Correction to "Uncertain Dynamical Systems—A Lyapunov Min–Max Approach"

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The following corrections should be made in the above paper.[1]

1) Following (1), the sentence "U and Ω are defined later" should read: "U and Ω are compact and defined later."

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[1]S. Gutman, *IEEE Trans. Automat. Contr.*, vol. AC-24, pp. 437–443, June 1979.

2) In Definition 7), delete the sentence: "In other words, $E(\cdot)$ is upper semicontinuous, etc."

3) In Definition 13), "$\|x\|<\delta$" should read: "$\|x_0\|<\delta$."

4) In Definition 16), add: "For sufficiently large η, the property is *in the large.*"

5) Theorem 3 should read: If $\mathcal{V}(x,t)$ is a real function defined on $\mathcal{R}^n \times \mathcal{R}^1_+$, if $\mathcal{V}(x,t)$ and $-D^0\mathcal{V}(x,t)$ are positive definite, and if $\gamma(\|x\|)\to\infty$ as $\|x\|\to\infty$, then the origin is uniformly asymptotically strongly stable in the large.

6) In the Appendix, delete the last sentence.

Book Reviews

In this section, the IEEE Control Systems Society publishes reviews of books in the control field and related areas. Readers are invited to send comments on these reviews for possible publication in the Technical Notes and Correspondence section of this TRANSACTIONS. The S-CS does not necessarily endorse the opinions of the reviewers.

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Nonlinear Systems Analysis—M. Vidyasagar (Englewood Cliffs, NJ: Prentice-Hall, 1978, 302 pp., $21.95). *Reviewed by L. G. Clark.*

L. G. Clark is Professor of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin. His main areas of interest are dynamical systems and nonlinear analysis.

This brief text on nonlinear systems is the most recent in the Prentice-Hall Network Series. It is intended by the author as a text for a one-term course at either the senior or first-year graduate level. Although it would take more than one text to cover so complex a field adequately, this small book contains the majority of topics that should be considered in an introductory analytical treatise on nonlinear analysis, as the following rapid review of its contents should reveal.

The first chapter introduces the differences between linear and nonlinear systems. It establishes the state vector form of differential equations and gives analytic definitions of some basic terms. The next chapter considers second-order systems. It discusses the phase plane, classification and classical theorems on singular points, and limit cycles and other associated behavior. Also, the approximate methods of Krylov–Bogu-liubov (averaging) and of power series (perturbing) are briefly encountered.

Chapter III entitled "Nonlinear Differential Equations," is primarily concerned with mathematical definitions and theorems associated with linear vector spaces. Contraction mapping and existence and uniqueness of solutions to ordinary differential equations are considered in this chapter. Chapter IV introduces several of the classical approximating methods of obtaining solutions to ordinary differential equations. The averaging techniques are aptly represented by the development of the describing function method. Numerical methods are introduced briefly, and some of the more common algorithms are shown. The problem of singular perturbations is also treated briefly in this chapter.

The fifth chapter is devoted to stability analysis of systems by the methods of Lyapunov. The definition of terms and a presentation of the several stability theorems of Lyapunov and others are carefully made in this section. Also included are many of the stability properties of linear systems and the application of the Lyapunov indirect method to linear systems. The chapter ends with a discussion of the Lur'e form of control and the associated Popov criterion.

Finally, Chapter VI presents results concerning input–output stability. The work here is somewhat more thorough than in other chapters and appears to be a condensation of work the author has done. As expected, it is directed specifically toward control problems rather than toward dynamical systems in general from which it evolves.

The reviewer found the book to be quite readable, if the reader has some background in analysis, although he takes exception to some of the claims or aims for the book that the author makes. For one thing, the author states that most of the important techniques for the analysis of nonlinear systems are "covered" in this small book. The reviewer feels, however, that the words "touched upon" are more descriptive, at least insofar as its use for a text in an engineering course is concerned. The reviewer did use it as the text in a first semester graduate course for nonelectrical engineering graduate students. The above remark and the comments that follow are made with that experience in mind.

The author says that the only prerequisite for using his book is a course in ordinary differential equations. But the book has an electrical engineering flavor and a definite emphasis on relating the various theory and applications to control that requires an understanding of the Laplace or Fourier transform and of state-space methods. Hence, it seems misleading to imply to future mathematical economists, biologists, etc. referred to in the Preface that they will not need to have had a course in linear system theory or at least an elementary one in control before using the text. It is to the author's credit that he does introduce