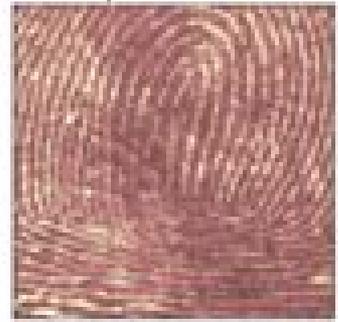
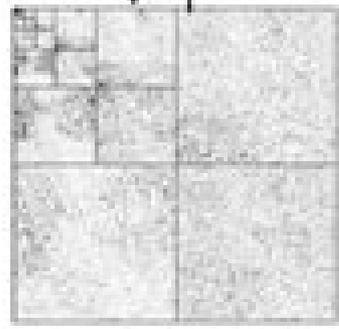


# COMPRESSION

Wavelet Transform



Thresh.



Quantization

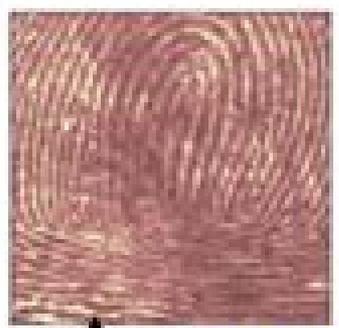


Encoding

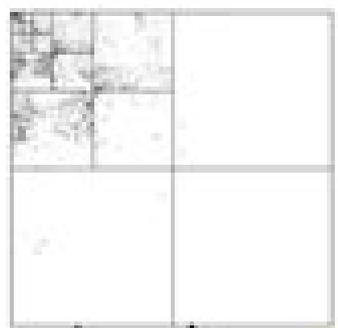
Storage or Transmission

# UNCOMPRESSION

Inv. Wavelet Transform



Unquantization



Uncoding

# Wavelet Image And Video Compression

**Wofgang Effelsberg,Ralf Steinmetz**



## **Wavelet Image And Video Compression:**

**Wavelet Image and Video Compression** Pankaj N. Topiwala, 2006-04-18 An exciting new development has taken place in the digital era that has captured the imagination and talent of researchers around the globe wavelet image compression This technology has deep roots in theories of vision and promises performance improvements over all other compression methods such as those based on Fourier transforms vectors quantizers fractals neural nets and many others It is this revolutionary new technology that is presented in *Wavelet Image and Video Compression* in a form that is accessible to the largest audience possible *Wavelet Image and Video Compression* is divided into four parts Part I Background Material introduces the basic mathematical structures that underly image compression algorithms with the intention of providing an easy introduction to the mathematical concepts that are prerequisites for the remainder of the book It explains such topics as change of bases scalar and vector quantization bit allocation and rate distortion theory entropy coding the discrete cosine transform wavelet filters and other related topics Part II Still Image Coding presents a spectrum of wavelet still image coding techniques Part III Special Topics in Still Image Coding provides a variety of example coding schemes with a special flavor in either approach or application domain Part IV Video Coding examines wavelet and pyramidal coding techniques for video data *Wavelet Image and Video Compression* serves as an excellent reference and may be used as a text for advanced courses covering the subject

**Image and Video Compression Using the Wavelet Transform** A. S. Lewis, 1995 *Wavelet Image Compression* William Pearlman, 2012-01-22 This book explains the stages necessary to create a wavelet compression system for images and describes state of the art systems used in image compression standards and current research It starts with a high level discussion of the properties of the wavelet transform especially the decomposition into multi resolution subbands It continues with an exposition of the null zone uniform quantization used in most subband coding systems and the optimal allocation of bitrate to the different subbands Then the image compression systems of the FBI Fingerprint Compression Standard and the JPEG2000 Standard are described in detail Following that the set partitioning coders SPECK and SPIHT and EZW are explained in detail and compared via a fictitious wavelet transform in actions and number of bits coded in a single pass in the top bit plane The presentation teaches that besides producing efficient compression these coding systems except for the FBI Standard are capable of writing bit streams that have attributes of rate scalability resolution scalability and random access decoding Many diagrams and tables accompany the text to aid understanding The book is generous in pointing out references and resources to help the reader who wishes to expand his knowledge know the origins of the methods or find resources for running the various algorithms or building his own coding system Table of Contents Introduction Characteristics of the Wavelet Transform Generic Wavelet based Coding Systems The FBI Fingerprint Image Compression Standard Set Partition Embedded Block SPECK Coding Tree based Wavelet Transform Coding Systems Rate Control for Embedded Block Coders Conclusion

