Preface

About the Subject

Fractional systems and fractional control have received great attention recently, both from an academic and industrial viewpoint, because of their increased flexibility (with respect to integer order systems) which allows a more accurate modeling of complex systems and the achievement of more challenging control requirements.

Chaotic systems have been studied for recent decades after the discovery of the first classical chaotic attractor in 1963. Chaos control and chaos synchronization are especially remarkable and important research fields aiming to affect the dynamics of chaotic systems in order to use them for different kinds of applications that can be examined within many different fields such as computer sciences, mechanics, communication, economics and finance, biology, chemistry, medicine, and geology, among others.

About the Book

The new Springer book, *Fractional Order Control and Synchronization of Chaotic Systems*, consists of 30 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 chaos theory, control systems, computer science, fuzzy logic, neural network, and 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. fractional order control and synchronization of chaotic systems.

Objectives of the Book

This book aims at presenting the latest developments, trends, research solutions, and applications of fractional order control and synchronization of chaotic systems. There are different methods that have been proposed for performing fractional order control, chaos control, and chaos synchronization tasks. But because of some limitations of these methods, newer approaches are designed and proposed by researchers to improve the related works within the field. Also, there are many studies already introduced in order to improve more advanced solutions for problems of fractional order control, chaos control, and chaos synchronization. Most of these studies include the usage of intelligent approaches, optimization methods, and hybrid techniques on the related problems of the control theory. Both novice and expert readers should find this book a useful reference in the field of fractional order control and chaos synchronization.

Organization of the Book

This well-structured book consists of 30 full chapters. They are organized into two parts.

Part I: Fractional Order Control Systems
Part II: Applications of Fractional Order Chaotic Systems

Book Features

- The chapters in this book deal with the recent research problems in the areas of fractional order control, chaos theory, control, synchronization, and engineering applications.
- The chapters in this book contain a good literature survey with a long list of references.
- The chapters in this book are well written with a good exposition of the research problem, methodology, numerical examples, simulation results, and block diagrams.
- The chapters in this book discuss the details of engineering applications and future research areas.

Audience

This book is primarily meant for researchers from academia and industry, who are working in the research areas—Fractional Order Control and Synchronization of Chaotic Systems with applications in engineering, automation, chaos, and control engineering. This book can also be used at the graduate or advanced undergraduate

level as a textbook or major reference for courses such as control systems, fractional differential equations, fractional control systems, mathematical modeling, computational science, numerical simulation, fuzzy logic control, and many others.

Acknowledgements

As the editors, we hope that the chapters in this well-structured book will stimulate further research in fractional order control systems, fractional order chaotic systems, and synchronization of chaotic systems and utilize them in the real-world applications.

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

We would like to thank all the reviewers for their diligence in reviewing the chapters.

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

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