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978-0-521-85478-8 - Practical Signal Processing
Mark Owen
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PRACTICAL SIGNAL PROCESSING

The principles of signal processing are fundamental to the operation of everyday devices such as digital cameras, mobile telephones and digital audio players. This book introduces the basic theory of digital signal processing, placing a strong emphasis on the use of techniques in real-world applications. The author uses intuitive arguments rather than mathematical ones wherever possible, reinforced by practical examples and diagrams.

The first part of the book covers sampling, quantisation, the Fourier transform, filters, Bayesian methods and numerical considerations. These ideas are then developed in the second part, illustrating how they are used in audio, image, and video processing and compression, and in communications. The book concludes with methods for the efficient implementation of algorithms in hardware and software. Throughout, links between various signal processing techniques are stressed and real-world examples showing the advantages and disadvantages of the different approaches are presented, enabling the reader to choose the best solution to a given problem.

With over 200 illustrations and over 130 exercises (including solutions), this book will appeal to practitioners working in any branch of signal processing, as well as to undergraduate students of electrical and computer engineering.

MARK OWEN received his Ph.D. in Speech Recognition from Cambridge University in 1992, after which he has worked in industry on digital signal processing applications in video, audio and radar. He is currently a freelance consultant in this, and related, fields.

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Preface

This is a book you can read in the park, on the beach, at the bus stop – or even in the bath.

The book is in two parts. The first part takes you step-by-step through the fundamental ideas of digital signal processing, while the second part shows how these ideas are used in a wide range of practical situations. My aim is that by the end of the book you will understand many of the signal processing algorithms and techniques that are essential to everyday devices such as digital cameras, modems, digital set-top boxes, mobile telephones and digital audio players. I have used examples drawn from the operation of such devices to help explain points in the text.

You do not need to know any calculus to understand any of the ideas discussed. A basic understanding of trigonometry and of arithmetic on complex numbers is necessary, however; and a very basic knowledge of the principles of electronic circuits is helpful, but by no means essential.

If you are a student, I hope that the approach this book takes will give you a more concrete and more intuitive grasp of the principles of digital signal processing than a purer mathematical treatment would. If you are a practising engineer or programmer with a particular problem to solve, I hope that the book helps you understand the problem and decide on the right way to tackle it. And if you are just interested in the subject for its own sake, I hope you enjoy the book.

There are exercises at the end of each chapter. Some of them you can probably do in your head; for some you might need pencil and paper; and for some you will need to write a short program. Some are slightly more ambitious programming projects. A few ask you to criticise inappropriate solutions to signal processing problems suggested by a hypothetical friend who has clearly not read this book: if you have any friends in this position you can remedy the situation by buying them a copy. Please try the easier exercises and at least think about how you would go about the harder ones; and please don't take your computer into the bath.

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