computer-aided design accuracy checks (CADAC) are used throughout the text to enhance computer literacy. Each CA In system engineering we take the above energy and power denitions, and extend them to an arbitrary signal x.t /, possibly complex, and define the normalized energy (e.g. 1 ohm system) as. ZT Z1. E D lim jx.t /j2 dt D jx.t /j2 dt. Which says the basis vectors are mutually orthogonal. From analytic geometry (and linear algebra), we know that we can nd a representation for AE as. AE. D Thoroughly class-tested and proven to be a valuable self-study companion, this text/reference features in-depth explanations, diagrams, calculations, and tables for an intensive overview of modern control theory and conventional control system design—keeping mathematics to a minimum while stressing real-world engineering challenges, this source emphasizes the use of CAD packages to improve and simplify the design of effective control systems. Software included! Download (pdf, 6.98 Mb) Donate Read.