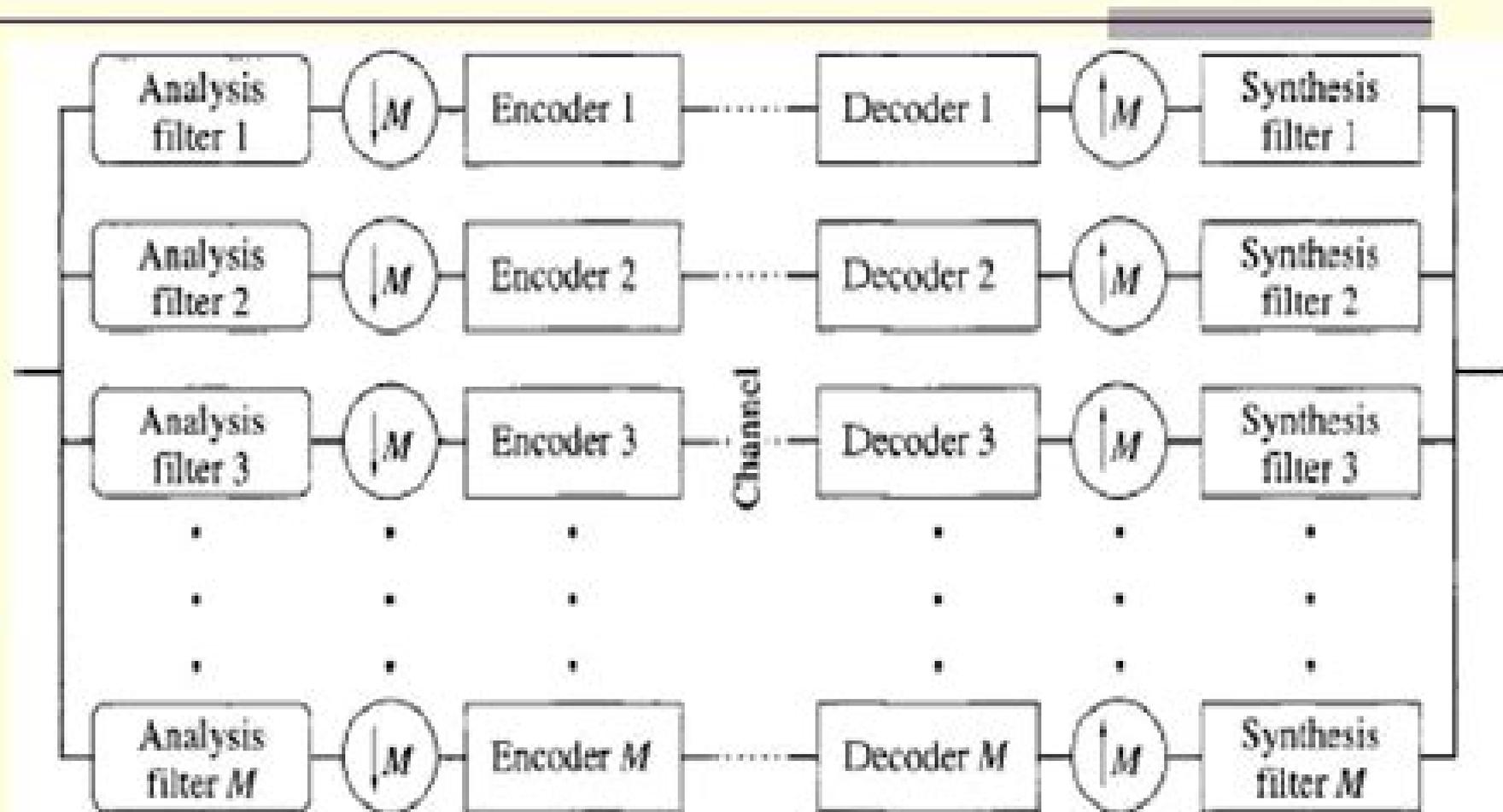


# Subband Coding Algorithm



**FIGURE 14.7** Block diagram of the subband coding system.

# Subband Image Coding

**Jonathan Nelson Bradley**



## **Subband Image Coding:**

*Subband Image Coding* John W. Woods, 2013-06-29 This book concerns a new method of image data compression which will may supplant the well established block transform methods that have been state of the art for the last 15 years Subband image coding or SBC was first performed as such in 1985 and as the results became known at first through conference proceedings and later through journal papers the research community became excited about both the theoretical and practical aspects of this new approach This excitement is continuing today with many major research laboratories and research universities around the world investigating the subband approach to coding of color images high resolution images video including video conferencing and advanced television and the medical application of picture archiving systems Much of the fruits of this work is summarized in the eight chapters of this book which were written by leading practitioners in this field The subband approach to image coding starts by passing the image through a two or three dimensional filter bank The two dimensional 2 D case usually is hierarchical consisting of two stages of four filters each Thus the original image is split into 16 subband images with each one decimated or subsampled by 4x4 resulting in a data conservation The individual channel data is then quantized for digital transmission In an attractive variation an octave like approach herein tenoned subband pyramid is taken for the decomposition resulting in a total of just eleven subbands Sub-band image coding, 1902 Este trabalho aborda o problema da compressão de imagens explorando a técnica de codificação por subbandas SBB Como estrutura básica usada na primeira parte do trabalho tem-se a divisão da imagem em 16 subbandas buscando replicar os resultados de Woods 1 As componentes das 16 SBB são quantizadas e codificadas e bits são alocados às SBB usando como critério a minimização do erro médio quadrático Os quantizadores são projetados segundo uma distribuição Gaussiana Generalizada Neste processo de codificação a subbanda de mais baixa frequência codificada com DPCM enquanto as demais SBB são codificadas por PCM Como inovação proposto o uso do algoritmo de Lempel Ziv na codificação sem perdas compactação das subbandas quantizadas Na compactação são empregados os algoritmos de Huffman e LZW modificação do LZA Os resultados das simulações são apresentados em termos da taxa bits/pixel versus relação sinal/ruído de pico e em termos de análise subjetiva das imagens reconstruídas Os resultados obtidos indicam um desempenho de compressão superior quanto ao algoritmo de Huffman usado comparado com o algoritmo LZW A melhoria de desempenho na técnica de decomposição em subbandas observada com o algoritmo de Huffman foi superior 2dB acima Todavia tendo em vista as vantagens da universalidade do algoritmo de Lempel Ziv deve-se continuar a investigar o seu desempenho implementado de forma diferente do explorado neste trabalho **A Theory of Subband Image Coding** Shinichi Doi, 1991 **Subband Compression of Images: Principles and Examples** T.A. Ramstad, S.O. Aase, J.H. Husøy, 1995-07-18 Sixth in the book series Advances in Image Communication which documents the rapid advancements of recent years in image communication technologies this volume provides a comprehensive exploration of subband coding Originally subband coding and transform coding were developed

