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River Publishers Book Catalogue

Series in Signal, Image and Speech
Processing

River Publishers Series in Signal, Image and Speech Processing

Digital Video Coding for Next Generation Multimedia H.264, HEVC, VVC, EVC Video Compression

Authors:

Shreyanka Subbarayappa, Ramaiah University of Applied Sciences, India

K. R. Rao, University of Texas at Arlington, Texas, U.S.A

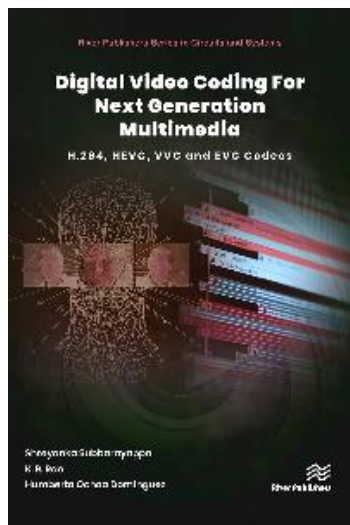
Humberto Ochoa Domínguez, Universidad Autónoma de Ciudad Juárez, México

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Available From: September 2022

Price: € 98.50



Description:

Innovations in communication systems and technology are growing tremendously. In multimedia communication systems, technology has transformed from analog television to digital television in the video domain. Mobile phones are known as smart phones as they are used, not only to make voice calls, but also used to send emails, video calls, transfer data, GPS, taking pictures and so on. Due to the widespread user applications, compression of data becomes important to save system resources. Video occupies 75% of data transfer traffic and is expected to cover 80% by the end of 2021. Video is also continuously increasing in file size from standard definition (SD) to ultra-high definition (UHD - 4K, 8K and 12K) video. More data or size in video requires higher transmission bandwidth or more disk space to store which can be slow and expensive. This drives the improvements in compression and hence the demand for a new codec. Several algorithms are used to achieve compression of Image or Video files, these algorithms working together are classified in terms of codecs and we use different codecs for different applications.

Advances in video compression technology reduce the utilization of system resources, like processing time, memory use, network bandwidth and battery life. This is possible by reducing the complexity of the video codecs without compromising on the output video quality. There are two distinct lines in the future video coding technology development work. Essential Video Coding (EVC) driven by MPEG team and Versatile Video Codec (VVC) driven by Joint Video Exploration Team (JVET). These codecs are the extended versions with advances in compression technologies when compared to the prior video codecs or reference codecs like H.264 and HEVC.

This book is devoted to the theory and design of different algorithms used in the video codecs to obtain efficient implementation and reconstruction of codec outputs. It also addresses the most recent codecs being developed, i.e., VVC and EVC along with the reference codecs, i.e., H.264 and HEVC. It also summarises the study results achieved by the international research community across four decades for different codecs and provides a comparison of their outputs. The book also emphasises the various algorithmic developments in the encoder and decoder blocks of the respective video codecs: motion estimation, motion vectors, motion compensation, block representation, transform domain, quantization, entropy coding methods for each codec. This book also touches on the practical aspects of different codecs along with projects at the end of each chapter which act as a good reference for the implementation of the codec software.

Keywords: Video Codecs; H.264; HEVC; VVC; EVC; Data compression; Motion estimation; transform domain; quantization; entropy coding; encoder and decoder blocks

River Publishers Series in Signal, Image and Speech Processing

Machine Learning Methods for Signal, Image and Speech Processing

Editors:

Meerja Akhil Jabbar, Vardhaman College Of Engineering, India

Kantipudi MVV Prasad, Symbiosis Institute of Technology, India

Sheng-Lung Peng, National Dong Hwa University, Taiwan

Mamun Bin Ibne Reaz, Universiti Kebangsaan, Malaysia

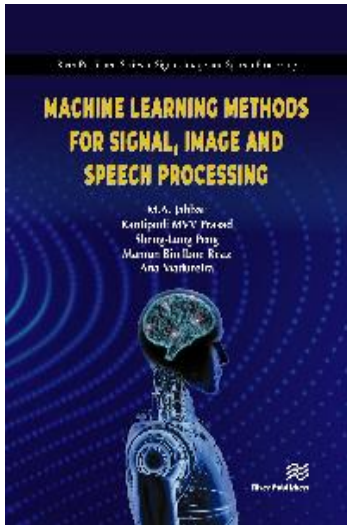
Ana Maria Madureira, Interdisciplinary Studies Research Center, Portugal

