

Review of the book
"Algorithmic Adventures"
by Juraj Hromkovič
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1 Summary of the review

In **Algorithmic Adventures** Juraj Hromkovič provides a very readable account of some of the most beautiful results in theoretical computer science.

2 Summary of the book

The book consists of ten chapters.

- **Chapter 1: A Short Story About the Development of Computer Science or Why Computer Science is Not a Computer Driving License**
The author describes fundamental aspects of a scientific approach to the theory of computation, and presents a brief history of the subject.
- **Chapter 2: Algorithmics, or What Have Programming and Baking in Common?**
The notion of *algorithm* and related concepts (*program*, *problem instance*, *etc.*) are presented by analogy with baking.
- **Chapter 3: Infinity Is Not Equal to Infinity, or Why Infinity is Infinitely Important in Computer Science**
The utility of infinity in computer science is discussed and Cantor's diagonalization method is used to show that the set of real numbers is strictly larger than the set of natural numbers.
- **Chapter 4: Limits of Computability or Why Do There Exist Tasks That Cannot Be Solved Automatically by Computers**
The existence of algorithmically unsolvable problems is established, and the method of reduction is introduced.
- **Chapter 5: Complexity Theory or What to Do When the Energy of the Universe Doesn't Suffice for Performing a Computation**
The notion of tractability is discussed and the method of reduction is further refined in the context of complexity theory.
- **Chapter 6: Randomness in Nature and as a Source of Efficiency in Algorithmics**
The concept of randomness is discussed. The introduction of randomness into algorithms is shown to make an intractable problem tractable if a small amount of error is tolerable.
- **Chapter 7: Cryptography, or How to Transform Drawbacks into Advantages**
Cryptographic security is described in terms of complexity theory and the basic ideas of public key cryptography are presented.

- **Chapter 8: Computing with DNA, or Biological Computer Technology on the Horizon**
Data representation and operations for DNA computation are discussed and an algorithm for solving the Hamiltonian Path Problem is presented.
- **Chapter 9: Quantum Computers, or Computing in the Wonderland of Particles**
A quantum model of computation is introduced and a few physical realizations of this model are discussed.
- **Chapter 10: How to Make Good Decisions for an Unknown Future or How to Foil an Adversary**
Online problems (where information is revealed over time) are discussed. Randomized algorithms are revisited in this context.

3 What is the book like (style)?

The author's stated goal is "to show the beauty, depth, and usefulness of the key ideas in computer science". I believe that he achieves this goal, and, moreover, does so in a way that is quite accessible to a popular audience.

A conversational tone and clear enthusiasm for the subject contribute to a very readable text. The truly remarkable aspect of the book is the manner in which abstract ideas (countability, computability, tractability, *etc.*) are presented for a nontechnical audience. Professor Hromkovič seems to have found a perfect balance, with just enough technical content to convey the depth and beauty of these ideas without getting bogged down in details.

The treatment of computability provides a good example of the author's approach. In Chapter 3, a concise discussion of cardinality culminates in a proof that the set of real numbers is strictly larger than the set of natural numbers. This result, while interesting in its own regard, is the essential ingredient in the proof of the existence of algorithmically unsolvable problems in Chapter 4. The entire development occurs in the course of roughly fifty pages of text (with numerous interesting digressions) assuming essentially no background beyond basic mathematics.

4 Would you recommend this book?

I recommend this book without reservation to anyone with an interest in theoretical computer science. Neophytes will find in it an outstanding introduction to the subject. Experts will appreciate its distillation of the fundamental ideas of computer science to their most essential forms.

The reviewer is a Senior Security Analyst at Envieta, LLC.