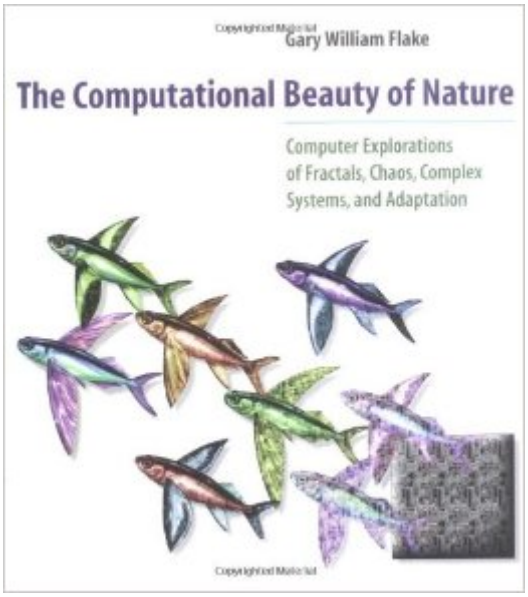
The Computational Beauty Of Nature: Computer Explorations Of Fractals, Chaos, Complex Systems, And Adaptation



Synopsis

"Simulation," writes Gary Flake in his preface, "becomes a form of experimentation in a universe of theories. The primary purpose of this book is to celebrate this fact."In this book, Gary William Flake develops in depth the simple idea that recurrent rules can produce rich and complicated behaviors. Distinguishing "agents" (e.g., molecules, cells, animals, and species) from their interactions (e.g., chemical reactions, immune system responses, sexual reproduction, and evolution), Flake argues that it is the computational properties of interactions that account for much of what we think of as "beautiful" and "interesting." From this basic thesis, Flake explores what he considers to be today's four most interesting computational topics: fractals, chaos, complex systems, and adaptation.Each of the book's parts can be read independently, enabling even the casual reader to understand and work with the basic equations and programs. Yet the parts are bound together by the theme of the computer as a laboratory and a metaphor for understanding the universe. The inspired reader will experiment further with the ideas presented to create fractal landscapes, chaotic systems, artificial life forms, genetic algorithms, and artificial neural networks.

Book Information

Series: MIT Press

Paperback: 514 pages

Publisher: A Bradford Book; Reprint edition (January 31, 2000)

Language: English

ISBN-10: 0262561271

ISBN-13: 978-0262561273

Product Dimensions: 8 x 0.9 x 9 inches

Shipping Weight: 2.1 pounds (View shipping rates and policies)

Average Customer Review: 4.6 out of 5 starsÂ Â See all reviewsÂ (25 customer reviews)

Best Sellers Rank: #53,433 in Books (See Top 100 in Books) #2 inÂ Books > Science & Math > Mathematics > Pure Mathematics > Fractals #6 inÂ Books > Computers & Technology > Computer Science > Computer Simulation #209 inÂ Books > Textbooks > Computer Science > Programming Languages

Customer Reviews

This is a good introductory textbook for college undergraduate mathematics and computer science students that attempts to combine the theory of computation with some mathematical concepts and in the end, manages to model virtual life by explaining basic concepts in chaos, adaptation, fractals,

and complex systems. There are better books on all of these subjects, but few others do such a good job of tying together key concepts from each discipline into the one theme of this book. However, there is only enough room to outline the included subjects rather than investigate them thoroughly.Also, the mathematics is elementary enough to be accessible to a mathematically mature high school student. The mathematics is concisely explained as it is needed, with just a page or two for each of calculus, linear algebra, affine transformations, complex numbers, vector calculus, and matrix algebra. Thus, the included mathematics makes a better refresher than a tutorial for the novice even though the author states in the preface that he wrote this book for a younger version of himself. This book teaches its subject matter mainly by demonstrating concepts through simulations that are expressed in dozens of programs which illustrate the points being made. Instructions on using the programs are scattered throughout the book. The source code is available for download on the web, along with selected excerpts from the book.I would recommend this as a first book for those interested in simulating natural concepts, but it should not be your last if your goal is to truly grasp the concepts presented and produce simulations of your own. However, an even better book on this subject is "Mathematical Models in Biology", although it is an advanced text.

I recently became interested a lot in Nature. Especially, being someone in the field of Computer Science, the computational aspect. And this book is by far one of my favourite among all the "How Nature Works" kind of books I've read.This Computational Beauty of Nature (CBofN) covered a lot of topics. Ranged from brief introduction to Computation Theory, Fractals, Chaos, Complexity, Adaptation. (See the Table of Content for more details).All topics are written in surprisingly clear and very understandable manner. With as little Math as possible. (From my opinion, these topics cannot be completely understood without Mathematics -- The Language of Nature). Therefore, it is also accessible to layperson.This book does not, however, go so deep into each subject. (You won't expect it to do that with its less-than 500 pages, don't you? :-) Instead, it does give nice backgrounds, fundamental knowledge, and important ideas for each. So, if you are interesting in any of the subjects presented here, you can go on to the more specialized books on your own.One of the nicest feature of this book, which can hardly be found in other text, is that the it does show how things work together, where and why. For example, natural phenomena like adaptation, evolution, computation, and some other things else related to each other. How can one view this from that perspective, and vice versa. etc.One other nice feature of this book is, you can really play with almost all concepts using a number of computer programs. All the programs are downloadable

(with source code, under GNU license) from the book's homepage. So, you can reproduce almost all the figures from the book.However, for one thing, the homepage address given in the book, in the edition/printing I have is incorrect.