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Available From: December 2021

Price: € 95.00



Description:

The signal processing (SP) landscape has been enriched by recent advances in artificial intelligence (AI) and machine learning (ML), yielding new tools for signal estimation, classification, prediction, and manipulation. Layered signal representations, nonlinear function approximation and nonlinear signal prediction are now feasible at very large scale in both dimensionality and data size. These are leading to significant performance gains in a variety of long-standing problem domains like speech and Image analysis. As well as providing the ability to construct new classes of nonlinear functions (e.g., fusion, nonlinear filtering).

This book will help academics, researchers, developers, graduate and undergraduate students to comprehend complex SP data across a wide range of topical application areas such as social multimedia data collected from social media networks, medical imaging data, data from Covid tests etc. This book focuses on AI utilization in the speech, image, communications and virtual reality domains.

Keywords: Signal processing, Machine learning, Deep learning, Image Processing, Speech Processing

River Publishers Series in Signal, Image and Speech Processing

JPEG Series

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Shreyanka Subbarayappa, Ramaiah University of Applied Sciences, India

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Price: € 98.50



Description:

While the JPEG image standard was developed more than 25 years ago, it is still dominant in terms of image formation, manipulation and transmission over the internet and other media. As technology advances, new demands have arisen for the efficient transmission and storage of images causing other formats to emerge. Over the years, several extensions such as, JPEGLS, JPEG2K, JPEGXT, JPEGXR, JPEGXS and JPEG Pleno, have been added, constructing a series of standards for the compression and transmission of images. This book is the first to bring together most of the series of JPEG standards in a book.

This book covers the descriptions of the JPEG standards and gives the reader an overview of the latest advances in the standards of the Joint Photographic Experts Group.

Topics discussed include:

- JPEG;
- JPEG XR;
- JPEG XT;
- JPEG 2000;
- JPEG XS;
- JPEG Pleno;
- JPEG AIC;
- JPEG LS;
- JPEG XL;
- JPSearch;
- JPEG Systems;
- JBIG;

Keywords: JPEG, transform coding, discrete cosine transform, discrete sine transform, wavelet based image compression, block-based image compression, plenoptic representation, light-field imaging, point cloud imaging, holographic imaging.

River Publishers Series in Signal, Image and Speech Processing

An Introduction to Electronic Warfare; from the First Jamming to Machine Learning Techniques

Authors:

Chi-Hao Cheng, Miami University, USA

James Tsui, US Air Force Research Laboratory (retired), USA

ISBN: 9788770224352

e-ISBN: 9788770224345

Available From: July 2021

Price: € 95.00



Description:

Since its creation at the beginning of World II, radars have forever transformed the practice of modern warfare. The evolution of countermeasure conducted by electronic warfare systems against radars and radars' corresponding counter countermeasures is an intriguing technical subject.

This book provides a very accessible introduction to a broad range of radar and electronic warfare technologies. The subjects covered in this book range from early radar development to later technologies such as stealthy techniques, low probability of intercept radar, and machine learning.

Historical events are used to illustrate the principles of electronic warfare and to help readers to apprehend contexts under which radars and corresponding electronic warfare techniques were developed.

