

Video Processing

Oge Marques

The Essential Guide to Video Processing Alan C. Bovik, 2009-07-07 This comprehensive and state-of-the art approach to video processing gives engineers and students a comprehensive introduction and includes full coverage of key applications: wireless video, video networks, video indexing and retrieval and use of video in speech processing. Containing all the essential methods in video processing alongside the latest standards, it is a complete resource for the professional engineer, researcher and graduate student. Numerous conceptual and numerical examples All the latest standards are thoroughly covered: MPEG-1, MPEG-2, MPEG-4, H.264 and AVC Coverage of the latest techniques in video security Like its sister volume *The Essential Guide to Image Processing*, Professor Bovik's *Essential Guide to Video Processing* provides a timely and comprehensive survey, with contributions from leading researchers in the area. Highly recommended for everyone with an interest in this fascinating and fast-moving field. –Prof. Bernd Girod, Stanford University, USA * Edited by a leading person in the field who created the IEEE International Conference on Image Processing, with contributions from experts in their fields. * Numerous conceptual and numerical examples *All the latest standards are thoroughly covered: MPEG-1, MPEG-2, MPEG-4, H.264 and AVC. * Coverage of the latest techniques in video security

Handbook of Image and Video Processing Alan C. Bovik, 2010-07-21 55% new material in the latest edition of this “must-have for students and practitioners of image & video processing! This Handbook is intended to serve as the basic reference point on image and video processing, in the field, in the research laboratory, and in the classroom. Each chapter has been written

by carefully selected, distinguished experts specializing in that topic and carefully reviewed by the Editor, Al Bovik, ensuring that the greatest depth of understanding be communicated to the reader. Coverage includes introductory, intermediate and advanced topics and as such, this book serves equally well as classroom textbook as reference resource. • Provides practicing engineers and students with a highly accessible resource for learning and using image/video processing theory and algorithms • Includes a new chapter on image processing education, which should prove invaluable for those developing or modifying their curricula • Covers the various image and video processing standards that exist and are emerging, driving today's explosive industry • Offers an understanding of what images are, how they are modeled, and gives an introduction to how they are perceived • Introduces the necessary, practical background to allow engineering students to acquire and process their own digital image or video data • Culminates with a diverse set of applications chapters, covered in sufficient depth to serve as extensible models to the reader's own potential applications

About the Editor... Al Bovik is the Cullen Trust for Higher Education Endowed Professor at The University of Texas at Austin, where he is the Director of the Laboratory for Image and Video Engineering (LIVE). He has published over 400 technical articles in the general area of image and video processing and holds two U.S. patents. Dr. Bovik was Distinguished Lecturer of the IEEE Signal Processing Society (2000), received the IEEE Signal Processing Society Meritorious Service Award (1998), the IEEE Third Millennium Medal (2000), and twice was a two-time Honorable Mention winner of the international Pattern Recognition Society Award. He is a Fellow of the IEEE, was Editor-in-Chief, of the IEEE Transactions on Image Processing (1996-2002), has served on and continues to

serve on many other professional boards and panels, and was the Founding General Chairman of the IEEE International Conference on Image Processing which was held in Austin, Texas in 1994. * No other resource for image and video processing contains the same breadth of up-to-date coverage * Each chapter written by one or several of the top experts working in that area * Includes all essential mathematics, techniques, and algorithms for every type of image and video processing used by electrical engineers, computer scientists, internet developers, bioengineers, and scientists in various, image-intensive disciplines

Real-time Image and Video Processing Nasser Kehtarnavaz, Mark Noel Gamadia, 2006 Real-Time Image and Video Processing presents an overview of the guidelines and strategies for transitioning an image or video processing algorithm from a research environment into a real-time constrained environment. Such guidelines and strategies are scattered in the literature of various disciplines including image processing, computer engineering, and software engineering, and thus have not previously appeared in one place. By bringing these strategies into one place, the book is intended to serve the greater community of researchers, practicing engineers, industrial professionals, who are interested in taking an image or video processing algorithm from a research environment to an actual real-time implementation on a resource constrained hardware platform. These strategies consist of algorithm simplifications, hardware architectures, and software methods. Throughout the book, carefully selected, representative examples from the literature are presented to illustrate the discussed concepts. After reading the book, readers will have a strong understanding of the wide variety of techniques and tools involved in designing a real-time image or

video processing system.

