

Book Reviews

Numerical Methods in Engineering with MATLAB

J. Kiusalaas

Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK. 2005. 426pp. Illustrated. £45. ISBN 0-521-85288-9.

Numerical Methods in Engineering with Python

J. Kiusalaas

Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK. 2005. 424pp. Illustrated. £45. ISBN 0-521-85287-0.

These are practical books that should serve very well as study aids for students or professionals involved in solving numerically engineering problems. The books focus on the importance of understanding the underlying numerical methods. They also provide sufficient information about how to apply Matlab or Python for solving different problems. Although other computer language programmers could benefit from these books, the choice of Matlab and Python as a programming platform and engineering tool is very reasonable. Matlab is a popular high-level scripting language for scientific computing and offers comprehensive numerical functionality. On the other hand the Python environment is completely open and thanks to its object-oriented design could be easily integrated with external tools. Python runs on most computers regardless of the platform and is freely available on the web. Therefore the book with Python could be an attractive option for many readers.

The author introduces the selection of numerical methods with a basic theoretical explanation. The material is well organised and allows the reader to progress from the basic concepts to more advanced numerical methods. Every algorithm is explained and supported by figures and numerical scripts to help understanding. Particularly useful are examples and problem sets which follow individual topics, as well as discussion of the disadvantages of different methods. The reader

receives guidance on choosing and applying specific numerical methods to a given problem and, more importantly, how to implement these methods. The emphasis is on understanding the strengths and weaknesses of numerical procedures, rather than how they are programmed.

The author has arranged the material in a very logical and concise way. The books start with introductions to Matlab and Python respectively, covering basic philosophy of the programming environments and specific features related to organisation of data types, variables, operators and functions. The following chapters are common for both books with the exception of examples, which are presented using Python or Matlab syntax depending on the book. The reader who has access to both books can see differences in these two languages. The most popular methods of solution of linear algebraic equations, with direct and iterative solution approaches, are clearly described. Practical recommendations on how numerical data should be organised and stored are given. The other major chapters treat interpolation and data fitting, numerical differentiation and integration. The chapter on eigenvalue problems concentrates on methods of finding eigenvalues from banded matrices. Initial and more difficult boundary value problems are covered, together with ordinary differential equations. The selection of algorithms in these chapters includes interesting recent developments for higher accuracy problems. The last chapter is concerned with the problem of optimisation and contains carefully selected relatively simple computational examples. This is a particularly clear and useful groundwork for more sophisticated problems. The weaker side of these books is the lack of a final chapter with references where interested readers could find supplementary information to described numerical techniques and additional information on the class of problems presented. Only limited references are provided in a footnote on selected pages.

These are attractive textbooks constituting a useful addition to engineering courses, and certainly of great value to many postgraduate research students offering a nice introduction to the subject of numerical methods. The extensive use of examples for which the source code can be downloaded from the book's website is a welcomed addition.

Dr A.F. Nowakowski

ELINT: the Interception and Analysis of Radar Signals

R.G. Wiley

Artech House, 46 Gillingham Street, London, SW1V 1AH. 2006. 451pp. Illustrated. £82.00. ISBN 1-58053-925-4.

A key part of the cat-and-mouse game of electronic warfare (EW) is the subject of electronic intelligence (ELINT). Since many of the reports and publications on this subject are classified, an open-literature book is of great interest. This title is an updated and extended version of earlier books in the Artech House Radar Library by the same author: *Electronic Intelligence: The Analysis of Radar Signals* (1983; Second edition – 1993) and *Electronic Intelligence: The Interception of Radar Signals* (1985). Dr Wiley regularly lectures on these subjects, and is certainly well-qualified to write these books.

The book is organised in sixteen chapters and five appendices. The introductory chapters describe the basis of ELINT and the implications of the radar range equation, followed by the characteristics of ELINT interception receiver systems. Successive chapters describe the techniques used to estimate the parameters of radar signals: direction of arrival, frequency, pulse length, pulse repetition frequency, modulation, transmit power and antenna scan parameters, as well as techniques for deinterleaving in a multi-signal environment and hence for the recognition of particular radar emitters. From a UK point of view it is nice to see credit for the contribution in 1957 to the invention of the technique of instantaneous frequency measurement (IFM) given to Dr S.J. Robinson, then of the Mullard Research Laboratories.

The book is written at graduate level in a clear and logical style, at an appropriate level of mathematical detail, and with numerous diagrams and graphs to help explain the points being made. In summary, it provides a detailed exposition of the techniques of ELINT and their performance and limitations, and will certainly be of use, both to students of the subject and to practising engineers.

**Hugh Griffiths FEng,
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Undergraduate research projects

A research project is often an important part of many university undergraduate courses. The Royal Aeronautical Society is occasionally approached regarding publication of papers from such projects in *The Aeronautical Journal*.

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