Keywords: Electrical Warfare, Radar, Electronic Countermeasure, Electronic Counter Countermeasure

River Publishers Series in Signal, Image and Speech Processing

Multirate Signal Processing for Communication Systems, Second Edition

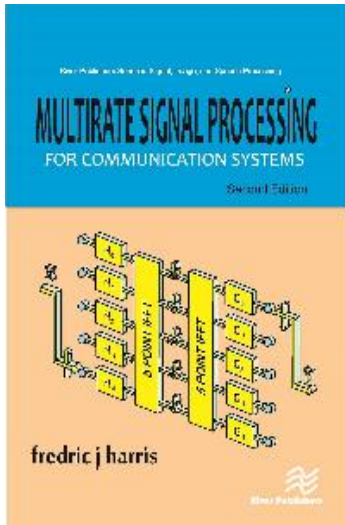
Author: frederic j harris, University of California San Diego, USA

ISBN: 9788770222105

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Available From: March 2021

Price: € 98.50



Description:

Multirate Signal processing can improve system performance and reduce costs in applications ranging from laboratory instruments, cable modems, wireless systems, satellites, Radar, Sonar, and consumer entertainment products. This second edition continues to offer a systematic, clear, and intuitive introduction to multirate signal processing for working engineers and system designers. Significant new material and fresh concepts, including Green Signal Processing techniques have been introduced.

The author uses extensive examples and figures to illustrate a wide range of multirate techniques, from basic resampling to leading-edge cascade and multi-stage filter structures. Along the way he draws on extensive research and consulting experience to introduce processing "tricks" shown to maximize performance and efficiency. Coverage includes:

- Effect of sampling and resampling in time and frequency domains
- Relationships between FIR filter specifications and filter length (# of taps)
- Window design and equal-ripple (Remez) design techniques
- Square-Root Nyquist and Half-band Filters including new enhancements
- Polyphase FIR filters: up-sampling, down-sampling
- Polyphase M-path analysis and synthesis channelizers and cascade pairs
- Polyphase interpolators for arbitrary sample rate changes
- Dyadic half-band filters, quadrature mirror filters
- Channel banks for multiple arbitrary bandwidths and center frequencies
- Comprehensive coverage of recursive all-pass filters and channelizers, non-uniform and uniform phase, mixed recursive and non-recursive
- Comparisons with traditional DSP designs
- Extensive applications coverage throughout

Keywords: Multirate, Intentional Aliasing, Unwrapping Aliases, M-path Analysis Filter Bank, M-Path Synthesis Filter Bank, Coupled Analysis and Synthesis Banks, CIC Filters, All-Pass Filters, All-Pass Channelizers, Enhanced Filter Designs, Green Filter Implementations, Arbitrary Bandwidth, Arbitrary Center Frequencies, Arbitrary Ratio Interpolator.

River Publishers Series in Signal, Image and Speech Processing

Robust Embedded Intelligence on Cellular Neural Networks

Authors:

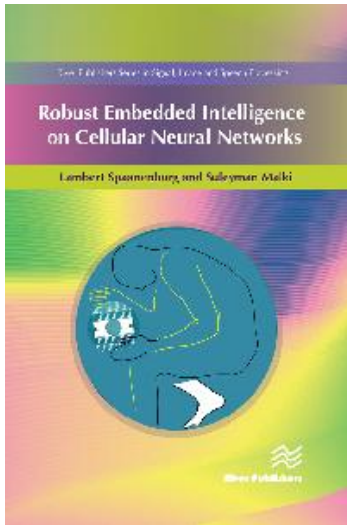
Lambert Spaanenburg, Comoray AB, Sweden and Lund University, Sweden
Suleyman Malki, Comoray AB, Sweden

ISBN: 9788770221009

e-ISBN: 9788770220996

Available From: January 2021

Price: € 95.00



Description:

Machine Intelligence (MI) is the motor that drives the modern information-rich society. Supercomputing and parallel coding have made MI programs feasible and the theoretical base of MI has matured. Graphical Processors (GPs) have found new life as carrier for low-cost supercomputing. The road towards lower cost & size leads to embedding systems, such as self-driving cars and intelligent houses.

Machine intelligence has not only opened many disruptive venues but given simultaneously a lot of anxiety. Compared to the many accidents in the early days of automotive traffic, the few problems with the TESLA cars are already sufficient for major concern. Evidently, still research is required to bring MI on the appropriate safety levels that rule the type tests for acceptance on the European automotive market.

