

Preface

About the Subject

Modeling, analysis, and control of dynamical systems have interested scientists and engineers for a long time. With the invention of digital computers, modeling and control have taken great importance with numerous applications in various fields. The basic steps involved in a control process are: (1) model the system mathematically (with some assumptions), (2) analyze the mathematical model and study its properties, (3) design a feedback control mechanism to meet the performance requirements, and (4) implement the control system and test its performance.

Mathematical modeling, analysis, and design of control systems are important research areas. The modern trend in engineering systems deals with complex systems having multiple-inputs and multiple-outputs and modern control theory with state space modeling is used to deal with such complex systems. Some classical examples of control systems are Watt governor, speed control system, temperature control system, DC motor, etc.

Nonlinear control systems have some exotic properties like chaos and fractals, and special control strategies are devised for control and synchronization of chaotic systems such as active control, adaptive control, sliding mode control, back stepping control, etc.

About the Book

The new Springer book, *Chaos Modeling and Control Systems Design*, consists of 15 contributed chapters by subject experts who are specialized in the various topics addressed in this book. The special chapters have been brought out in this book after a rigorous review process in the broad areas of Control Systems, Power Electronics, Computer Science, Information Technology, modeling, and engineering applications. Special importance was given to chapters offering practical

solutions and novel methods for the recent research problems in the main areas of this book, viz., Control Systems, Modeling, Computer Science, IT, and engineering applications.

This book discusses trends and applications of chaos modeling and control systems design in science and engineering.

Objectives of the Book

The objective of this book takes a modest attempt to cover the framework of chaos modeling and control systems design in a single volume. The book is not only a valuable title on the publishing market, but is also a successful synthesis of computational intelligence techniques in world literature. Several multidisciplinary applications in Control, Engineering, and Information Technology are discussed inside this book where control engineering methods have excellent potentials for use.

Organization of the Book

This well-structured book consists of 15 full chapters. They are organized into two parts.

Part I Chaos Modeling and Applications

Part II Control Systems and Applications

Book Features

- The book chapters deal with recent research problems in the areas of chaos theory, control systems, computer science, information technology, and engineering.
- The chapters contain a good literature survey with a long list of references.
- The chapters are well written with a good exposition of the research problem, methodology, and block diagrams.
- The chapters are lucidly illustrated with numerical examples and simulations.
- The chapters discuss details of engineering applications and future research areas.

Audience

The book is primarily meant for researchers from academia and industry working in the research areas—Chaos Theory, Control Engineering, Computer Science, and Information Technology. The book can also be used at the graduate or advanced undergraduate level as a textbook or major reference for courses such as control systems, process control and instrumentation, mathematical modeling, computational science, numerical simulation, applied artificial intelligence, fuzzy logic control, and many others.

Acknowledgments

As the editors, we hope that the chapters in this well-structured book will stimulate further research in chaos and control systems and utilize them in real-world applications. We would like to thank all the reviewers for their diligence in reviewing the chapters.

We hope sincerely that this book, covering so many different topics, will be useful for all readers.

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Special thanks go to Springer, especially the book Editorial team.

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