Preface

Recently, Profs. Leonov and Kuznetsov have introduced a new classification of nonlinear dynamics in which they concentrated on two kinds of attractors: self-excited attractors and hidden attractors. A self-excited attractor has a basin of attraction that is excited from unstable equilibria. So from that point of view, most known nonlinear systems, such as Lorenz system, Rössler system, Chen system, or Sprott system, belong to chaotic systems with self-excited attractors. In contrast, a few unusual systems such as those with an infinite number of equilibrium points, with stable equilibria, or without equilibrium belong to systems with hidden attractors.

Studying systems with hidden attractors has become an attractive research direction because hidden attractors play an important role in theoretical problems and engineering applications. For example, hidden attractor can generate unexpected and potentially disastrous responses to perturbations in a structure like a bridge or an airplane wing. Therefore, it is useful for engineering students and researchers to have an overview of this new classification of attractors. This brief book is a concise reference in nonlinear systems with hidden attractors. Furthermore, emergent topics in circuit implementation of systems with hidden attractors are presented in this book. Also, this book can be used as a part of the bibliography in courses related to dynamical systems and their applications, nonlinear circuits, or oscillations in mechanical systems.

This book is organized as follows: Hidden attractor and its presence in nonlinear systems are presented briefly in Chap. 1. Systems with stable equilibrium, systems with an infinite number of equilibrium points, and systems without equilibrium are reported in Chaps. 2–4, respectively. In Chap. 5, we discuss synchronization of systems with hidden attractors. Chapter 6 introduces circuitry realizations of various systems with hidden attractors. Finally, conclusion remarks are drawn in Chap. 7.

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