*Wavelet Image Compression* William A. Pearlman, 2013 This book

explains the stages necessary to create a wavelet compression system for images and describes state of the art systems used in image compression standards and current research It starts with a high level discussion of the properties of the wavelet transform especially the decomposition into multi resolution subbands It continues with an exposition of the null zone uniform quantization used in most subband coding systems and the optimal allocation of bitrate to the different subbands Then the image compression systems of the FBI Fingerprint Compression Standard and the JPEG2000 Standard are described in detail Following that the set partitioning coders SPECK and SPIHT and EZW are explained in detail and compared via a fictitious wavelet transform in actions and number of bits coded in a single pass in the top bit plane The presentation teaches that besides producing efficient compression these coding systems except for the FBI Standard are capable of writing bit streams that have attributes of rate scalability resolution scalability and random access decoding Many diagrams and tables accompany the text to aid understanding The book is generous in pointing out references and resources to help the reader who wishes to expand his knowledge know the origins of the methods or find resources for running the various algorithms or building his own coding system

**Video Compression and Rate Control Methods Based on the Wavelet Transform** Eric J. Balster, 2004 Abstract Wavelet based image and video compression techniques have become popular areas in the research community In March of 2000 the Joint Pictures Expert Group JPEG released JPEG2000 JPEG2000 is a wavelet based image compression standard and predicted to completely replace the original JPEG standard In the video compression field a compression technique called 3D wavelet compression shows promise Thus wavelet based compression techniques have received more attention from the research community This dissertation involves further investigation of the wavelet transform in the compression of image and video signals and a rate control method for real time transfer of wavelet based compressed video A pre processing algorithm based on the wavelet transform is developed for the removal of noise in images prior to compression The intelligent removal of noise reduces the entropy of the original signal aiding in compressibility The proposed wavelet based denoising method shows a computational speedup of at least an order of magnitude than previously established image denoising methods and a higher peak signal to noise ratio PSNR A video denoising algorithm is also included which eliminates both intra and inter frame noise The inter frame noise removal technique estimates the amount of motion in the image sequence Using motion and noise level estimates a video denoising technique is established which is robust to various levels of noise corruption and various levels of motion A virtual object video compression method is included Object based compression methods have come to the forefront of the research community with the adoption of the MPEG 4 Motion Pictures Expert Group standard Object based compression methods promise higher compression ratios without further cost in reconstructed quality Results show that virtual object compression outperforms 3D wavelet compression with an increase in compression ratio and higher PSNR Finally a rate control method is developed for the real time transmission of wavelet based compressed video Wavelet compression schemes demand a rate

control algorithm for real time video communication systems Using a leaky bucket design approach the proposed rate control method manages the uncertain factors in both the acquisition time of the group of frames GoF computation time of compression decompression algorithms and network delay Results show good management and control of buffers and minimal variance in frame rate

Video Compression Techniques Wolfgang Effelsberg, Ralf Steinmetz, 1998-10-22 The book assumes that the reader has a basic background in computing or engineering

**On the Applicability of Wavelet Transforms to Image and Video Compression** Oyvind Stromme, 1999

**Image/video Compression and Quality Assessment Based on Wavelet Transform** Zhigang Gao, 2007 Abstract Because of the contradiction of the vast data size of raw digital images and videos and the limited transmission bandwidth and storage space it is essential to develop compression methodologies with high compression ratio and good reconstructed quality It is also important to develop quality metrics which are consistent with human vision and easy to calculate The spatial frequency localization and multi resolution capabilities of the wavelet transform make it a natural means of signal representation This work investigates the advantages of the wavelet transform and focuses on the following research topics

- 1 An image quality metric that assesses the quality of an image in the wavelet domain
- 2 A quality constrained compression algorithm that compresses an image to a desired visual quality
- 3 An innovative DWT based temporal filtering scheme that achieves high compression ratio and reduces the ghost effect without motion estimation
- 4 A virtual sub object video coding scheme that is suitable for applications with static background