In the ACM Turing Award 2018, Hennessey and Patterson prophesize the breakthrough of Domain-Specific Processor. A typical example is the modern vision hardware in the automotive domain. Such applications bring collectively self-driving in reach for safety concerns. It features a domain-specific mix of hardware and software. Hardware can be correctly designed & manufactured and will not change afterwards. Software can be formally proven but efficiency requires to keep it close to the platform.

Robust Embedded Intelligence on Cellular Neural Networks makes the reader familiar with the mathematical and electronic techniques to turn a data-driven problem into a safe embedded solution. In particular, it treats aspects on Cellular Neural Networks (CNN) for reliable visual recognition in a wide range of practical applications, highlighting vein feature extraction and license plate recognition.

Keywords: Cellular Neural Networks, Embedded Intelligence, Robust Design, Morphological Functions, FPGAs, Memory Design, Embedded Systems, System Design, Vein Feature Extractions

River Publishers Series in Signal, Image and Speech Processing

Electronic Signals and Systems **Analysis, Design and Applications**

Authors:

Muhammad Nasir Khan, The University of Lahore, Pakistan

Syed K. Hasnain, Aalborg University, Denmark

Mohsin Jamil, Memorial University of Newfoundland, Canada

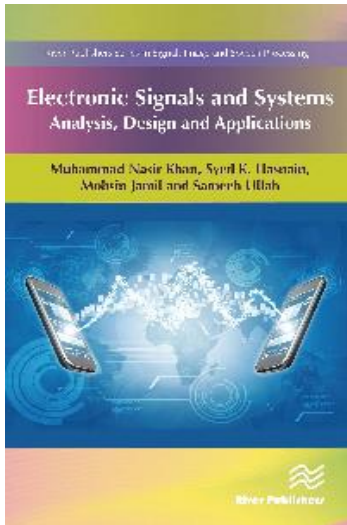
Sameeh Ullah, Illinois State University, USA

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e-ISBN: 9788770221696

Available From: November 2020

Price: € 95.00



Description:

The subject of Signals and Systems is enormously complex, involving many concepts such as signals, mathematics and filter design that are woven together in an intricate manner. To cope with this scope and complexity, many Signals and Systems texts are often organized around the "numerical examples" of a system. With such organization, students can see through the complexity of Signals and Systems, they can learn about the distinct concepts and protocols in one part of the communication system while seeing the big picture of how all parts fit together. From a pedagogical perspective, our personal experience has been that such approach indeed works well. Based on the Authors extensive experience of teaching and research, the book is written with such a reader in mind. The Book is intended for a course on signals & systems at the senior undergraduate level and above. The authors consider all the requirements and tools used in analysis and design of discrete time systems for filter design and signal processing.

Key features of the International Edition:

- The extensive use of MATLAB based examples to illustrate how to solve the signals & systems problems. The textbook includes a wealth of problems with solutions.
- Worked-out examples have been included to explain new and difficult concepts and to expose the reader to real-life signal processing problems.

The inclusion of FIR and IIR filter design further enriches the contents of the book.

Keywords: Signals, discrete Fourier transform, finite impulse response, infinite impulse response, digital and analog filters, z-transform

River Publishers Series in Signal, Image and Speech Processing

Applied Data Analytics - Principles and Applications

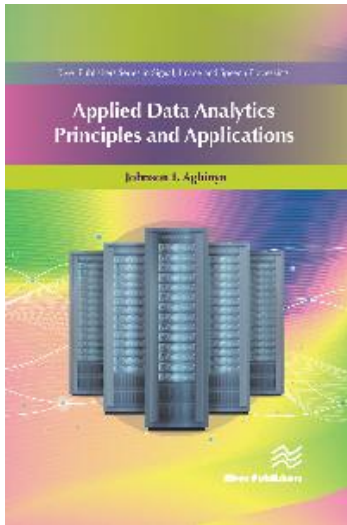
Author: Johnson I. Agbinya, Melbourne Institute of Technology, Australia

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Price: € 95.00



Description:

The emergence of huge amounts of data which require analysis and in some cases real-time processing has forced exploration into fast algorithms for handling very large data sizes. Analysis of x-ray images in medical applications, cyber security data, crime data, telecommunications and stock market data, health records and business analytics data are but a few areas of interest. Applications and platforms including R, RapidMiner and Weka provide the basis for analysis, often used by practitioners who pay little to no attention to the underlying mathematics and processes impacting the data. This often leads to an inability to explain results or correct mistakes, or to spot errors.