Learning Processing Daniel Shiffman, 2015-09-09 Learning Processing, Second Edition, is a friendly start-up guide to Processing, a free, open-source alternative to expensive software and daunting programming languages. Requiring no previous experience, this book is for the true programming beginner. It teaches the basic building blocks of programming needed to create cutting-edge graphics applications including interactive art, live video processing, and data visualization. Step-by-step examples, thorough explanations, hands-on exercises, and sample code, supports your learning curve. A unique lab-style manual, the book gives graphic and web designers, artists, and illustrators of all stripes a jumpstart on working with the Processing programming environment by providing instruction on the basic principles of the language, followed by careful explanations of select advanced techniques. The book has been developed with a supportive learning experience at its core. From algorithms and data mining to rendering and debugging, it teaches object-oriented programming from the ground up within the fascinating context of interactive visual media. This book is ideal for graphic designers and visual artists without programming background who want to learn programming. It will also appeal to students taking college and graduate courses in interactive media or visual computing, and for self-study. A friendly start-up guide to Processing, a free, open-source alternative to expensive software and daunting programming languages No previous experience required—this book is for the true programming beginner! Step-by-step examples, thorough explanations, hands-on exercises, and sample code supports your learning curve

Digital Video Processing A. Murat Tekalp, 2015-06-06 Over the years,

thousands of engineering students and professionals relied on Digital Video Processing as the definitive, in-depth guide to digital image and video processing technology. Now, Dr. A. Murat Tekalp has completely revamped the first edition to reflect today's technologies, techniques, algorithms, and trends. Digital Video Processing, Second Edition, reflects important advances in image processing, computer vision, and video compression, including new applications such as digital cinema, ultra-high-resolution video, and 3D video. This edition offers rigorous, comprehensive, balanced, and quantitative coverage of image filtering, motion estimation, tracking, segmentation, video filtering, and compression. Now organized and presented as a true tutorial, it contains updated problem sets and new MATLAB projects in every chapter. Coverage includes Multi-dimensional signals/systems: transforms, sampling, and lattice conversion Digital images and video: human vision, analog/digital video, and video quality Image filtering: gradient estimation, edge detection, scaling, multi-resolution representations, enhancement, de-noising, and restoration Motion estimation: image formation; motion models; differential, matching, optimization, and transform-domain methods; and 3D motion and shape estimation Video segmentation: color and motion segmentation, change detection, shot boundary detection, video matting, video tracking, and performance evaluation Multi-frame filtering: motion-compensated filtering, multi-frame standards conversion, multi-frame noise filtering, restoration, and super-resolution Image compression: lossless compression, JPEG, wavelets, and JPEG2000 Video compression: early standards, ITU-T H.264/MPEG-4 AVC, HEVC, Scalable Video Compression, and stereo/multi-view approaches

Digital Video Processing for Engineers Michael Parker, Suhel

Dhanani,2012-10-10 Any device or system with imaging functionality requires a digital video processing solution as part of its embedded system design. Engineers need a practical guide to technology basics and design fundamentals that enables them to deliver the video component of complex projects. This book introduces core video processing concepts and standards, and delivers practical how-to guidance for engineers embarking on digital video processing designs using FPGAs. It covers the basic topics of video processing in a pictorial, intuitive manner with minimal use of mathematics. Key outcomes and benefits of this book for users include: understanding the concepts and challenges of modern video systems; architect video systems at a system level; reference design examples to implement your own high definition video processing chain; understand implementation trade-offs in video system designs. Video processing is a must-have skill for engineers working on products and solutions for rapidly growing markets such as video surveillance, video conferencing, medical imaging, military imaging, digital broadcast equipment, displays and countless consumer electronics applications This book is for engineers who need to develop video systems in their designs but who do not have video processing experience. It introduces the fundamental video processing concepts and skills in enough detail to get the job done, supported by reference designs, step-by-step FPGA- examples, core standards and systems architecture maps Written by lead engineers at Altera Corp, a top-three global developer of digital video chip (FPGA) technology