separately. The former however benefitted considerably from the earlier evolution of transform coding theory and practice. Retaining their own terminology and views, the two methods are closely related and this book indeed aims to unify the approaches. Specifically, the volume contributes effectively to the understanding of frequency domain coding techniques. Many images from coding experiments are presented, enabling the reader to consider the properties of different coders. Chapter 1 introduces the problem of image compression in general terms. Sampling of images and other fundamental concepts such as entropy and the rate distortion function are briefly reviewed. The idea of viewing coding techniques as series expansions is also introduced. The second chapter presents signal decomposition and the conditions for perfect reconstruction from minimum representations. Chapter 3 deals with filter bank structures, primarily those displaying the perfect reconstruction property. Quantization techniques and the efficient exploitation of the bit resources are discussed from a theoretical perspective in Chapter 4, and this issue is further examined in Chapter 6 from a more practical point of view. Chapter 5 provides a development of gain formulas, i.e. quantitative measures of the performance of filter banks in a subband coding context, and these are then employed in a search for optimal filter banks. A number of examples of coded images using different subband coders are presented in Chapter 7, these indicating that subband coders give rise to some characteristic types of image degradations. Accordingly, Chapter 8 presents several techniques for minimizing these artifacts. The theory and practice of subband coding of video at several target bit rates is discussed in the last chapter.

*Subband Image Coding with Vector Quantization* Jonathan Nelson Bradley, 1989  
*Subband and Wavelet Still Image Coding for Improved Image Quality* Matthew Anthony Mow, 1994

**Vector Quantization in Subband Coding of Images** Saad John Bedros, 1995

**Wavelet, Subband and Block Transforms in Communications and Multimedia** Ali N. Akansu, Michael J. Medley, 2006-04-18

Wavelet and subband transforms have been of great interest in the fields of engineering and applied mathematics. The theories of these powerful signal processing tools have matured and many applications utilizing them are emerging in different disciplines. This book comprised of eleven chapter contributions from prominent researchers in the field focuses on communications and multimedia applications of wavelet and subband transforms. The first six chapters of this book deal with a variety of communications applications that significantly benefit from wavelet and subband theories. Similarly, the remaining five chapters present recent advances in multimedia applications of wavelet and subband transforms. These chapters interconnect the requirements of applications with the underlying theory and their engineering solutions. Hence, the reader can easily trace the entire path from fundamentals to the purpose and merit of application in hand. A combined list of references for the entire volume is given at the end of the text that should be helpful to the interested reader for a further study. This book is anticipated to be of particular interest to engineers and scientists who want to learn about state of the art subband and wavelet transform applications as well as their theoretical underpinnings. It can also serve as a supplementary book for graduate level engineering and applied mathematics courses on wavelet and subband transforms.

**Subband**

**Coding of Images** Hasan Gadjali,1987      *Subband/transform Image Coding for Lossy and Lossless Compression* Daniel Glover,1992      **Video Image Compression Using Subband Coding and Vector Quantization** Eric Kwok-Leong Lo,1994

**Subband Coding of Stereo Images and Image Sequences** William D. Reynolds,1997      Subband Transform Coding for Image Compression Wael Mouhammad Jamil Bazzi,1999

Image compression has been an active research area for more than 25 years The purpose of digital image compression is to reduce the amount of data needed to represent a digital image Subband coding is one popular technique which has been successful applied for the purpose of digital image compression This technique has recently received considerable attention In subband coding the input image is divided into a number of separate frequency components which are encoded separate The following work initialed after observing that most subband coders have been based on using spatial coding techniques in the subbands Coding the transforms of the subbands is proposed here Results tor typical standard images show that coding the transforms of the subbands in a subband coder results in a lower reconstruction error as compared to using spatial coding techniques like predictive coding      *Subband Image Coding Using Classification and Trellis Coded Quantization* Rajan Laxman Joshi,1996      Low Bit-rate Subband Coding of Image and Video Signals Using Vector Quantization Choon S. Kim,1992      Subband Analysis-synthesis and Edge Modeling Methods for Image Coding Steven Lynn Eddins,1990      Diamond-shaped Subband Image Coding Xiaohui Li,1992

**Region-based Subband Coding of Image Sequences** Muhammed Z. Coben,2003      *Selected Papers on Image Coding and Compression* Majid Rabbani,1992      **A New Technique for Subband Coding of Images** Nguyen Khac Phu,1987

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