**Advanced Wavelet Application for Video Compression and Video Object Tracking** Chao He, 2005 Abstract Wavelet transform has become a very powerful tool for image video compression and processing In this dissertation we present our research in the area of three dimensional 3 D wavelet based video compression and Gabor wavelet based video object tracking respectively The wavelet transform has been successfully used for image compression

- 1 Its success in image compression motivates a lot of researches in the wavelet transform based video compression
- 3 D wavelet transform based video compression is a direction drawing many attentions We investigate two topics in this area The first topic is optimal 3 D zerotree ZTR structure for the 3 D wavelet based video compression Many researches have been done to use the 3 D zerotree and 3 D wavelet transform in video compression However the problem of how to build a 3 D zerotree was not studied carefully In this research we study the theory behind building a zerotree and propose a new 3 D zerotree structure which generates better coding performance The second topic is time and space efficiency of the 3 D wavelet transform based video compression for real time video applications The 3D wavelet transform needs to save and process large 3 D data which is a bottle neck for real time applications We investigate this issue and present a time and space efficient video codec utilizing integer wavelet transforms The wavelet transform can represent signal in a multi resolution way so it is also used in object tracking We presents an object tracking method for object based video processing which uses a 2 D Gabor wavelet transform GWT a 2 D triangular mesh and a 2 D golden section algorithm

The feature points are stochastically selected based on the energy of their GWT coefficients. The global placement of the feature points is determined by a 2-D mesh whose feature is the area of the triangles formed by the feature points. In order to find the corresponding object in the next frame, the 2-D golden section algorithm is employed and this can be shown to be the fastest algorithm to find the maximum of a unimodal function.

**Low Bit Rate Wavelet-based Image and Video Compression with Adaptive Quantization, Coding and Postprocessing** Jiebo Luo, 1995 *A Wavelet Fractal Method for Content Based Image and Video Compression* Robert J. Bonneau, Columbia University, 1997 Traditional methods of image and video coding rely on linear transformations that focus primarily on high compression. With the increasing demand for digital imagery and video, there is now a need for functionality of the compressed information. This dissertation develops a new framework for compression that uses a fractal wavelet method to break the imagery into shape, texture, color, and motion. With this new organization, image information is readily accessible to the user in compressed form. Based on this compression method, we then develop an object-oriented video format. Image analysts tend to break imagery into the categories of shape, texture, color, and motion. Thus, we begin our approach to image compression by finding mathematical methods that preserve shape and texture in an efficient manner. This new non-traditional method begins by using fractals. A fractal is an object which, when observed at its smallest level of detail, resembles the overall object itself. Some natural examples include ferns, snowflakes, clouds, and mountains. Recently, engineers have applied fixed point theory to describe a method of fractal image compression. Unfortunately, fixed point theory only provides a partial description of fractal compression since it says little about the spatial frequency structure behind the process.

**Image and Video Compression** Madhuri A. Joshi, Mehul S. Raval, Yogesh H. Dandawate, Kalyani R. Joshi, Shilpa P. Metkar, 2014-11-17 Image and video signals require large transmission bandwidth and storage, leading to high costs. The data must be compressed without a loss or with a small loss of quality. Thus, efficient image and video compression algorithms play a significant role in the storage and transmission of data. *Image and Video Compression: Fundamentals, Techniques, and Applications* explains the major techniques for image and video compression and demonstrates their practical implementation using MATLAB programs. Designed for students, researchers, and practicing engineers, the book presents both basic principles and real practical applications. In an accessible way, the book covers basic schemes for image and video compression, including lossless techniques and wavelet and vector quantization-based image compression and digital video compression. The MATLAB programs enable readers to gain hands-on experience with the techniques. The authors provide quality metrics used to evaluate the performance of the compression algorithms. They also introduce the modern technique of compressed sensing, which retains the most important part of the signal while it is being sensed.