Applied Data Analytics - Principles and Applications seeks to bridge this missing gap by providing some of the most sought after techniques in big data analytics. Establishing strong foundations in these topics provides practical ease when big data analyses are undertaken using the widely available open source and commercially orientated computation platforms, languages and visualisation systems. The book, when combined with such platforms, provides a complete set of tools required to handle big data and can lead to fast implementations and applications.

The book contains a mixture of machine learning foundations, deep learning, artificial intelligence, statistics and evolutionary learning mathematics written from the usage point of view with rich explanations on what the concepts mean. The author has thus avoided the complexities often associated with these concepts when found in research papers. The tutorial nature of the book and the applications provided are some of the reasons why the book is suitable for undergraduate, postgraduate and big data analytics enthusiasts.

This text should ease the fear of mathematics often associated with practical data analytics and support rapid applications in artificial intelligence, environmental sensor data modelling and analysis, health informatics, business data analytics, data from Internet of Things and deep learning applications.

Keywords: Data Analytics, Markov Chain, Kalman Filters, Vector Machines, Artificial Neural Networks, Neural Networks, Recurrent Neural Networks, Convolutional Neural Networks, Probabilistic Neural Networks, Principal Component Analysis, Moment Generating Functions, Digital Identity Management System

River Publishers Series in Signal, Image and Speech Processing

Music Science

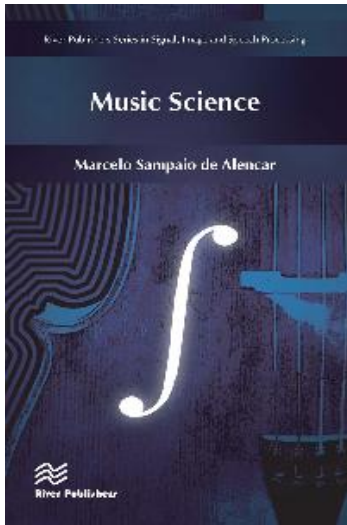
Author: Marcelo Sampaio de Alencar, Institute of Advanced Studies in Communications, Federal University of Bahia (UFBA, Brazil)

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e-ISBN: 9788770221290

Available From: November 2019

Price: € 95.00



Description:

The book presents the fundamentals of music science, followed by a discussion on the historical evolution of music. An introduction to the analysis of signals in time and frequency is presented, which includes sound and noise. Features and mathematical aspects of the sound are discussed, including vibration and timbre.

The book presents a review of existing voice models and discusses the voice production, sound perception, music characteristics and acoustics, tempo, rhythm and harmony. Musical theory is presented, including staff, notes, alterations, keys and intervals, tones and associated frequencies and wavelengths.

The creation of major and minor scales is emphasized, along with a study on consonance and dissonance, measure, metric, tempo markings, dynamics, modulation. The book also explains the chord formation, and discusses melody and composition.

The book has four appendices, including an appendix on the basic differentiation and integration theorems, another with useful Fourier tables, and an appendix featuring the notes, their frequencies and wavelengths. The book also has a glossary of music terms.

