

Numerical Methods and the C-language, 2014

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Bibliography for NRC14

Some familiarity with programming in general and the C/C++ language in particular is assumed in this course. It is not easy to find books on numerical methods with software support in one these programming languages, whereas there are tons of books that provide in depth study of the general features of the languages.

The basic reference is the huge (about 1000 pages) book:

[NRC] W. H. Press- S. A. Teukolsky- W. T. Vetterling - B. P. Flannery: Numerical Recipes in C++, 2nd ed. 2002, Cambridge Univ. Press, ISBN 0-521-75033-4

An older version in C is available for free on the www-page:

<http://www.haoli.org/nr/bookcpdf.html>.

If this does not work, googling with numerical recipes might work.

See also the supplementary example book by the same authors

Numerical Recipes Example Book (C++), 2nd ed. 2002, Cambridge Univ. Press, ISBN 0-521-750342

and the accompanying CD-ROM with about 300 programs in the C++ language, version 2.11. The newest version 3.0 will not be used.

An alternative software package is GNU Scientific Library (GSL) which provides a collection of about 1400 numeric algorithms. The use of this software is described in

GNU Scientific Library Reference Manual by M. Galassi, J. Davies, J. Theiler, B. Gough, G. Jungman, P. Alken, M. Booth, F. Rossi, 2009, ISBN: 0-9546120-7-8 (ISBN-13: 978-0-9546120-7-8).

<http://www.gnu.org/software/gsl/manual/htmlnode/>

Some of the hard to find books about the mathematical features of the C/C++ languages are

[G] R. Glassey: Numerical computation using C, Academic Press, 1993, ISBN 0-12-286155-8.

[Y] D. Yang: C++ and object oriented numeric computing for scientists and engineers, Springer-Verlag, 2001, ISBN 0-387-98990-0.

Errata: <http://www.math.wayne.edu/~yang/book/errata.htm>

These books are pleasure to read and describe the aspects relevant for our purposes.

The complete description of the C/C++ languages can be found in:

B. W. Kernighan- D. M. Ritchie: The C programming language, Second ed. Prentice Hall 1988, ISBN 0-13-110362-8.

B. Stroustrup: The C++ programming language, Third ed. Addison Wesley, 1997, ISBN 0-201-88954-4.

Both books also contain many exercises for the readers. The solutions can be found, respectively, in

C. L. Tondo- S. E. Gimpel: The C answer book, Second ed., Prentice Hall 1989, ISBN 0-13-109653-2.

D. Vandevoorde: C++ solutions, Addison Wesley, 1998, ISBN 0-201-30965-3.

Stroustrup's book is written to serve as a handbook and as such it is rather difficult for a novice in the C++ language.

Some books on numerical methods should be mentioned, too. A very useful book, perhaps the one most frequently cited in all fields of mathematics, is

[AS] M. Abramowitz- I. A. Stegun eds: Handbook of Mathematical Functions with formulas, Graphs and Mathematical Tables, Dover, 1965, ISBN 0-486-61272-4.

A book with emphasis on computation is (this book has perhaps the best www-page support I have seen)

[H] M. T. Heath: Scientific Computing- An introductory survey, Second ed. McGraw Hill, 2002, ISBN-0-07-239910-4.

Some other widely used books are J. Stoer- R. Bulirsch, S. D. Conte- C. de Boor, R. Burden- J. Faires,.... Round-off errors are present in all numerical computation and where possible, measures should be taken to diminish the accumulation of errors. These topics are discussed in

N. J. Higham: Accuracy and Stability of Numerical Algorithms, SIAM, 1996, ISBN 0-89871-355-2.

Many of the applications of mathematical modeling include solution of linear systems of equations. A comprehensive monograph on this topic is

G.H. Golub- C. F. van Loan: Matrix Computations, Fourth ed., John Hopkins Univ. Press, 2013, ISBN 978-1421407944

Practical applications of mathematical modeling are discussed in

C. R. MacCluer: Industrial Mathematics, Modeling in Industry, Science and Government, Prentice Hall, 2000, ISBN 0-13-949199-6.

Alan suomenkielistä materiaalia edustavat seuraavat teokset

J. Korpela ja T. Larmela: C-ohjelmointikieli, 3. painos, Otodata, Espoo, 1988, ISBN 951-767-049-4.

P. Hietanen: C++ ja olio-ohjelmointi, Teknolit, 2000, ISBN 951-846-000-0.(useita painoksia)

M. Mäkelä, O. Nevanlinna ja J. Virkkunen: Numeerinen matematiikka.- Gaudeamus, 1982, ISBN 951-662-326-3.

J. Haataja, J. Heikonen, Y. Leino, J. Rahola, J. Ruokolainen, ja V. Savolainen: Numeeriset menetelmät käytännössä, CSC 2002, <http://www.csc.fi/csc/julkaisut/oppaat>

R. Mäkinen ja T. Männikkö: Matemaattiset algoritmit, Jyväskylä 1993, ISBN 951-34-0174-X.

R. Mäkinen ja K. Salmenjoki: Numeeriset menetelmät, Jyväskylä 1989, ISBN 951-680-131-5.

P. Neittaanmäki M. Mäkelä ja S. Parviainen: Epälineaarinen optimointi, Jyväskylä 1988, ISBN 951-680-006-8.