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**WORKSHOP ON REMOTE SENSING TECHNIQUES
WITH APPLICATIONS TO AGRICULTURE, WATER
AND WEATHER RESOURCES**

(27 February - 21 March 1989)

DIGITAL FILTERS AND THEIR APPLICATIONS

V. CAPPELLINI
University of Florence
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Florence
ITALY

DIGITAL SIGNAL PROCESSING

edited by
V. Cappellini and A.G. Constantinides

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Techniques of Physics Series Number 4

Digital Filters and their Applications

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Consiglio Nazionale delle Ricerche, Florence, Italy

"Overall this book is good value: it contains a very large number of references, it is up to date, well written and easy to follow . . . I would think that the engineer needing to design a digital filter could do little better than start by reading this text!"

L. G. Cuthbert in *Electronics and Power*

1978, xvi + 384pp., \$57.00

0.12.159250.2

Contents

Digital filters
Design methods of finite impulse response digital filters
Design methods of infinite impulse response digital filters
Quantization effects and noise in digital filters
Evaluation of digital filter coefficients
Software implementation of digital filters
Hardware implementation of digital filters
Applications of digital filters
Appendices. Index.

Physics of Computer Memory Devices

S. Middelhoeck

Department of Electrical Engineering
Delft University of Technology
The Netherlands

P. K. George

Rockwell International Electronics
Research Division, Anaheim
California, USA

and P. Dekker

Department of Electrical Engineering
Delft University of Technology
The Netherlands

1976, x + 402pp., \$55.50

0.12.495050.7

"The book covers rather more than the title suggests since it gives not only the physical principles of the various devices but includes their organisation and circuit details where appropriate.

"The book should thus interest all computer engineers who wish to keep abreast of recent developments in digital computer storage systems and also physicists concerned with their underlying principles."

J. C. Cluley in *The Computer Journal*

Contents

Introduction
Computer architecture. History of storage techniques. References.
Delay line memories and materials
Delay line memories. Fundamental considerations. Ultrasonic bulk wave delay lines. Surface wave delay lines. References.
Matrix memories
Introduction. Magnetic memories. Ferroelectric matrix memories. Semiconductor memories. Superconductive memories. References.
Beam accessible memories
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Electromechanically accessible magnetic surface memories
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Subject index

DIGITAL SIGNAL PROCESSING

edited by V. Cappellini

*Facoltà di Ingegneria
Università degli Studi
Florence, Italy*

and A. G. Constantinides

*Department of Electrical Engineering
Imperial College of Science and Technology
London, England*

July 1980, xx + 292pp., \$52.50

0.12.159080.1

The past decade has seen an increase in the importance of digital methods and techniques. Their greater power has enabled them to replace analogue techniques and also, as flexibility has been acquired, to find wider applications. This development is the result of several factors, including realistically obtainable high efficiency, permitting better signal processing and analysis; greater flexibility in applications; and advances in computer hardware and software, particularly the introduction of microcomputers, microprocessors and fast array processors, which are also now much cheaper. These digital techniques gained importance not only in one-dimensional (1-D) signal processing, but also in two-dimensional (2-D) signal processing (digital image processing).

This book is the proceedings of a conference on digital signal processing at which speakers from twenty-two nations presented more than ninety scientific and technical lectures grouped in twenty-three sessions. The carefully edited selection of conference papers presented here provides an authoritative and permanent record of the proceedings, giving advanced and novel contributions in various topics and fields of application. Some are of a synthetic review nature while others contain completely new applications. They are conveniently grouped in five parts: advanced methods and techniques for designing digital filters; improvements in efficient transformations (Fast Fourier Transforms); implementation aspects (using microprocessors); applications, for example radar systems, biomedicine, seismology; and finally the new field of art-processing.

This work will be of interest not only to research workers in university departments of physics, engineering, communications, and applied mathematics, but also to industries concerned with the analysis and processing of signals and images such as communications firms, broadcasting corporations, aerospace organizations, government departments and hospitals. Its sections on art-processing will have reference value in the art, architecture, archaeology and museum worlds.