Practical Image and Video Processing Using MATLAB Oge Marques,2011-08-04
UP-TO-DATE, TECHNICALLY ACCURATE COVERAGE OF ESSENTIAL TOPICS IN IMAGE AND VIDEO PROCESSING This is the first book to combine image and video processing with a practical MATLAB®-oriented approach in order to demonstrate the most

important image and video techniques and algorithms. Utilizing minimal math, the contents are presented in a clear, objective manner, emphasizing and encouraging experimentation. The book has been organized into two parts. Part I: Image Processing begins with an overview of the field, then introduces the fundamental concepts, notation, and terminology associated with image representation and basic image processing operations. Next, it discusses MATLAB® and its Image Processing Toolbox with the start of a series of chapters with hands-on activities and step-by-step tutorials. These chapters cover image acquisition and digitization; arithmetic, logic, and geometric operations; point-based, histogram-based, and neighborhood-based image enhancement techniques; the Fourier Transform and relevant frequency-domain image filtering techniques; image restoration; mathematical morphology; edge detection techniques; image segmentation; image compression and coding; and feature extraction and representation. Part II: Video Processing presents the main concepts and terminology associated with analog video signals and systems, as well as digital video formats and standards. It then describes the technically involved problem of standards conversion, discusses motion estimation and compensation techniques, shows how video sequences can be filtered, and concludes with an example of a solution to object detection and tracking in video sequences using MATLAB®. Extra features of this book include: More than 30 MATLAB® tutorials, which consist of step-by-step guides to exploring image and video processing techniques using MATLAB® Chapters supported by figures, examples, illustrative problems, and exercises Useful websites and an extensive list of bibliographical references This accessible text is ideal for upper-level undergraduate and graduate students in digital image and video processing courses, as well as for engineers, researchers,

software developers, practitioners, and anyone who wishes to learn about these increasingly popular topics on their own.

Introduction to Video and Image Processing Thomas B. Moeslund, 2012-01-25
This textbook presents the fundamental concepts and methods for understanding and working with images and video in a unique, easy-to-read style which ensures the material is accessible to a wide audience. Exploring more than just the basics of image processing, the text provides a specific focus on the practical design and implementation of real systems for processing video data. Features: includes more than 100 exercises, as well as C-code snippets of the key algorithms; covers topics on image acquisition, color images, point processing, neighborhood processing, morphology, BLOB analysis, segmentation in video, tracking, geometric transformation, and visual effects; requires only a minimal understanding of mathematics; presents two chapters dedicated to applications; provides a guide to defining suitable values for parameters in video and image processing systems, and to conversion between the RGB color representation and the HIS, HSV and YUV/YCbCr color representations.

Video Processing and Communications Yao Wang, Jörn Ostermann, Ya-Qin Zhang, 2002 Useful as a reference work, this book offers a good balance between theoretical concepts and practical solutions, with more rigorous formulation of certain problems such as motion estimation, sampling, basic coding theory. Provides an in-depth exposition of fundamental theory and techniques for video processing, including frequency domain characterization of video signals and visual perception, video sampling and format conversion, two dimensional and three dimensional motion estimation. Also presents techniques important for video communications, including video coding and

error control, and up-to-date coverage on recent international standards on video communications. A chapter is devoted to video streaming over Internet and wireless networks, one of the most popular video communication applications. In addition, it discusses processing and communications of stereoscopic and multiview video. Practicing researchers and engineers.