Keywords: Music Science, Music Theory, Acoustics, Sound Analysis, Fourier Theory

Versatile Video Coding

Authors:

Humberto Ochoa Dominguez, IIT-UACJ, Mexico

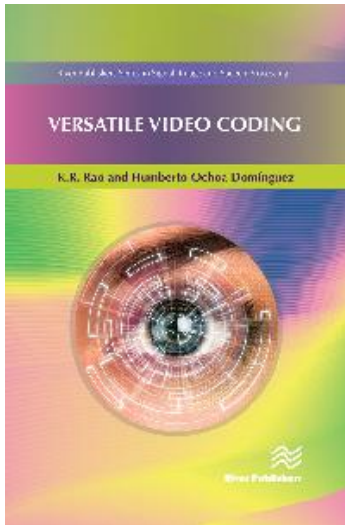
K.R. Rao, University of Texas at Arlington, USA

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Price: € 95.00



Description:

Video is the main driver of bandwidth use, accounting for over 80 per cent of consumer Internet traffic. Video compression is a critical component of many of the available multimedia applications, it is necessary for storage or transmission of digital video over today's band-limited networks. The majority of this video is coded using international standards developed in collaboration with ITU-T Study Group and MPEG.

The MPEG family of video coding standards begun on the early 1990s with MPEG-1, developed for video and audio storage on CD-ROMs, with support for progressive video. MPEG-2 was standardized in 1995 for applications of video on DVD, standard and high definition television, with support for interlaced and progressive video. MPEG-4 part 2, also known as MPEG-2 video, was standardized in 1999 for applications of low- bit rate multimedia on mobile platforms and the Internet, with the support of object-based or content based coding by modeling the scene as background and foreground. Since MPEG-1, the main video coding standards were based on the so-called macroblocks. However, research groups continued the work beyond the traditional video coding architectures and found that macroblocks could limit the performance of the compression when using high-resolution video. Therefore, in 2013 the high efficiency video coding (HEVC) also known and H.265, was released, with a structure similar to H.264/AVC but using coding units with more flexible partitions than the traditional macroblocks. HEVC has greater flexibility in prediction modes and transform block sizes, also it has a more sophisticated interpolation and de blocking filters.

In 2006 the VC-1 was released. VC-1 is a video codec implemented by Microsoft and the Microsoft Windows Media Video (VMW) 9 and standardized by the Society of Motion Picture and Television Engineers (SMPTE). In 2017 the Joint Video Experts Team (JVET) released a call for proposals for a new video coding standard initially called Beyond the HEVC, Future Video Coding (FVC) or known as Versatile Video Coding (VVC). VVC is being built on top of HEVC for application on Standard Dynamic Range (SDR), High Dynamic Range (HDR) and 360° Video. The VVC is planned to be finalized by 2020.

This book presents the new VVC, and updates on the HEVC. The book discusses the advances in lossless coding and covers the topic of screen content coding. Technical topics discussed include:

- Beyond the High Efficiency Video Coding
- High Efficiency Video Coding encoder
- Screen content
- Lossless and visually lossless coding algorithms
- Fast coding algorithms
- Visual quality assessment
- Other screen content coding algorithms
- Overview of JPEG Series

Keywords: Versatile Video Coding (VVC), HEVC, Lossless coding, JPEG, JPEG2000, Beyond HEVC, Transcoders, Legacy codec, Real Media HD, Subjective evaluation, unified intra prediction, coding tree unit, cross-media retrieval, prediction unit, de-blocking filter, in loop filter, coefficient scanning, screen content coding

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River Publishers Series in Signal, Image and Speech Processing

Recent Advances in Information, Communications and Signal Processing

Editors:

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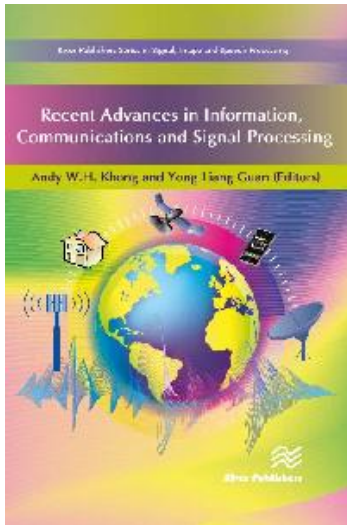
Yong Liang Guan, Nanyang Technological University, Singapore

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Available From: March 2018

Price: € 85.00



Description:

Research in information, communications and signal processing has brought about new services, applications and functions in a large number of fields which include consumer electronics, biomedical devices and defence. These applications play an important role in advancing technologies to enhance human life in general.

