

Preface

About the Subject

The development of Computational Intelligence (CI) systems was inspired by observable and imitable aspects of intelligent activity of human beings and nature. The essence of the systems based on computational intelligence is to process and interpret data of various nature, so that that CI is strictly connected with the increase in available data as well as their capabilities of processing mutually supportive factors. Without them, the development of this field would be almost impossible, and its application practically marginal. That is why these techniques have especially developed in recent years. Developed theories of computational intelligence have been quickly applied in many fields of engineering, data analysis, forecasting, biomedicine, and others. They are used in image and sound processing and identifying, signal processing, multidimensional data visualization, steering of objects, analysis of lexicographic data, requesting systems in banking, diagnostic systems, expert systems, and many other practical implementations.

Intelligent control systems are very useful when no mathematical model is available a priori and intelligent control itself develops a system to be controlled. Intelligent control is inspired by the intelligence and genetics of living beings. Some important types of intelligent control are fuzzy logic, artificial neural networks, genetic algorithms, ant colony optimization (ACO), particle swarm optimization (PSO), support vector machines, etc. Intelligent control systems, especially fuzzy logic control systems, have found great applications in engineering and industry.

About the Book

The new Springer book, *Computational Intelligence Applications in Modeling and Control*, consists of 16 contributed chapters by subject experts 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 is given to chapters offering practical solutions and novel methods for recent research problems in the main areas of this book, viz., Control Systems, Modeling, Computer Science, IT and engineering applications.

Intelligent control methods can be broadly divided into the following areas:

- Neural network control
- Fuzzy logic control
- Neuro-fuzzy control
- Genetic control
- Expert Systems
- Bayesian control
- Intelligent agents

This book discusses trends and applications of computational intelligence in modeling and control systems engineering.

Objectives of the Book

The objective of this book takes a modest attempt to cover the framework of computational intelligence and its applications 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 the world literature. Several multidisciplinary applications in Control, Engineering, and Information Technology are discussed in this book, where CI have excellent potentials for use.

Organization of the Book

This well-structured book consists of 16 full chapters.

Book Features

- The book chapters deal with recent research problems in the areas of intelligent control, 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 the future research areas.

Audience

This book is primarily meant for researchers from academia and industry, who are working in the research areas—Computer Science, Information Technology, Engineering, and Control Engineering. The book can also be used at the graduate or advanced undergraduate level as a textbook or major reference for courses such as intelligent control, 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 computational intelligence and control systems and utilize them in 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.

Benha, Egypt
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