The Art of Computer Programming (TAOCP)

by Donald E. Knuth.

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Volume 1

Fundamental Algorithms, Third Edition (Reading, Massachusetts: Addison-Wesley, 1997), xx+650pp.
ISBN 0-201-89683-4
Translations of previous editions:
Romanian translation by Adrian Davidoviciu, Adrian Petrescu, Smaranda Dimitriu, and Paul Zamfirescu, *Algoritmi fundamentali* (Bucharest: Editura tehnica, 1974), 676pp.
Russian translation by Galina P. Babenko and Iu. M. Baiakovskii, edited by K. I. Babenko, and V. S. Shtarkman, *Osnovnye algoritmy* (Moscow: Mir, 1976), 735pp.
Japanese translation, under direction of Takakazu Simauti, in two volumes:

- Chapter 1, by Ken Hirose, *Kiso Gainen* (Tokyo: Saiensu-Sha, 1978), 22+331pp.;
- Chapter 2, by Nobuo Yoneda and Katsuhiko Kakehi, *Jôhô Kôzô* (Tokyo: Saiensu-Sha, 1978), 8+373pp.

Chinese translation by Guan JiWen and Su YunLin, *Ji Ben Suan Fa* (Beijing: Defense Industry Publishing Co., 1980), 14+573pp.
Spanish translation by Michel Antscherl Harlange and Joan Lluis i Biset, under direction of Ramón Puigjaner i Trepat, *Algoritmos Fundamentales* (Barcelona: Reverté, 1980), xxiii+672pp.
Indian Student Edition, with an introduction by P. C. P. Bhatt (New Delhi: Narosa Publishing House, 1985).
Hungarian translation, under direction of Miklós Simonovits, *Alapvetö Algoritmusok* (Budapest: Müszaki Könyvkiadó, 1987), 654pp.
French translation of the third edition, International Thompson Publishing, in preparation.
Japanese translation of the third edition, ASCII Corporation, in preparation.
Russian translation of the third edition, Dialektika Computer Publishing, in preparation.

Volume 2

Seminumerical Algorithms, Third Edition (Reading, Massachusetts: Addison-Wesley, 1997), xiv+762pp.
ISBN 0-201-89684-2
Translations of previous editions:
Russian translation by Galina P. Babenko, É. G. Belaga, and L. V. Maiorov, edited by K. I. Babenko, *Poluchislennye algoritmy* (Moscow: Mir, 1977), 724pp.
Japanese translation, under direction of Takakazu Simauti, in two volumes:

- Chapter 3, by Masaaki Sibuya, *Ransû* (Tokyo: Saiensu-Sha, 1982), ii+259pp.;
- Chapter 4, by Keisuke Nakagawa, *Sanjutsu Enzan* (Tokyo: Saiensu-Sha, 1986), xii+536pp.

Romanian translation by Florian Petrescu, Ioan Georgescu, Rolanda Predescu, and Paul Zamfirescu, *Algoritmi seminumerici* (Bucharest: Editura tehnica, 1983), 722pp.
Chinese translation by Guan JiWen and Su YunLin, *Ban Shu Zhi Suan Fa* (Beijing: Defense Industry Publishing Co., 1992), 10+622pp.
Hungarian translation, under direction of Miklós Simonovits, *Szeminumerikus Algoritmusok* (Budapest: Müszaki Könyvkiadó, 1987), 690pp.
French translation of the third edition, International Thompson Publishing, in preparation.
Russian translation of the third edition, Dialektika Computer Publishing, in preparation.

