

Book Reviews

Evolutionary Algorithms in Engineering Applications

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Evolutionary Algorithms are general purpose search techniques inspired by restricted models of natural evolution. These search techniques are appealing to many users in different areas. This book is the collection of the papers from the field of engineering application. The book is the result of contribution by 61 scientists from all over the world. Its 554 pages contains 31 chapters which cover a wide range of engineering topics in a coherent style and show the elegance of implementations of evolutionary algorithms to these topics. Editors of the book are well-recognized authorities in the field with whose effort, this collection is of great value and on a high scientific level.

The book is divided into five parts. The first, introductory part, deals with theoretical and computational aspects of evolutionary algorithms and with robust encoding techniques which may be effective for a wide range of applications. The following parts deal with applications of evolutionary algorithms to different engineering fields, i.e., (i) architecture and civil engineering, (ii) computer science and engineering, (iii) electrical, control and signal processing and (iv) mechanical and industrial engineering. Each part contains several chapters written by the specialists in the field. The chapters report recent advances in the fields that the authors have dealt with.

I have found this book very interesting, however only some parts of the book are useful for my research. It seems to me that the subjects of the book are too scattered. This can be consider as a drawback of this collection of papers. But on the other hand the reader can get a feel of how wide the application of evolutionary algorithms is. The reader can also compare the approaches from different engineering fields. Some of the presented papers applications are real-world problems which makes the book very attractive not only for scholars but also for practitioners and engineers.

Generally, I do appreciate the publication of the book and I do feel that the book will be well recognized among a new scientific group of researchers who are interested in applications of evolutionary algorithms.

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Genetic Algorithms & Engineering Design

Mitsuo GEN & Runwei CHENG

Ashikaga Institute of Technology, Ashikaga, Japan

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If you are looking for a book with a complete treatment of theory behind genetic algorithms for optimization and clear explanations of the problems facing the industrial engineering discipline look no further than *Genetic Algorithms & Engineering Design*. This book does an excellent job of straddling the fence between reference text and the typified user manual, i.e. a how-to book. It manages to be both explicit in detail yet clear in its broad conceptual descriptions.

The title seems to indicate that this book is the combination of Engineering Design with the discipline of Genetic Algorithms. And it is. BUT. The chapters on genetic algorithms for optimization problems are so complete in themselves that this book is really two books in one. There are even references to other GA publications, annual GA conferences, and useful GA web sites in the first chapter. The next three chapters build up to the topic of Industrial Engineering problems by describing optimization problems that are assailed with GAs: Constrained Optimization, Combinatorial Optimization, and Reliability Optimization. These sections cover broad, almost all, aspects of these types of problems. For example, Stochastic Optimization, Interval Programming, the Knapsack problem, the Traveling Salesman problem, Reliability Optimization with Fuzzy Goal and Fuzzy Constraints and many other sub-topics. The Interval Programming section, while useful, is written more like a traditional math book, lots of Theorems and Definitions. It's the least penetrable section of the book, not impossible, just a bit thick. So ends the first book-within-the-book, *GAs for Optimization* (that would be my title for it). For these chapters alone this book should be on every GA practitioner's desk. Not in his library mind you, on his desk, as in within reach for quick reference. That's where I have mine.

The second *book within the book* tutors and challenges on problems revolving around Industrial Engineering work flow and design. Flow-Shop sequencing, Job-Shop Scheduling, Machine Scheduling, and Facility Layout Design are all covered in sufficient detail to give the user a thorough grounding. There's even a section, albeit slightly out place, on Transportation problems. And to round out the text there's a chapter on other miscellaneous engineering problems. The first chapter of the *second book*, a.k.a. chapter 5, discusses the general Flow-Shop Sequencing family of problems. The chapter starts with some history then describes a fairly trivial two-machine just to make the concept clear. Next multi-machine problems are described and a number of heuristic algorithms are given. A number of GA solutions are then presented with examples. Finally a fuzzy-flow shop problem is presented with a GA solution. The chapter on the Job-Shop Scheduling family of problems is also well organized. It starts with the description of the *classical job-shop model* (a section name no less) moves through a number of the discovered heuristics which apply to various aspects of the problem. The chapter ends with a GA solution to the problem and a number of different approaches researcher have taken.

At \$100 this book seems pretty expensive but it's more than worth it. This reviewer has read many GA texts over the years. Few have had the clarity and completeness of this book. It is a worthwhile addition to my library. It would be even more so if I worked in the Industrial Engineering discipline.

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