Contents

List of Contributors. Conference Notes. Preface.

Design methods and techniques for 1-D and 2-D digital filters

D. Pelloni and F. Bonzanigo: On the design of high-order linear phase FIR filters. R. A. Gabel, Y. Neuvo and H. Rudin: Iterative spectral factorization algorithms for digital filters. S. Horvath Jr.: A new adaptive recursive LMS filter. A. G. Constantinides and E. Tzanettis: Some properties of frequency dependent linear transformations in digital filter design. E. Deprettere and P. Dewilde: Generalized orthogonal filters for stochastic prediction and modelling. G. Garibotto: Two-dimensional phase filtering.

Transformations

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Implementations

P. J. W. Rayner: The application of finite arithmetic structures to the design of digital processing systems. S. Tazaki, Y. Yamada and R. M. Gray: Evaluation of two-dimensional quantization. J. P. Brafman, J. Szczupak and S. K. Mitra: Topological considerations in the implementation of a digital filter using microprocessors.

Applications

Applications to speech processing and communications

B. Gold: Variable rate speech processing. K. Sheno and B. P. Agrawal: Selection of a PCM coder for digital switching. A.D. Polydoros and E.N. Protonotarios: Digital interpolation of stochastic signals. T. A. Ramstad: Branch filtering using FIR and IIR complementary structures.

Applications to biomedicine

L. Baroncelli, A. Del Bimbo and G. Zappa: Two-dimensional Kalman filtering with applications to the restoration of seintigraphic images. H. Knutsson, P. Edholm and G. Granlund: Aspects of 3-D reconstruction by Fourier techniques. S. Bellini, C. Cafforio, M. Piacentini and F. Rocca: Design of a computerized emission tomographic system.

Applications to radar systems

G. Benelli, V. Cappellini and E. Del Re: Some important sampling techniques with applications to radar systems. R. C. Creasey: Digital chirp filtering using the Chinese remainder theorem. G. Bucci and D. Maio: Performance evaluation of an interrogation reply scheduling technique for a discrete address beacon system.

Other applications

D. Aboutajdine, Z. El Abidine Amri, M. Majim and J. G. Postaire: Arrival time determination in explosion seismology.

Art processing

M. Bernabo, V. Cappellini and M. Fondelli: Edge extraction techniques for analysis of art works. R. Bruno, L. Christiani Testi and T. Zanobini Leoni: Analysis and reconstruction of art works using a digital computer. V. Cappellini and M. Fondelli: Application of digital image processing to archaeological prospecting.

Subject index

A volume in the Microelectronics and Signal Processing Series

APPLICATIONS OF WALSH AND RELATED FUNCTIONS

With an Introduction to Sequency Theory

K.G. Beauchamp

*Director of Computer Services
University of Lancaster
Lancaster, UK*

January 1985, 308pp., \$55.00/£35.00 (UK only) ISBN: 0.12.084180.0

New and exciting applications for Walsh and Related Functions (e.g. Haar, Slant, Cosine, etc.) have resulted from recent developments, particularly in image processing, communication, and Boolean logic design. The properties of these functions suit them to use in signal processing situations as well as to many of the newer digital processes and promise to contribute to the solution of many current research problems.

The tutorial introduction to sequency theory linked by a chapter on hardware to the discussion of specific applications will prove invaluable to the scientist, researcher or engineer seeking an overview of the main lines of development in the use of these functions.

Applications discussed include spectral analysis, digital filtering, image processing and pattern recognition. Recent progress in non-sinusoidal radar and spread spectrum communication is one of the uses described in the field of communications. The final chapter summarises a new field for the functions, namely Boolean logic design and analysis in which significant results have proved possible.

The substantial developments which have taken place since publication of Ken Beauchamp's *Applications of Walsh Functions* in 1975 attest to the growing importance and interest in this subject.

