BOOK REVIEW

MODERN CONTROL SYSTEMS ENGINEERING, by Z. Gajic and M. Lelic, Prentice Hall, Europe, 1996, ISBN 0-13-134116-2

The book *Modern Control Systems Engineering* represents a modern treatment of the classical control theory. It is based on the state space approach where only elementary knowledge in differential equations and linear algebra is needed. Real word examples and problems are implemented practically using the MATLAB package. The dynamic systems are simulated in SIMULINK.

The authors state that the book can be used by senior students in engineering and as a first year graduate control theory text.

The book is structured to cover the fundamental control theory concepts such as state space, controllability, observability and stability. These concepts are used nowadays and will be used in the future not just in control engineering, but in many other engineering and scientific disciplines, like aerospace, robotics, commnications, etc.

In addition, the asset of the book is in showing how to use MATLAB for control system design purposes. The book can be recommended for undergraduate students and professionals in control area, also it can be used as an introductory graduate control theory text.

Chapter one presents an introduction to continuous and discrete time invariant linear control systems. The difference between closed-loop and open-loop, state space and transfer function methods, are briefly discussed. Modeling of dynamics and linearization of non-linear control systems are presented.

Chapter two presents the transfer function approach, also know as the frequency domain technique, to give methods for finding the system transfer function based on the Laplace and Z transforms and their relationship to time derivatives. Conventional ways of representing linear time invariant systems, via block diagrams and signal flow graphs, are also considered.

Chapter three combines the differential and difference equations to describe the dynamical systems in the form of system transfer functions. The representation in discrete- time domain is given.

Chapter four deals with the stability. The basic definitions of stability of linear time invariant systems are given .The system stability in the sense of Lyapunov is also defined. Stability tests for both continuous and discrete time systems are discussed.

Chapter five introduces definitions and concepts of system controllability and observability and observability related to linear systems. The reduced order and full order estimator designs are presented.

Chapter six discusses transient and steady-state responses of a dynamic system. In addition, system dominant poles and system sensitivity function are introduced. The response of a second-order system due to a unit step input is analysed in detail and the main control system specifications are summarised.

Chapter seven presents the root locus technique using only elementary mathematics. The main rules for constructing the root locus are given. The root locus technique for discrete–time control systems is also discussed.

Chapter eight presents systematic procedures for time domain controller design techniques based on the root locus method. Complete set of controller design techniques which have much simpler forms than those based on the bode diagrams, are provided. The pole placement technique is fully explained for SISO systems.

Chapter nine considers the controller design based on Bode diagrams. The frequency domain

techniques are analysed and compared with the root locus method.

Chapter ten gives an overview of modern control to provide students with better insight into this extremely broad and multi-disciplinary engineering area.

The book is a good contribution to the modern control systems design. Academics or professional working in the area of control system design will find this work interesting as a source of good ideas leading to applied solutions.

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