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BOOK REVIEWS

Desmond J. Higham and Nicholas J. Higham, *Matlab Guide, Second Edition*, SIAM, Philadelphia, 2005, ISBN 0-89871-578-4, xxiii + 382 pp.

The first edition of this book described Matlab 6 (Release 12). This second edition incorporates changes and new features introduced in Release 13 and 14. More examples have been added, a new chapter (Case Studies - ch. 22), as well as many sections with new or reorganized material have been incorporated.

Chapter 1, *A brief tutorial*, presents by examples some of the elementary capabilities of Matlab, which are continued in the following chapter, *Basics*. The distinctive features of Matlab are defined in Chapter 3: automatic storage allocation, functions with variable arguments lists and complex arrays and arithmetic; they are also elaborated in the chapters to follow. Chapters 4 to 7 are devoted to fundamentals of Matlab: arithmetic, matrix manipulation, operators and flow control, and m-files. The following two chapters are devoted to two domains in which Matlab excels: graphics and linear algebra. Elementary examples show the facilities for 2D and 3D graphics, resp. dealing with linear systems, factorization of matrices and eigenvalue problems. The next chapter brings some more elements concerning the functions in Matlab (function handles, anonymous functions, function arguments, nested, private and recursive functions). Chapters 11 and 12 are devoted to numerical methods; carefully chosen examples relieve the powerful facilities for solving different problems (polynomials and data fitting, nonlinear equations and optimization, the Fast Fourier Transform, quadrature in ch. 11, respectively ordinary differential equations, boundary value problems, delay differential equations and partial differential equations in ch. 12) and for visualizing the results. Chapter 13 deals with input and output while Chapter 14 refers to troubleshooting. Since the main target of Matlab refers to matrix manipulation, the important class of the sparse matrix has not been omitted; some interesting aspects are treated in Chapter 14. More specialized features are discussed in the subsequent three chapters, concerning the m-files, handle graphics, resp. other data types and multidimensional arrays. The powerful resources for numerical computations in Matlab are completed by the symbolic math toolbox (constructed on the Maple core) discussed in Chapter 19. The next two chapters deal with techniques for improving the speed in executing programs and in exploiting different capabilities of Matlab. In the final chapter, Case Studies, there are treated some larger, more realistic examples. The aim is to show how Matlab can be used on nontrivial problems, as well as to point out good programming practice.

The book ends with three appendices (A. The top 111 Matlab functions, B. Changes in Matlab, C. Resources), a glossary, a bibliography and an index.

The m-files described in the book can be downloaded from the web page of the author (`http://www.maths.manchester.ac.uk/~higham/mg/`).

The impetuous growing of the Matlab community is a natural consequence of the fact that this language provides the best response to the primary needs in many fields of applied numerical analysis, such as numerical linear algebra. The present book in turn responds to the need for an alternative to the lengthy and detailed documentation, to the need for a quick introduction through relevant examples, which to enhance the main, distinctive features. Undoubtedly, the authors have successfully accomplished this task, and have also put, as usually, their distinctive mark.

Emil Cătinaş

Cleve B. Moler, *Numerical Computing with Matlab*, SIAM, Philadelphia, PA, 2004, ISBN 0-89871-560-1 XI + 336 pp.

The book under review is an axcellent textbook for an introductory course in numerical methods, Matlab, and technical computing. It is structured on 11 chapters, a bibliography and an index, shortly described as follows: 1. *Introduction to Matlab*: by various problems and examples. 2. *Linear systems of equations*: Gaussian elimination, effect of roundoff errors, condition numbers, pagerank and Markov chains. 3. *Interpolation*: Lagrange, piecewise linear, piecewise cubic Hermite as well as some standard routines in Matlab, shape-preserving piecewise cubic polynomials. 4. *Zeros and roots*: bisection, Newton, secant, inverse quadratic interpolation and the algorithm `zeroin`, and its Matlab implementation `fzero` with a simplified description. 5. *Least squares*: the Householder reflections and QR method briefly described and applied to curve fitting. 6. *Quadrature*: principles of adaptive quadrature are described. 7. *Ordinary differential equations* presents the Matlab simplest functions for their numerical integration, and then compares them for different features, such as efficiency, accuracy, performance. Further concepts are briefly described, such as stiffness and errors. 8. *Fourier analysis*: finite Fourier transform, periodic time series, fast (finite) Fourier transform. 9. *Random numbers*: description of some algorithms for the generation of pseudorandom numbers with uniform and normal distribution. 10. *Eigenvalues and singular values*: computational algorithms and sensitivity to perturbations. 11. *Partial differential equations*: three classical model problems for second order partial differential equations are considered, together with finite differences method and the numerical stability.

The emphasis in this book is on the informed use of mathematical software. Each method and technique described is accompanied by an illustrative program written in Matlab. The standard Matlab routines for the problems discussed are tailored and simplified in order to analyze certain aspects described in the book.

Numerous exercises require the reader to modify and to extend the programs.

The routines and programs can be downloaded from the author's web page (`www.mathworks.com/moler`) so that running them is just some clicks away. Moreover, the programs make extensively use of graphical output, which make the intrinsic aspects and essential features to be easier to understand.

Finally, we cannot help ourselves asking: who else can better teach the introduction about numerical computing with Matlab other than the very creator of Matlab?

Emil Cătinaş