Multidimensional Signal, Image, and Video Processing and Coding John W. Woods, 2011-05-31 This book gives a concise introduction to both image and video processing, providing a balanced coverage between theory, applications and standards. It gives an introduction to both 2-D and 3-D signal processing theory, supported by an introduction to random processes and some essential results from information theory, providing the necessary foundation for a full understanding of the image and video processing concepts that follow. A significant new feature is the explanation of practical network coding methods for image and video transmission. There is also coverage of new approaches such as: super-resolution methods, non-local processing, and directional transforms. This book also has on-line support that contains many short MATLAB programs that complement examples and exercises on multidimensional signal, image, and video processing. There are numerous short video clips showing applications in video processing and coding, plus a copy of the vidview video player for playing .yuv video files on a Windows PC and an illustration of the effect of packet loss on H.264/AVC coded bitstreams. New to this edition: New appendices on random processes, information theory New coverage of image analysis - edge detection, linking, clustering, and segmentation Expanded coverage on image sensing and perception, including color spaces. Now summarizes the new MPEG coding standards: scalable video coding (SVC) and multiview video coding (MVC), in

addition to coverage of H.264/AVC. Updated video processing material including new example on scalable video coding and more material on object- and region-based video coding. More on video coding for networks including practical network coding (PNC), highlighting the significant advantages of PNC for both video downloading and streaming. New coverage of super-resolution methods for image and video. Only R&D level tutorial that gives an integrated treatment of image and video processing - topics that are interconnected. New chapters on introductory random processes, information theory, and image enhancement and analysis Coverage and discussion of the latest standards in video coding: H.264/AVC and the new scalable video standard (SVC)

Video Processing in the Cloud Rafael Silva Pereira, Karin K. Breitman, 2011-08-22 As computer systems evolve, the volume of data to be processed increases significantly, either as a consequence of the expanding amount of available information, or due to the possibility of performing highly complex operations that were not feasible in the past. Nevertheless, tasks that depend on the manipulation of large amounts of information are still performed at large computational cost, i.e., either the processing time will be large, or they will require intensive use of computer resources. In this scenario, the efficient use of available computational resources is paramount, and creates a demand for systems that can optimize the use of resources in relation to the amount of data to be processed. This problem becomes increasingly critical when the volume of information to be processed is variable, i.e., there is a seasonal variation of demand. Such demand variations are caused by a variety of factors, such as an unanticipated burst of client requests, a time-critical simulation, or high volumes of

simultaneous video uploads, e.g. as a consequence of a public contest. In these cases, there are moments when the demand is very low (resources are almost idle) while, conversely, at other moments, the processing demand exceeds the resources capacity. Moreover, from an economical perspective, seasonal demands do not justify a massive investment in infrastructure, just to provide enough computing power for peak situations. In this light, the ability to build adaptive systems, capable of using on demand resources provided by Cloud Computing infrastructures is very attractive.

Advanced Image and Video Processing Using MATLAB Shengrong Gong, Chunping Liu, Yi Ji, Baojiang Zhong, Yonggang Li, Husheng Dong, 2018-08-21 This book offers a comprehensive introduction to advanced methods for image and video analysis and processing. It covers deraining, dehazing, inpainting, fusion, watermarking and stitching. It describes techniques for face and lip recognition, facial expression recognition, lip reading in videos, moving object tracking, dynamic scene classification, among others. The book combines the latest machine learning methods with computer vision applications, covering topics such as event recognition based on deep learning, dynamic scene classification based on topic model, person re-identification based on metric learning and behavior analysis. It also offers a systematic introduction to image evaluation criteria showing how to use them in different experimental contexts. The book offers an example-based practical guide to researchers, professionals and graduate students dealing with advanced problems in image analysis and computer vision.

