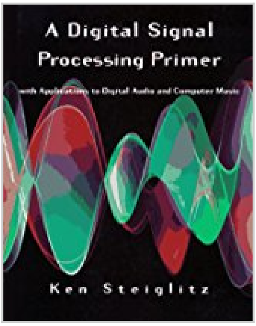

A Digital Signal Processing Primer: With Applications to Digital Audio and Computer Music

By Ken Steiglitz

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This text is directed at the market of DSP users brought about by the development of powerful and inexpensive software tools to analyze signals. These tools allow sophisticated manipulation of signals but do not provide an understanding of the theory or the foundation for the techniques. This work develops an approach to the development of the mathematics of DSP and uses examples from areas of the spectrum familiar to beginners, together with questions and suggested experiments

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Editorial Review

From the Inside Flap
Using computer technology to store, change, and manufacture sounds and pictures -- digital signal processing -- is one of the most significant achievements of the late twentieth century. This book is an informal, and I hope friendly, introduction to the field, emphasizing digital audio and applications to computer music. It will tell you how DSP works, how to use it, and what the intuition is behind its basic ideas. By keeping the mathematics simple and selecting topics carefully, I hope to reach a broad audience, including:

beginning students of signal processing in engineering and computer science courses; composers of computer music and others who work with digital sound; World Wide Web and internet practitioners, who will be needing DSP more and more for multimedia applications; general readers with a background in science who want an introduction to the key ideas of modern digital signal processing. We'll start with sine waves. They are found everywhere in our world and for a good reason: they arise in the very simplest vibrating physical systems. We'll see, in Chapter 1, that a sine wave can be viewed as a phasor, a point moving in a circle. This representation is used throughout the book, and makes it much easier to understand the frequency response of digital filters, aliasing, and other important frequency-domain concepts. In the second chapter we'll see how sine waves also arise very naturally in more complicated systems -- vibrating strings and organ pipes, for example -- governed by the fundamental wave equation. This leads to the cornerstone of signal processing: the idea that all signals can be expressed as sums of sine waves. From there we take up sampling and the simplest digital filters, then continue to Fourier series, the FFT algorithm, practical spectrum measurement, the z-transform, and the basics of the most useful digital filter design algorithms. The final chapter is a tour of some important applications, including the CD player, FM synthesis, and the phase vocoder. At several points I return to ideas to develop them more fully. For example, the important problem of aliasing is treated first in Chapter 3, then in greater depth in Chapter 11. Similarly, digital filtering is reexamined several times with increasing sophistication. This is why you should read this book from the beginning to the end. Not all books are meant to be read that way, but this one definitely is. Some comments about mechanics: All references to figures and equations refer to the current chapter unless stated otherwise. Absolutely fundamental results are enclosed in boxes. Each chapter ends with a Notes section, which includes historical comments and references to more advanced books and papers, and a set of problems. Read the problems over, even if you don't work them the first time around. They aren't drill exercises, but instead mention generalizations, improvements, and wrinkles you will encounter in practice or in more advanced work. A few problems suggest computer experiments. If you have access to a practical signal-processing laboratory, use it. Hearing is believing. Many people helped me with this book. First I thank my wife Sandy, who supports me in all that I do, and who helped me immeasurably by just being. For his generous help, both tangible and intangible, I am indebted to Paul Lansky, professor of music and composer at Princeton. The course on computer music that we teach together was the original stimulus for this book. I am indebted to many others in many ways. Perry Cook, Julius Smith, Tim Snyder, and Richard Squier read drafts with critical acumen, and their comments significantly improved the result. And I also thank, for assistance of various flavors, Steve Beck, Jack Gelfand, Jim Kaiser, Brian Kernighan, Jim McClellan, Gakushi Nakamura, Matt Norcross, Chris Pirazzi, John Puterbaugh, Jim Roberts, and Dan Wallach. Ken Steiglitz Princeton, N.J.

From the Back Cover

This new book by Ken Steigliz offers an informal and easy-to-understand introduction to digital signal processing, emphasizing digital audio and applications to computer music. A DSP Primer covers important topics such as phasors and tuning forks; the wave equation; sampling and quantizing; feedforward and feedback filters; comb and string filters; periodic sounds; transform methods; and filter design. Steiglitz uses an intuitive and qualitative approach to develop the mathematics critical to understanding DSP.

A DSP Primer is written for a broad audience including:

- Students of DSP in Engineering and Computer Science courses.
- Composers of computer music and those who work with digital sound.
- WWW and Internet developers who work with multimedia.
- General readers interested in science that want an introduction to DSP.

Features:

- Offers a simple and uncluttered step-by-step approach to DSP for first-time users, especially beginners in computer music.
- Designed to provide a working knowledge and understanding of frequency domain methods, including FFT and digital filtering.
- Contains thought-provoking questions and suggested experiments that help the reader to understand and apply DSP theory and techniques.

About the Author

Ken Steiglitz is a Professor in the Computer Science Department at Princeton University where he is also Associate Chair. He received his M.E.E. and Eng.Sc.D. degrees from New York University. His current research interests inlude parallel computer architectures, economic simulations, and tools for computer music.

Users Review

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This A Digital Signal Processing Primer: With Applications to Digital Audio and Computer Music are generally reliable for you who want to become a successful person, why. The explanation of this A Digital Signal Processing Primer: With Applications to Digital Audio and Computer Music can be among the great books you must have will be giving you more than just simple reading through food but feed anyone with information that perhaps will shock your prior knowledge. This book is usually handy, you can bring it almost everywhere and whenever your conditions at e-book and printed kinds. Beside that this A Digital Signal Processing Primer: With Applications to Digital Audio and Computer Music giving you an enormous of experience including rich vocabulary, giving you trial run of critical thinking that we know it useful in your day activity. So , let's have it and revel in reading.

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