Recent Advances in Information, Communications and Signal Processing aims to give students, researchers, and engineers information pertaining to recent advances in these fields. In terms of research in signal processing topics, the two chapters included in this book have a strong emphasis on advances in algorithmic development in the biomedical, and human-computer interfaces domain areas. More specifically, the use of deep learning for placental maturity staging is discussed as well as the use of vibration analysis for localising impacts on surfaces for human-computer applications. In terms of communications signal processing, advances in new wireless communication such as NOMA (non-orthogonal multiple access) and millimetre-wave antenna design for 5G cellular mobile radio, as well as innovations in LDPC (low density parity check code) decoding and networking coding, are featured.

Keywords: Signal processing, deep neural networks, source localisation, mechanical vibration analysis, non-orthogonal multiple access, millimetre-wave communication, low density parity check code, network coding.

River Publishers Series in Signal, Image and Speech Processing

High Efficiency Video Coding and Other Emerging Standards

Authors:

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J.J. Hwang, Kunsan National University, South Korea

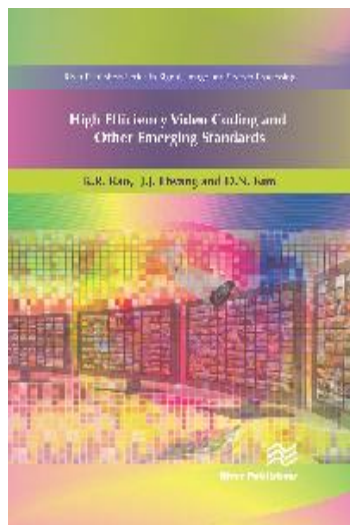
D. N. Kim, Sejong University, South Korea

ISBN: 9788793609037

e-ISBN: 9788793609020

Available From: August 2017

Price: € 85.00



Description:

High Efficiency Video Coding and Other Emerging Standards provides an overview of high efficiency video coding (HEVC) and all its extensions and profiles. There are nearly 300 projects and problems included, and about 400 references related to HEVC alone. Next generation video coding (NGVC) beyond HEVC is also described. Other video coding standards such as AVS2, DAALA, THOR, VP9 (Google), DIRAC, VC1, and AV1 are addressed, and image coding standards such as JPEG, JPEG-LS, JPEG2000, JPEG XR, JPEG XS, JPEG XT and JPEG-Pleno are also listed. Understanding of these standards and their implementation is facilitated by overview papers, standards documents, reference software, software manuals, test sequences, source codes, tutorials, keynote speakers, panel discussions, reflector and ftp/web sites – all in the public domain. Access to these categories is also provided.

Keywords: HEVC, JCT-VC, HM Software, Lossless coding, THOR, DIRAC, VP10, AV1, VC1, AVSChina, JPEG, JPEG-LS, JPEG2000, JPEGXR, JPEGXT, JPEGPLENO, Beyond HEVC, Transcoders, JVET Subjective evaluation, Legacy codec, Real Media HD, Subjective evaluation, Arithmetic coding, MPEG-DASH, Unified intra prediction, coding tree unit, prediction unit, transform unit, Coefficient scanning, HM software, Lossless coding

River Publishers Series in Signal, Image and Speech Processing

Digital Filter Design and Realization

Authors:

Takao Hinamoto, Hiroshima University, Japan

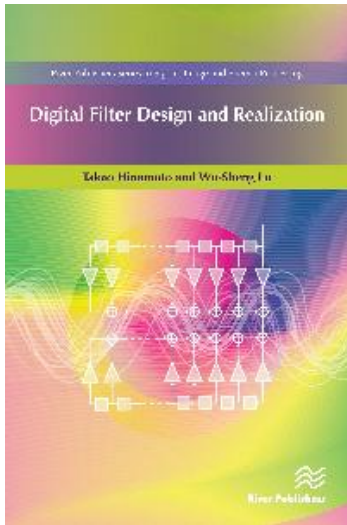
Wu-Sheng Lu, University of Victoria, Canada

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Available From: May 2017

Price: € 85.00



Description:

Analysis, design, and realization of digital filters have experienced major developments since the 1970s, and have now become an integral part of the theory and practice in the field of contemporary digital signal processing.