Digital Video Image Quality and Perceptual Coding H.R. Wu, K.R. Rao, 2017-12-19 The hand is quicker than the eye. In many cases, so is digital video. Maintaining image quality in bandwidth- and memory-restricted

environments is quickly becoming a reality as thriving research delves ever deeper into perceptual coding techniques, which discard superfluous data that humans cannot process or detect. Surveying the topic from a Human Visual System (HVS)-based approach, Digital Video Image Quality and Perceptual Coding outlines the principles, metrics, and standards associated with perceptual coding, as well as the latest techniques and applications. This book is divided broadly into three parts. First, it introduces the fundamental theory, concepts, principles, and techniques underlying the field, such as the basics of compression, HVS modeling, and coding artifacts associated with current well-known techniques. The next section focuses on picture quality assessment criteria; subjective and objective methods and metrics, including vision model based digital video impairment metrics; testing procedures; and international standards regarding image quality. Finally, practical applications come into focus, including digital image and video coder designs based on the HVS as well as post-filtering, restoration, error correction, and concealment techniques. The permeation of digital images and video throughout the world cannot be understated. Nor can the importance of preserving quality while using minimal storage space, and Digital Video Image Quality and Perceptual Coding provides the tools necessary to accomplish this goal. Instructors and lecturers wishing to make use of this work as a textbook can download a presentation of 786 slides in PDF format organized to augment the text. accompany our book (H.R. Wu and K.R. Rao, Digital Video Image Quality and Perceptual Coding, CRC Press (ISBN: 0-8247-2777-0), Nov. 2005) for lecturers or instructor to use for their classes if they use the book.

Digital Video Processing A. Murat Tekalp, 2015-06-15 Thousands of

engineering students and professionals have relied on Digital Video Processing as the definitive, in-depth guide to digital image and video processing technology. Now, Dr. A. Murat Tekalp has completely revamped his guide to reflect today's technologies, techniques, algorithms, and trends. Digital Video Processing, Second Edition, reflects important advances in signal processing and computer vision, and new applications such as 3D, ultra-high-resolution video, and digital cinema. This edition offers rigorous, comprehensive, balanced, and quantitative coverage of image filtering, motion estimation, tracking, segmentation, video filtering, and compression. Now organized and presented as a true tutorial, it contains updated problem sets and new MATLAB projects in every chapter. Coverage includes Multi-dimensional signals/systems: transforms, sampling, and lattice conversion Digital images and video: human vision, analog/digital video, and video quality Image filtering: gradient estimation, edge detection, scaling, multi-resolution representations, enhancement, de-noising, and restoration Motion estimation: image formation; motion models; differential, matching, optimization methods, and transform-domain methods; and 3D motion and shape estimation Video segmentation: color image and motion segmentation, change detection, shot boundary detection segmentation, semantic object segmentation, and performance evaluation Multi-frame filtering: motion-compensated filtering; multi-frame standards conversion, noise filtering, and restoration; and super-resolution Image compression: lossless compression, JPEG, wavelets, and JPEG2000 Video compression: early standards, ITU-T H.264 / MPEG-4 AVC, HEVC, Scalable Video Compression, and stereo/multi-view approaches

The Emergence of Video Processing Tools ,2014

Real-Time Image and Video Processing Nasser Kehtarnavaz, Mark Gamadia, 2022-06-01 This book presents an overview of the guidelines and strategies for transitioning an image or video processing algorithm from a research environment into a real-time constrained environment. Such guidelines and strategies are scattered in the literature of various disciplines including image processing, computer engineering, and software engineering, and thus have not previously appeared in one place. By bringing these strategies into one place, the book is intended to serve the greater community of researchers, practicing engineers, industrial professionals, who are interested in taking an image or video processing algorithm from a research environment to an actual real-time implementation on a resource constrained hardware platform. These strategies consist of algorithm simplifications, hardware architectures, and software methods. Throughout the book, carefully selected representative examples from the literature are presented to illustrate the discussed concepts. After reading the book, the readers are exposed to a wide variety of techniques and tools, which they can then employ to design a real-time image or video processing system.

