Error curves


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Book Review


The first chapter of this book contains an account of the mathematical background to the algebraic eigenvalue problem, with emphasis on the manner in which the eigensystem is related to the various canonical forms of a matrix. The remainder of the book deals with the practical problems involved in computing eigenvalues and eigenvectors on a digital computer and in determining their accuracy.

Chapter 2 discusses the way in which the eigensystem is affected by small changes in the elements of the matrix. This leads to a chapter on error analysis of the type that the author has especially pioneered. In Chapter 4 the earlier material is applied to the problem of solving linear algebraic equations and some consideration is given to the various numerical methods that are available.

In Chapter 5 the author describes techniques for solving the eigenvalue problem for Hermitian matrices. This is one of the most important chapters in the book. In Chapter 6 the author passes to the more difficult problem of computing the eigensystem of a general matrix and deals in particular with its reduction to condensed (Hessenberg) form. He then goes on to describe how eigenvalues and eigenvectors of the condensed matrix can be obtained. The two final chapters deal with the LR and QR algorithms and with iterative methods.

No review would give an adequate impression of this book if it did not emphasize its massive character. Most of the chapters are around 70 pages in length and the whole book runs to about 650 pages. The chapters start with the briefest of statements as to their scope and are packed with detailed information. The book is designed for the professional numerical analyst with research interests in the field, and in no way caters for the less specialized worker who would like to obtain an understanding of the problems at a less detailed level. However, an exception must be made in the case of the first chapter, which will undoubtedly be of real use to many people who will not make much of the rest of the book. In spite of all the detail, the author nowhere goes off into realms of purely mathematical interest; as anyone who knows him would expect, he keeps in sight throughout the ultimate objective of practical computation on a digital computer. The book is without doubt an important addition to the specialized literature on numerical analysis.

M. V. Wilkes