

JULY 01 1991

C Language Algorithms for Digital Signal Processing FREE

Paul M. Embree; Bruce Kimble; James F. Bartram



J. Acoust. Soc. Am. 90, 618 (1991)

<https://doi.org/10.1121/1.401205>



View
Online



Export
Citation

CrossMark

Related Content

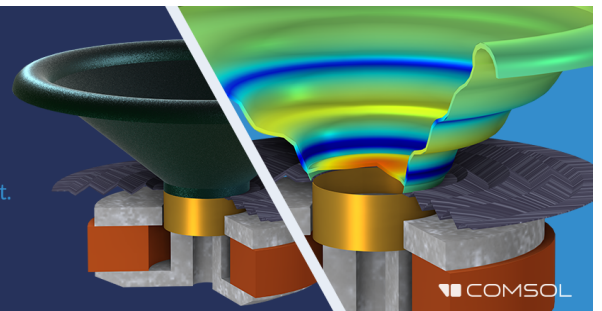
BBC Guide to Acoustic Practice—Second Edition

J Acoust Soc Am (July 1991)

Take the Lead in Acoustics

The ability to account for coupled physics phenomena lets you predict, optimize, and virtually test a design under real-world conditions – even before a first prototype is built.

» Learn more about COMSOL Multiphysics®



COMSOL

BOOK REVIEWS

Robert T. Beyer

Department of Physics, Brown University, Providence, Rhode Island 02912

The opinions expressed are those of the individual reviewers and are not necessarily endorsed by the Editorial Board of this Journal.

Editorial Policy: *If there is a negative review, the author of the book will be given a chance to respond to the review in this section of the Journal and the reviewer will be allowed to respond to the author's comments. [See "Book Reviews Editor's Note," J. Acoust. Soc. Am. 81, 1651 (May 1987).]*

C Language Algorithms for Digital Signal Processing

Paul M. Embree and Bruce Kimble

Prentice Hall, Englewood Cliffs, New Jersey, 1991.
xvi + 456 pp. + diskette. Price \$44.00.

The acoustic signal processing field comprises those of us acousticians who find a need to detect a signal in the presence of noise or distortion, and having detected it to estimate its parameters. We should like to do the best (Latin: *optimum*) we can under the circumstances. It may or may not turn out that the answer to this abstract mathematical exercise is to filter, take a Fourier transform, perform matrix and vector arithmetic, or do image processing. Suppose that we determine that one or more of these functions is in fact optimum or suppose that one or more of these functions is a good approximation to the optimum. Then we are motivated to perform them in an efficient cost-effective way. This is where the book under review comes to the rescue. To quote the authors, Embree and Kimble, "digital techniques have become the method of choice in signal processing as digital computers have increased in power, speed, and convenience and as powerful microprocessors have become more available."

All right; but what is this thing called "C language?" According to its inventors, Kernighan and Ritchie [B. W. Kernighan and D. M. Ritchie, *The C Programming Language (2nd ed.)*, Prentice Hall (1988)], "C is a general-purpose programming language...originally designed for and implemented on the UNIX[®] operating system..." They also say that "C is not a 'very high level' language." Embree and Kimble, for their part, state that "...the C language is proving itself to be the most valuable programming tool for real-time and computationally intensive tasks," going on to say that "The C language is a reasonably high-level language..." Embree and Kimble say that "we are fully aware that there are personal and historical biases toward using FORTRAN for digital signal processing. We were both introduced to [digital signal processing (DSP)] with FORTRAN programs. However, we believe that the reasons for the movement to C will overwhelm the resistance to change." They are undoubtedly correct in this assessment, but this reviewer confesses to a personal partiality to APL, because of its ability to do what C cannot do. In the words of Kernighan and Ritchie, "C provides no operations to deal directly with composite objects such as character strings, sets, lists or arrays." Well, enough of that.

The book under review starts with a chapter on "Digital Signal Processing Fundamentals." Now of course this material can be obtained from a number of excellent texts, some of them authored by Fellows of the Acoustical Society of America. As a matter of fact, these books are referenced at the end of the chapter. Similarly, the second chapter is on "C Programming Fundamentals," a subject well covered in several books—including Kernighan and Ritchie—also referenced at the end of the chapter. It is evident that Embree and Kimble wish to bring the material together in one place. They do say that "readers familiar with these topics may wish to skip one or both chapters." Before hastening on, though, this reviewer would like to say that Chap. 2 contains more than just fundamentals. The authors are concerned with efficient programming, and to this end they educate the reader in advanced concepts related to pointers and structures. They go still further: in Sec. 2.11, Comments on Programming Style, they concern themselves with reliability, maintainability, and extensibility, in addition to effi-

ciency. Here they are operating on a higher philosophical plane than is inherent in the mission of their book. Returning to the enumeration of the chapters, the third chapter, entitled "User Interface and Disk Storage Routines," deals with some necessary housekeeping associated with the use of their enclosed diskette. The following four chapters treat their basic DSP functions: "Filtering Routines," "Discrete Fourier Transform Routines," "Matrix and Vector Routines," and "Image Processing Routines." Finally, Appendix A details the Standard C Function Library, while Appendix B describes their DSP Function Library and Programs.

Then there is the diskette. This reviewer had some of his colleagues try it out. They were impressed. Some minor specific comments: They had to use the IEEE McClellan-Parks program to design a finite impulse response (FIR) filter; that was not on the diskette. As for portability, they encountered a small, easily solved problem with the declaration of the three types of integer numbers (int, short int, and long int).

There is no doubt that this is a well-written, technically correct, useful, and quite reasonably priced book. Is it alone in the field? Definitely not. The authors' excellent chapter-end references actually list many of the competitors! The potential user has plenty of choice. If she or he chooses this book, that person will not be at all disappointed.

JAMES F. BARTRAM

Raytheon Company
1847 West Main Road
Portsmouth, Rhode Island 02871

BBC Guide to Acoustic Practice—Second Edition

Keith A. Rose

British Broadcasting Corporation, Broadcasting House, London, W1A1AA.
144 pp. + 1 fold out chart, wire spiral bound. Price 30 £.

Keith Rose brings to bear his 28 years of experience designing studios and related facilities for the BBC. As an "acoustic architect" (an appropriate term, but unfamiliar here in the United States) for the BBC architectural and civil engineering department, Mr. Rose has accumulated a wealth of practical experience in studio design that he shares in a meticulously organized 8½ × 12 in. volume printed on heavy glossy stock. However, the combination of glossy paper and the unseriffed character style resembling a smaller version of the IBM Selectric Orator type, can cause its two-column pages to be difficult to read, especially in direct light.

The book contains 9 black and white photographs and 48 well-drawn details, plans, and sections. These all illustrate the author's points, but in a style using construction features and terminology that are somewhat unfamiliar to most of us here in the United States. This fairly well characterizes the writing style as well. It is largely clear, precise, leans towards being a little wordy, and is quite British in style. Technical terms like "plinth," "howlround," "pugging," "woodwool," etc. are new to this reviewer. The British style of written word and architectural detail, however, is not a