**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 and 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

*Encyclopedia of Optical and Photonic Engineering (Print) - Five Volume Set* Craig Hoffman, Ronald Driggers, 2015-09-22

The first edition of the Encyclopedia of Optical and Photonic Engineering provided a valuable reference concerning devices or systems that generate transmit measure or detect light and to a lesser degree the basic interaction of light and matter This Second Edition not only reflects the changes in optical and photonic engineering that have occurred since the first edition was published but also Boasts a wealth of new material expanding the encyclopedia s length by 25 percent Contains extensive updates with significant revisions made throughout the text Features contributions from engineers and scientists leading the fields of optics and photonics today With the addition of a second editor the Encyclopedia of Optical and Photonic Engineering Second Edition offers a balanced and up to date look at the fundamentals of a diverse portfolio of technologies and discoveries in areas ranging from x ray optics to photon entanglement and beyond This edition s release corresponds

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**Image Processing and Communications Challenges 8** Ryszard S. Choraś,2016-10-27 This book collects a series of research papers in the area of Image Processing and Communications which not only introduce a summary of current technology but also give an outlook of potential future problems in this area The key objective of the book is to provide a collection of comprehensive references on some recent theoretical development as well as novel applications in image processing and communications The book is divided into two parts and presents the proceedings of the 8th International Image Processing and Communications Conference IP C 2016 held in Bydgoszcz Poland September 7-9 2016 Part I deals with image processing A comprehensive survey of different methods of image processing computer vision is also presented Part II deals with the telecommunications networks and computer networks Applications in these areas are considered

*Discrete Wavelet Transforms* Juuso T. Olkkonen,2011-04-04 Discrete wavelet transform DWT algorithms have become standard tools for discrete time signal and image processing in several areas in research and industry As DWT provides both frequency and location information of the analyzed signal it is constantly used to solve and treat more and more advanced problems The present book *Discrete Wavelet Transforms Theory and Applications* describes the latest progress in DWT analysis in non stationary signal processing multi scale image enhancement as well as in biomedical and industrial applications Each book chapter is a separate entity providing examples both the theory and applications The book comprises of tutorial and advanced material It is intended to be a reference text for graduate students and researchers to obtain in depth knowledge in specific applications

**Wavelet Applications in Signal and Image Processing**,1999 *Advances in Computing, Communication, Automation and Biomedical Technology* M. G. Sumithra ,Arulmurugan Ramu ,Chow Chee Onn,2020-12-30 *Advances in Computing Communication Automation and Biomedical Technology* aims to bring together leading academic scientists researchers industry representatives postdoctoral fellows and research scholars around the world to share their knowledge and research expertise to advances in the areas of Computing Communication Electrical Civil Mechanical and Biomedical Systems as well as to create a prospective collaboration and networking on various areas It also provides a premier interdisciplinary platform for researchers practitioners and educators to present and discuss the most recent innovations trends and concerns as well as practical challenges encountered and solutions adopted in the fields of innovation

**Security and Privacy Assurance in Advancing Technologies: New Developments** Nemati, Hamid,2010-11-30 This book provides a comprehensive collection of knowledge from experts within the field of information security and privacy and explores the changing roles of information technology and how this change will impact information security and privacy Provided by publisher

**Still Image and Video Compression with MATLAB** K. S. Thyagarajan,2011-03-16 This book describes the principles of image

and video compression techniques and introduces current and popular compression standards such as the MPEG series. Derivations of relevant compression algorithms are developed in an easy to follow fashion. Numerous examples are provided in each chapter to illustrate the concepts.

## Unveiling the Energy of Verbal Artistry: An Mental Sojourn through **Wavelet Image And Video Compression**

In a global inundated with displays and the cacophony of instant conversation, the profound energy and emotional resonance of verbal artistry often disappear into obscurity, eclipsed by the constant onslaught of noise and distractions. Yet, situated within the lyrical pages of **Wavelet Image And Video Compression**, a fascinating perform of fictional brilliance that pulses with natural feelings, lies an unique journey waiting to be embarked upon. Composed by a virtuoso wordsmith, this mesmerizing opus guides readers on a mental odyssey, lightly exposing the latent possible and profound influence stuck within the intricate web of language. Within the heart-wrenching expanse with this evocative examination, we can embark upon an introspective exploration of the book is main styles, dissect its captivating publishing style, and immerse ourselves in the indelible impact it leaves upon the depths of readers souls.

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