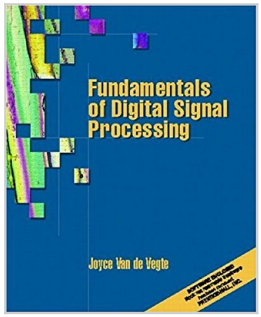

Fundamentals of Digital Signal Processing

By Joyce Van de Vegte

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This professional reference provides thorough coverage of digital signal processing techniques and all essential theory—extensively supported by examples, but not dependent on calculus. Motivated learners (even those several years out of school) will be able to master the major DSP methods presented here with step-by-step explanations. The book contains a variety of interesting and in-depth DSP explorations to help establish the link between theory and practice—and give readers a sense of how DSP is used, and an introduction to hardware and software for digital signal processors. For Electrical and Electronics Engineers, Electronics Technologists, Electronics Engineering Technologists, Computer Engineering Technologists, and Researchers.

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Editorial Review

From the Back Cover

Digital signal processing (DSP) can no longer be considered the domain of graduate students and researchers. It now pervades the technology that we take for granted in our homes and offices, and its influence is growing. Increasingly, DSP is being considered an essential technical skill.

FUNDAMENTALS OFDIGITAL SIGNAL PROCESSING was written to create an accessible resource for college and university students, engineers, and computer scientists who want to gain a working knowledge of the principles, applications, and language of DSP. To make the ideas accessible, calculus is not used in the main text. Essential mathematical topics needed to understand the material are included in an appendix.

All key concepts of DSP are covered in this text, including details of how to perform transforms and design filters. The coverage is heavily supported by examples throughout the text, which focus on real-life sounds such as speech, whale songs, and seismic vibrations and on real-life images such as fingerprints, bacteria, and airport X-rays.

The CD packaged with the book includes sample sounds, images, data, and movies for most chapters, as well as software for spectrograms and wavelets. The sun symbol in the margins of the text indicates illuminating material is available on the CD. Matlab™ files and examples of how to use them are also included so the reader can verify methods presented in the text and solve end-of-chapter problems with ease. Quick tests of basic chapter concepts are provided as well.

Instructors using this book will benefit from the accompanying Instructor's Manual with CD-ROM (ISBN: 0-13-033263-1).

Digital signal processing (DSP) can no longer be considered the domain of graduate Students and researchers. It now pervades the technology that we take for granted in our homes and offices, and its influence is growing. This book was written to create an accessible resource for college students, engineers, and computer scientists wanting to gain a working knowledge of the principles, applications, and language of DSP.

First and foremost, DSP is exciting! The author attempts to give readers a sense of this excitement immediately by starting with a nonmathematical crash course in DSP In the chapters that follow, examples frequently focus on real-life sounds—such as speech, whale songs, and seismic vibrations—and on real-life images—such as fingerprints, bacteria, and airport X-rays. The accompanying CD provides links between graphs and sounds, and allows readers to hear for themselves the "before" and "after" of processing. Once the necessary theory has been covered, in-depth applications of speech recognition, image processing, motor control, and encryption are studied, among others.

All key concepts of DSP are covered in this text, including details of how to perform transforms and design filters. This coverage is heavily supported by examples throughout. To make the ideas as accessible as possible, no calculus is used at all in the main text. While the mathematical techniques that are used are not trivial, they are always presented in as straightforward a manner as possible. Even students with strong

mathematical backgrounds will appreciate the chance to focus on issues of DSP rather than mathematics. Essential mathematical topics that are prerequisite to understanding the material in the text are included in an appendix.