Contents:

Part 1: Theory and Practice. The Sequency Functions: Introduction. Orthogonality. The Walsh function series. The Haar function series. Mixed function series. Discrete sampled functions. **Transformation:** Introduction. The discrete Walsh transform. Fast Walsh transform algorithms. The discrete Haar transform (DHT). The discrete slant transform (DST). Shift-invariant transformation. Transform conversion. Two-dimensional transformation. **Analysis and Processing:** Introduction. Correlation and convolution. Digital filtering waveform synthesis.

Part 2: Applications. Signal Processing: Introduction. Spectroscopy. Speech processing. Medical applications. Seismology. Non-linear applications. **Image Processing:** Introduction. Image compression. Image enhancement and restoration. Pattern recognition. **Communications:** Introduction. Multiplexing. Coding. Non-sinusoidal electromagnetic radiation. **Logic Design and Analysis:** Introduction. Rademacher-Walsh ordering. Synthesis of digital networks. Minimisation of logic functions. Fault diagnosis.

A volume in the Techniques in Physics series

DIGITAL FILTERS AND THEIR APPLICATIONS

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Computer Science, Information Processing, Communications; Theory of Computation; Systems Hardware; Systems Software; Data Communications, Networks; Computing in Medicine, Biology

Digital Signal Processing - 84

Proceedings of the International Conference, Florence, Italy, 5-8th September, 1984

Edited by V. CAPPELLINI, Department of Electrical Engineering, University of Florence and IROE - C.N.R., Florence, Italy and A.G. CONSTANTINIDES, Department of Electrical Engineering, Imperial College of Science and Technology, University of London, London, England

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APPROXIMATE MONTH OF PUBLICATION: DECEMBER

Digital Signal Processing is one of the fastest growing areas both in terms of research and applications. Advances in signal processing contribute to a wide range of fields including communications, radar systems, image processing, remote sensing, geophysics, biomedicine, pattern recognition, robotics and electrical power systems. Digital Signal Processing as a discipline is relatively young, being barely recognizable as such less than twenty years ago. The remarkable impetus, however, that Digital Signal Processing received as a result of developments in digital circuit technology (LSI, VLSI, microprocessors, etc.), the diversity of fields to which it can contribute, and the grown recognition of its fundamental role in underpinning a vast array of modern industrial applications means that it is



NORTH-HOLLAND
Amsterdam and New York

now an established, mature and unquestionably essential discipline.

This book presents the Proceedings of the International Conference on Digital Signal Processing, held at the Congress Palace in Florence, September 5-8, 1984, the fourth in a regular triennial series. Speakers from 26 Nations presented about 180 scientific and technical lectures grouped in regular and special Sessions after a careful selection performed through an International Technical Committee. Conference papers reported here, therefore, provide an authoritative and permanent record of the contributions. Some papers are more theoretical or of review nature, whilst others contain new implementations and applications. They are conveniently grouped into 16 fields. In particular new digital filtering design methods, implementation architectures and digital image processing techniques with special advanced applications (speech processing, biomedicine, pattern recognition and robotics) are presented.

Overall, the book gives an up-to-date advanced "scenario" of the wide interdisciplinary nature of Digital Signal Processing, which is becoming more important in its diverse manifestations (theory, implementation, applications).

This work will be of interest not only to researchers, professors and students in university departments of engineering, communications, physics and applied mathematics, but also to engineers and managers of industries concerned with the analysis and processing of signals and images and other organizations and establishments (such as broadcasting corporations, aerospace organizations, government departments and hospitals).

CONTENTS: A. 1-D Digital Filters and Design Methods. B. 2-D and M-D Digital Filters and Design Methods. C. Digital Transformations. D. Spectral Estimation. E. Adaptive Processing. F. Implementation Techniques and Architectures. G. Special Devices and Dedicated Realizations. H. VLSI Processors. I. Digital Signal Processing Techniques. J. Speech Processing. K. Digital Image Processing. L. Digital Signal Processing and Communications. M. Radar Applications. N. Remote Sensing. O. Digital Processing of Biomedical Signals and Images. P. Pattern Recognition and Robotics. Author Index.

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