Digital Filter Design and Realization is written to present an up-to-date and comprehensive account of the analysis, design, and realization of digital filters. It is intended to be used as a text for graduate students as well as a reference book for practitioners in the field. Prerequisites for this book include basic knowledge of calculus, linear algebra, signal analysis, and linear system theory.

Technical topics discussed in the book include:

- Discrete-Time Systems and z-Transformation
- Stability and Coefficient Sensitivity
- State-Space Models
- FIR Digital Filter Design
- Frequency-Domain Digital Filter Design
- Time-Domain Digital Filter Design
- Interpolated and Frequency-Response-Masking FIR Digital Filter Design
- Composite Digital Filter Design
- Finite Word Length Effects
- Coefficient Sensitivity Analysis and Minimization
- Error Spectrum Shaping
- Roundoff Noise Analysis and Minimization
- Generalized Transposed Direct-Form II
- Block-State Realization

Keywords: Digital filters, frequency-domain design, time-domain design, interpolated FIR filters, frequency-response-masking FIR filters, composite filters, state-space realization, finite-word-length, coefficient sensitivity, round-off noise, overflow oscillations, error feedback, transposed direct-form II, block-state realization

River Publishers Series in Signal, Image and Speech Processing

Digital Signal Processing: A Breadth-First Approach

Authors:

Muhammad Nasir Khan, The University of Lahore, Pakistan

S. K. Hasnain, Swedish College of Engineering, Pakistan

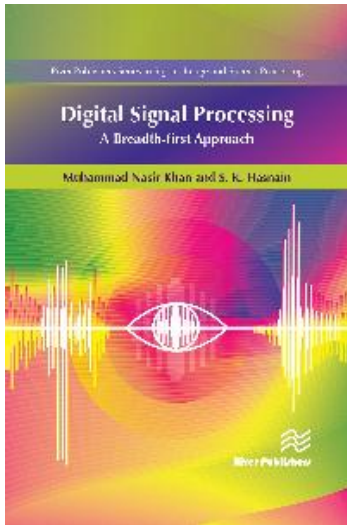
Mohsin Jamil, National University of Sciences and Technology, Pakistan

ISBN: 9788793379404

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Available From: April 2016

Price: € 80.00



Description:

The subject of Digital Signal Processing (DSP) is enormously complex, involving many concepts, probabilities, and signal processing that are woven together in an intricate manner. To cope with this scope and complexity, many DSP texts are often organized around the “numerical examples” of a communication system. With such organization, readers can see through the complexity of DSP, they learn about the distinct concepts and protocols in one part of the communication system while seeing the big picture of how all parts fit together. From a pedagogical perspective, our personal experience has been that such approach indeed works well.

Based on the authors’ extensive experience in teaching and research, *Digital Signal Processing: a breadth-first approach* is written with the reader in mind. The book is intended for a course on digital signal processing, for seniors and undergraduate students. The subject has high popularity in the field of electrical and computer engineering, and the authors consider all the needs and tools used in analysis and design of discrete time systems for signal processing.

Key features of the book include:

- The extensive use of MATLAB based examples to illustrate how to solve signal processing problems. The textbook includes a wealth of problems, with solutions
- Worked-out examples have been included to explain new and difficult concepts, which help to expose the reader to real-life signal processing problems
- The inclusion of FIR and IIR filter design further enrich the contents

Keywords: Electrical Engineering, Computer Engineering, Digital Signal Processing, Signals and Systems, Convolution and Correlation, Z Transform, Discrete Time Fourier Transform, Digital Filters, Design of FIR Filters, Design of IIR Filters, Finite Word Length Effects