Volume 3

Sorting and Searching, Second Edition (Reading, Massachusetts: Addison-Wesley, 1998), xiv+780pp.+foldout.
ISBN 0-201-89685-0
Translations of the first edition:
Romanian translation by Rodica Boconcios, A. Davidoviciu, P. Dimo, Fl. Moraru, A. Petrescu, I. Sipos, and Smaranda Dimitriu, *Sortare si cautare* (Bucharest: Editura tehnica, 1976), xii+736pp.
Russian translation by Nadezhda I. V'iukova, V. A. Galatenko, and A. B. Khodulev, edited by Iu. M. Baiakovskii and V. S. Shtarkman, *Sortirovka i poisk* (Moscow: Mir, 1978), 844pp.
Chinese translation by Guan JiWen and Su YunLin, *Pei Xue He Cha Zhao* (Beijing: Defense Industry Publishing Co., 1985), viii+645pp.
Spanish translation by Jaime de Argila y de Chopitea and Ramón Puigjaner Trepat, under direction of Ramón Puigjaner Trepat *Clasificación y Búusqueda* (Barcelona: Reverté, 1980), xxiii+672pp.
Hungarian translation, under direction of Miklós Simonovits, *Keresés és Rendezés* (Budapest: Müszaki Könyvkiadó, 1988), 761pp.
French translation of the second edition, International Thompson Publishing, in preparation.
Russian translation of the second edition, Dialektika Computer Publishing, in preparation.

Volume 4

Combinatorial Algorithms, in preparation.
Present plans are to publish ``Volume 4'' as three separate subvolumes:

- Volume 4A, *Enumeration and Backtracking*
  - 7.1. Boolean techniques (aka bit fiddling)
  - 7.2. Generating all possibilities
  - 7.2.1. Combinatorial generators
  - 7.2.2. Basic backtrack
  - 7.2.3. Efficient backtracking
  - 7.3. Shortest paths
- Volume 4B, *Graph and Network Algorithms*
  - 7.4. Graph algorithms
  - 7.4.1. Components and traversal
  - 7.4.2. Special classes of graphs

- 7.4.3. Expander graphs
- 7.4.4. Random graphs
- 7.5. Network algorithms
- 7.5.1. Distinct representatives
- 7.5.2. The assignment problem
- 7.5.3. Network flows
- 7.5.4. Optimum subtrees
- 7.5.5. Optimum matching
- 7.5.6. Optimum orderings
- 7.6. Independence theory
- 7.6.1. Independence structures
- 7.6.2. Efficient matroid algorithms

- Volume 4C, *Optimization and Recursion*
  - 7.7. Discrete dynamic programming
  - 7.8. Branch-and-bound techniques
  - 7.9. Herculean tasks (aka NP-hard problems)
  - 7.10. Near-optimization
  - 8. Recursion

The material will first appear in beta-test form as fascicles of approximately 128 pages each, issued approximately twice per year beginning in 1999. These fascicles will represent my best attempt to write a comprehensive account, but computer science has grown to the point where I cannot hope to be an authority on all the material covered in these books. Therefore I'll need feedback from readers in order to prepare the official volumes later. The publishers have pledged to make the fascicles available in an inexpensive form, essentially at cost. (Of course, the paper and binding will probably be designed to self-destruct in a few years, so that you will have to buy the real book after it is debugged:-)
If all goes as planned, Volumes 4A, 4B, and 4C will be ready in the year 2004.

Volume 5

Syntactic Algorithms, in preparation.

- 9. Lexical scanning (includes also string search and data compression)
- 10. Parsing techniques

Estimated to be ready in 2009.

Future plans

As I write Volumes 4 and 5, I'll need to refer to topics that belong logically in Volumes 1--3 but weren't invented yet when I wrote those books. Instead of putting such material artificially into Volumes 4 or 5, I'll put it into fascicle form. One of the first such fascicles will be a description of `MMIX`, a RISC machine that will take the place of `MIX`.

After Volume 5 has been completed, I will revise Volumes 1--3 again to bring them up to date. In particular, the new material for those volumes that has been issued in beta-test fascicles will be incorporated at that time.

Then I will publish a ‘‘reader’s digest’’ edition of Volumes 1--5, condensing the most important material into a single book.

And after Volumes 1--5 are done, God willing, I plan to publish Volume 6 (the theory of context-free languages) and Volume 7 (Compiler techniques), but only if the things I want to say about those topics are still relevant and still haven’t been said. Volumes 1--5 represent the central core of computer programming for sequential machines; the subjects of Volumes 6 and 7 are important but more specialized.

Volumes 1--3 are available from the publisher, Addison-Wesley Publishing Company.

