BOOK REVIEWS

Automatique des Systèmes Continus

Éléments de cours et exercises résolus

by Christophe Sueur, Philippe Vanheeghe and Pierre Borne

Éditions Technip, Paris, 1997, 178 p.
Collection Sciences et Technologies
ISBN 2-7108-0732-7

Control theory has fast developed over the last decades, and is now established as a powerful and eminently practical tool for the solution of linear feedback control problems.

This book deals with the fundamental aspects of time and frequency modelling, analysis and control of continuous-time linear systems, planning to solve the regulator or tracking problems. The approach made is the "*classical*" or "*conventional*" one and consists in design methods based on a suitable shaping of the transmission and loop gain functions, employing pole-zero techniques. This approach cannot be disregarded in comparison with "modern" control theory; on the contrary, we believe that the classical approach is well-established and proven by practice, and distinguishes as a collection of sensible and useful goals and problem formulations.

The book contains two main Parts, an Appendix and the bibliography.

The **first Part** of the book, including course elements, is structured in 10 Chapters, and a chapter-by-chapter description of this part follows.

Chapter 1 is dedicated to the main notions used in control systems: formulation of regulator and tracking problems, the tracking principle and tracking properties (stability, precision and rapidity). **Chapter 2** deals with the Laplace transform: definitions, properties and solving of linear differential equations. **Chapter 3** discusses the transfer functions: definitions, transfer functions composition, the effect of disturbance and Mason's rule for the computation of transfer functions associated with a graph. **Chapter 4** is about the time response evaluation of systems of different orders, while **Chapter 5** is dedicated to the frequency response evaluation: the Bode, Nyquist and Black plots for the same systems as those analysed at Chapter 4. The problem of stability, the Routh criterion, geometric criteria and robustness of stability make the object of **Chapter 6**. **Chapter 7** addresses the precision problem of closed loop systems, with the set point error and error due to a disturbance. **Chapter 8** presents analogic PID controllers: principles and design methods. Simple design methods such as Ziegler-Nichols's , the Noslin criterion, etc. are dealt with in **Chapter 9. Chapter 10** presents the influence of poles placement on controller properties: the influence of pole placement, dominant poles and zeros, the effect of correction elements, Evan's locus.

Part 2 of the book contains 33 exercises under the form of problem formulations and key to problems, covering many of the problems in automation practice. These examples are treated in detail and there is much pedagogical merit in this part. The problems raised in the book are basic problems in linear control systems, answering many of the questions that the reader might ask. Among the examples discussed, one can mention two classes of applications: one for the theoretical systems and another for practical systems such as mechanical systems, electrical motors, thermic and hydraulic systems, etc.

The material is well organized and presented with clarity, the reader's understanding is helped with many elaborate examples. The book is intended to aid engineering students of the first and the second cycles in the analysis and design of control systems. In my opinion, the reader should be versatile in digital computers programming and have access to a computer.

In the reviewer's opinion this is a useful textbook both for those who are starting work in analysis and control system design, and, to some extent, for those who have already got some experience in this area.

Theodor Balan