

Second Edition

Streamlining Digital Signal Processing

A Tricks of the Trade Guidebook

Edited by Richard G. Lyons

 WILEY

 IEEE

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This book is dedicated to all the signal processing engineers who struggle to learn their craft and willingly share that knowledge with their engineering brethren—people of whom the English poet Chaucer would say, “Gladly would he learn and gladly teach.”

Preface

An updated and expanded version of its first edition, this book presents recent advances in digital signal processing (DSP) to simplify, or increase the computational speed of, common signal processing operations. The topics here describe clever DSP *tricks of the trade* not covered in conventional DSP textbooks. This material is practical, real-world DSP tips and tricks as opposed to the traditional highly specialized, math-intensive research subjects directed at industry researchers and university professors. Here we go beyond the standard *DSP fundamentals* textbook and present new, but tried-n-true, clever implementations of digital filter design, spectrum analysis, signal generation, high-speed function approximation, and various other DSP functions.

Our goal in this book is to create a resource that is relevant to the needs of the working DSP engineer by helping bridge the theory-to-practice gap between introductory DSP textbooks and the esoteric, difficult-to-understand academic journals. We hope the material in this book makes the practicing DSP engineer say, “Wow that’s pretty neat—I have to remember this, maybe I can use it sometime.” While this book will be useful to experienced DSP engineers, due to its gentle tutorial style it will also be of considerable value to the DSP beginner.

The mathematics used here is simple algebra and the arithmetic of complex numbers, making this material accessible to a wide engineering and scientific audience. In addition, each chapter contains a reference list for those readers wishing to learn more about a given DSP topic. The chapter topics in this book are written in a stand-alone manner, so the subject matter can be read in any desired order.

The contributors to this book make up a *dream team* of experienced DSP engineer-authors. They are not only knowledgeable in signal processing theory, they are “make it work” engineers who build working DSP systems. (They actually know which end of the soldering iron is hot.) Unlike many authors whose writing seems to say, “I understand this topic and I defy you to understand it,” our contributors go all-out to convey as much DSP understanding as possible. As such the chapters of this book are postcards from our skilled contributors on their endless quest for signal processing’s holy grail: accurate processing results at the price of a bare minimum of computations.

Software simulation code, in the C-language, MATLAB®, and MathCAD® is available for some of the material in this book. The Internet website URL address for such software is <http://booksupport.wiley.com>.

We welcome you to this DSP tricks of the trade guidebook. I, the IEEE Press, and John Wiley & Sons hope you find it valuable.

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“If you really wish to learn then you must mount the machine and become acquainted with its tricks by actual trial.”

—Wilbur Wright, co-inventor of the first successful airplane,
1867–1912

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Part One

Efficient Digital Filters