Video and Image Processing in Multimedia Systems Borko Furht, Stephen W. Smoliar, HongJiang Zhang, 2012-12-06 Video and Image Processing in Multimedia Systems treats a number of critical topics in multimedia systems, with respect to image and video processing techniques and their implementations. These techniques include: Image and video compression techniques and standards, and Image and video indexing and retrieval techniques. Video and Image Processing in Multimedia Systems is divided into three parts. Part I serves as an introduction to multimedia systems, discussing basic concepts, multimedia networking and synchronization, and an overview of multimedia

applications. Part II presents comprehensive coverage of image and video compression techniques and standards, their implementations and applications. Because multimedia data (specifically video and images) require efficient compression techniques in order to be stored and delivered in real-time, video and image compression is a crucial element of an effective multimedia system. In Part III attention is focused on the semantic nature of image and video source material, and how that material may be effectively indexed and retrieved. Topics discussed include static images, full-motion video, and the manner in which compressed representations can facilitate structural analysis. Part III concludes with an extended discussion of a case study. This book serves as an invaluable reference with respect to the most important standards in the field. Video and Image Processing in Multimedia Systems is suitable as a textbook for course use.

Applied Video Processing in Surveillance and Monitoring Systems Dey, Nilanjan, Ashour, Amira, Acharjee, Suvojit, 2016-10-11 Video monitoring has become a vital aspect within the global society as it helps prevent crime, promote safety, and track daily activities such as traffic. As technology in the area continues to improve, it is necessary to evaluate how video is being processed to improve the quality of images. Applied Video Processing in Surveillance and Monitoring Systems investigates emergent techniques in video and image processing by evaluating such topics as segmentation, noise elimination, encryption, and classification. Featuring real-time applications, empirical research, and vital frameworks within the field, this publication is a critical reference source for researchers, professionals, engineers, academicians, advanced-level students, and technology developers.

Multimedia Image and Video Processing Ling Guan, 2017-12-19 As multimedia

applications have become part of contemporary daily life, numerous paradigm-shifting technologies in multimedia processing have emerged over the last decade. Substantially updated with 21 new chapters, Multimedia Image and Video Processing, Second Edition explores the most recent advances in multimedia research and applications. This edition presents a comprehensive treatment of multimedia information mining, security, systems, coding, search, hardware, and communications as well as multimodal information fusion and interaction. Clearly divided into seven parts, the book begins with a section on standards, fundamental methods, design issues, and typical architectures. It then focuses on the coding of video and multimedia content before covering multimedia search, retrieval, and management. After examining multimedia security, the book describes multimedia communications and networking and explains the architecture design and implementation for multimedia image and video processing. It concludes with a section on multimedia systems and applications. Written by some of the most prominent experts in the field, this updated edition provides readers with the latest research in multimedia processing and equips them with advanced techniques for the design of multimedia systems.

Feature Detectors and Motion Detection in Video Processing Dey, Nilanjan, Ashour, Amira, Patra, Prasenjit Kr., 2016-10-25 Video is one of the most important forms of multimedia available, as it is utilized for security purposes, to transmit information, promote safety, and provide entertainment. As motion is the most integral element in videos, it is important that motion detection systems and algorithms meet specific requirements to achieve accurate detection of real time events. Feature Detectors and Motion Detection in Video Processing explores innovative methods and approaches to

analyzing and retrieving video images. Featuring empirical research and significant frameworks regarding feature detectors and descriptor algorithms, the book is a critical reference source for professionals, researchers, advanced-level students, technology developers, and academicians.

Decoding **Video Processing**: Revealing the Captivating Potential of Verbal Expression

In an era characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its power to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Video Processing**," a mesmerizing literary creation penned by a celebrated wordsmith, readers attempt an enlightening odyssey, unraveling the intricate significance of language and its enduring affect our lives. In this appraisal, we shall explore the book is central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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