MIXware

The MIX computer will soon be replaced by a RISC machine called `MMIX`. Meanwhile if you want to try out the existing programs for the original 60s-era machine, you might be able to find suitable software at the following sites:

- MIXBuilder: an editor, assembler, simulator, and interactive debugger for Win32 platforms, by Bill Menees
- EMIX: an expandible MIX emulator for the Win32 platform, by Daniel Andrade and Marcus Pereira
- MIX/MIXAL in C with lex and CWEB documentation, by Douglas Laing
- MIX/MIXAL package from The Retrocomputing Museum
- a "swiss" version that can be compiled for Linux

(Please let me know of any other sites that I should add to this list.)

Errata for Volume 1

The main changes between the second and third editions of Volume 1 are listed in the Errata for Volume 1 (2nd ed.) (335K bytes of compressed PostScript, 80pp)---an archival file that is not being kept up to date. But thousands of additional refinements appear in the 3rd edition; you should really ask someone to get it for you next Christmas.

There’s also a (shorter and nearly up-to-date) list of changes to the new edition:

- Errata for Volume 1 (3rd ed.) (141K bytes of compressed PostScript, 13pp)
- Errata for Volume 1 (3rd ed.), long form (169K bytes of compressed PostScript, 19pp)
- Errata for Volume 1 (3rd ed.), TeX form (46K bytes of raw TeX text)

Note: You can’t run that TeX file through TeX; it imports all kinds of other files that are private. But if you have no way to look at compressed PostScript files, you might try reading the TeX code as a last resort; at least you’ll be able to figure out the page numbers on which corrections have been made.

Errata for Volume 2

The main changes between the second and third editions of Volume 2 are listed in the Errata for Volume 2 (2nd ed.) (555K bytes of compressed PostScript, 142pp)---an archival file that is not being kept up to date. But thousands of additional refinements appear in the 3rd edition; you should really ask someone to get it for you next Christmas.

There's also a (shorter and nearly up-to-date) list of changes to the new edition:

- Errata for Volume 2 (3rd ed.) (82K bytes of compressed PostScript, 8pp)
- Errata for Volume 2 (3rd ed.), long form (87K bytes of compressed PostScript, 9pp)
- Errata for Volume 2 (3rd ed.), TeX form (26K bytes of raw TeX text)

Note: You can't run that TeX file through TeX; it imports all kinds of other files that are private. But if you have no way to look at compressed PostScript files, you might try reading the TeX code as a last resort; at least you'll be able to figure out the page numbers on which corrections have been made.

Errata for Volume 3

The main changes between the first and second editions of Volume 3 are listed in the Errata for Volume 3 (1st ed.) (430K bytes of compressed PostScript, 109pp)---an archival file that is not being kept up to date. But thousands of additional refinements appear in the 2nd edition; you should really ask someone to get it for you next Christmas.

There's also a (shorter and nearly up to date) list of changes to the new edition:

- Errata for Volume 3 (2nd ed.) (70K bytes of compressed PostScript, 6pp)
- Errata for Volume 3 (2nd ed.), long form (91K bytes of compressed PostScript, 8pp)
- Errata for Volume 3 (2nd ed.), TeX form (20K bytes of raw TeX text)

Note: You can't run that TeX file through TeX; it imports all kinds of other files that are private. But if you have no way to look at compressed PostScript files, you might try reading the TeX code as a last resort; at least you'll be able to figure out the page numbers on which corrections have been made.

Rewards

The first finder of any error in my books receives $2.56; significant suggestions are also worth $0.32 each. At present the books are almost brand new, so your chances of finding a previously unreported error today are much better than they will be a month from now. Indeed, if you are really a careful reader, you may be able to recoup more than the cost of the books this way.

Please send your comments either by email to `taocp@cs.stanford.edu` or by old-fashioned mail to

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SPECIAL NOTE TO THE SPEAKERS OF FRENCH AND OTHER EXOTIC LANGUAGES: Numerous quotations and bibliographic citations found in this book have been copied verbatim from the original sources. If you believe you have found a typographic error, you must prove it by showing that the original was incorrect; believe it or not, your language has changed over the years, just as English has.

Although I'm working full time on Volume 4 these days, I will try to reply to all such messages within six months of receipt.

BUT PLEASE DO NOT SEND EMAIL TO TAOCP EXCEPT TO REPORT ERRORS IN THE ART OF COMPUTER PROGRAMMING.

Don Knuth's home page

Don Knuth's other books