Chapter 1 contains the "Crash Course in Digital Signal Processing." It provides a surface treatment of all the major topics of the book, without going into details of the underlying mathematics. Chapter 2 explains how to obtain a digital signal from the analog signals that surround us, and Chapter 3 provides some experience with defining and handling digital signals. Chapters 4 through 8 contain the majority of the important underlying theory for DSP Topics covered in these chapters include difference equations, digital convolution, *z* transforms, discrete time Fourier transforms, and discrete Fourier series. The essential concepts of filter, transfer function, frequency response, and spectrum are developed. Filter design is taken care of in Chapters 9 and 10, for both finite impulse response and infinite impulse response filters. Practical aspects are covered beginning with Chapter 11, which discusses discrete and fast Fourier transforms, followed by Chapters 12 and 13, which examine DSP hardware and programming issues. Applications of DSP for sounds and images are investigated in Chapters 14 and 15. Finally, Chapter 16 provides a description of wavelet theory and applications. Appendix A contains "The Math You Need," while the other appendices prove claims made in the text so that the text may stand on its own, without the need for outside references. End-of-chapter summaries and questions are provided for each chapter. The accompanying CD includes sample sounds, images, data, and video sequences for most chapters, as well as software for spectrograms and wavelets. The sun symbol in the margin of the text indicates that illuminating material is available on the CD. Matlab files and examples of how to use them are included on the CD to permit the reader to verify methods presented in the text. These files can also be used to solve many end-of-chapter problems with ease. Quick tests of basic chapter concepts are provided on the CD as well. The instructor's manual includes solutions to text problems, laboratories based on Matlab and the Analog Devices ADSP-2181 EZ-KIT Lite DSP development kit, and laboratory guides. It is accompanied by a CD containing PowerPoint® slides of key text graphics, as well as laboratory documents and solution set files. All comments, suggestions, and reports of errors in the text or software will be most appreciated. They may be sent to Joyce Mills (née Van de Vegte) at **millsj@camosun.bc.ca** .

Because the mathematical requirements of this text are moderate, the book can be used as early as the second year of a college engineering or technology program. Increasingly, DSP will be considered an essential technical skill. Perhaps this text can be of use as the pressure grows to teach DSP earlier in the curriculum.

I must thank my colleagues in the Computer and Electronics Engineering Technology Department of Camosun College for lending their expert advice, both solicited and unsolicited, on many topics addressed herein. Faculty in other departments, particularly Stewart Langton and Mile Erlic, were also most generous with their time, and Jon Jacox and other students were kind enough to proof many of the question and solution sets. Thanks go also to the Dean of Technology, Baldev Pooni, and the Vice President of the College, Bob Priebe, for their support of this initiative.

Several individuals at Prentice Hall helped to make the text a reality. I wish to thank my editor, Charles Stewart, for his contagious excitement about the project when it first began, and also editorial representative Carmen Batsford for her excellent advice and good sense of humor throughout. A special thank you must go to Delia Uherec, assistant editor, who promptly and expertly answered my questions and did everything possible to remove obstacles from my path. Delia's well-timed words of encouragement in the final phases of manuscript preparation were most appreciated.

As this text was being prepared, a number of reviewers provided constructive comments and suggestions that have certainly improved the finished product: Kefu Xue, Wright State University; Anthony Oxtoby, Purdue University; Mark Hihghum, Bay De Noe Community College; Charles A. Cipari, Arizona State University;

and Charles J. Eckard, ITT Technical Institute. Also, my father, Dr. J. Van de Vegte, a textbook author himself, painstakingly edited not one but two complete draft manuscripts. He was surely my harshest critic, but the book is many times better as a result of his input, and my mother assures me that "rewrite this section" is just his way of saying "I love you."

In my home, my children whisper the word "textbook" reverently, as if it were one of the great and mysterious wonders of the world. I am humbled by how generously my family has accommodated my obsession. While I was ensconced at my computer, my dear husband Don juggled job, children, and housework, and only occasionally reminisced aloud about how life used to be. Indeed, the only downside to finishing the text is that I will have to start doing dishes again. My children—Stevin, Jesika, and Eric—will be joyful when my time is theirs again, as will I.

Jessy and Eric say this book will make you smarter. I hope they're right. Of course, their other idea was to use it to start the campfire: There's a lesson here somewhere.

Users Review

From reader reviews:

Ralph Capra:

The guide with title Fundamentals of Digital Signal Processing has a lot of information that you can find out it. You can get a lot of advantage after read this book. This specific book exist new information the information that exist in this book represented the condition of the world at this point. That is important to yo7u to understand how the improvement of the world. This particular book will bring you inside new era of the syndication. You can read the e-book on your smart phone, so you can read that anywhere you want.

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