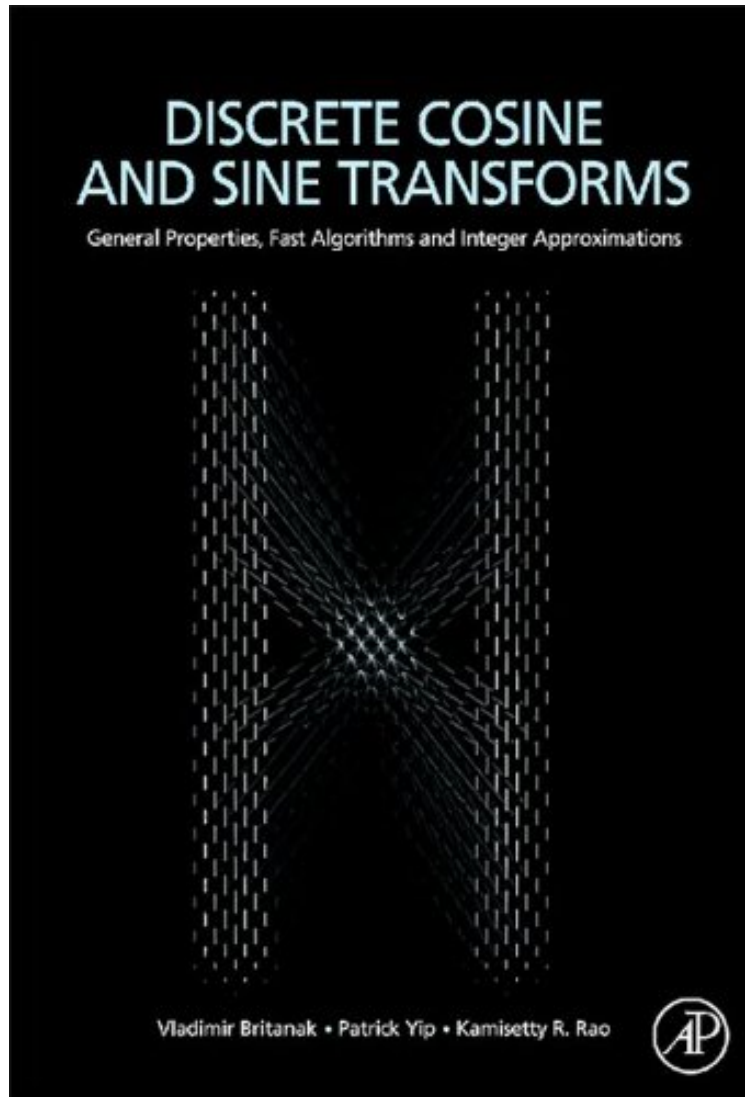


(Ebook pdf) Discrete Cosine and Sine Transforms: General Properties, Fast Algorithms and Integer Approximations

Discrete Cosine and Sine Transforms: General Properties, Fast Algorithms and Integer Approximations

Vladimir Britanak, Patrick C. Yip, K. R Rao
*ePub | *DOC | audiobook | ebooks | Download PDF*



 Download

 Read Online

#3287649 in eBooks 2010-07-28 2010-07-28 File Name: B00BXETQ3E | File size: 46.Mb

Vladimir Britanak, Patrick C. Yip, K. R Rao : Discrete Cosine and Sine Transforms: General Properties, Fast Algorithms and Integer Approximations before purchasing it in order to gage whether or not it would be worth my time, and all praised Discrete Cosine and Sine Transforms: General Properties, Fast Algorithms and Integer Approximations:

The Discrete Cosine Transform (DCT) is used in many applications by the scientific, engineering and research communities and in data compression in particular. Fast algorithms and applications of the DCT Type II (DCT-II) have become the heart of many established international image/video coding standards. Since then other forms of the DCT and Discrete Sine Transform (DST) have been investigated in detail. This new edition presents the complete set of DCT and DST discrete trigonometric transforms, including their definitions, general mathematical properties, and relations to the optimal Karhunen-Loève transform (KLT), with the emphasis on fast algorithms (one-dimensional and two-dimensional) and integer approximations of DCTs and DSTs for their efficient implementations in the integer domain. DCTs and DSTs are real-valued transforms that map integer-valued signals to floating-point coefficients. To eliminate the floating-point operations, various methods of integer approximations have been proposed to construct and flexibly generate a family of integer DCT and DST transforms with arbitrary accuracy and performance. The integer DCTs/DSTs with low-cost and low-powered implementation can replace the corresponding real-valued transforms in wireless and satellite communication systems as well as portable computing applications. The book is essentially a detailed excursion on orthogonal/orthonormal DCT and DST matrices, their matrix factorizations and integer approximations. It is hoped that the book will serve as a valuable reference for industry, academia and research institutes in developing integer DCTs and DSTs as well as an inspiration source for further advanced research. Presentation of the complete set of DCTs and DSTs in context of entire class of discrete unitary sinusoidal transforms: the origin, definitions, general mathematical properties, mutual relationships and relations to the optimal Karhunen-Loève transform (KLT) Unified treatment with the fast implementations of DCTs and DSTs: the fast rotation-based algorithms derived in the form of recursive sparse matrix factorizations of a transform matrix including one- and two-dimensional cases Detailed presentation of various methods and design approaches to integer approximation of DCTs and DSTs utilizing the basic concepts of linear algebra, matrix theory and matrix computations leading to their efficient multiplierless real-time implementations, or in general reversible integer-to-integer implementations Comprehensive list of additional references reflecting recent/latest developments in the efficient implementations of DCTs and DSTs mainly one-, two-, three- and multi-dimensional fast DCT/DST algorithms including the recent active research topics for the time period from 1990 up to now

From the Back Cover Since the book, "Discrete Cosine Transform" by K. R. Rao and P. Yip, (Academic Press, Boston) was published in 1990, the DCT has increasingly attracted the attention of scientific, engineering and research communities. The DCT is used in many applications and in data compression in particular. This is due to the fact that the DCT has excellent energy-packing capability and also approaches the statistically optimal Karhunen-Loève transform (KLT) in decorrelating a signal. The development of various fast algorithms for the efficient implementation of the DCT involving real arithmetic only, further contributed to its popularity. In the last several years there have been significant advances and developments in both theory and applications relating to transform processing of signals. In particular, digital processing motivated the investigation of other forms of discrete cosine transforms (DCTs) for their integer approximations. International standards organizations (ISO/IEC and ITU-T) have adopted the use of various forms of the integer DCT. At the same time, the investigation of other forms of discrete sine transforms (DSTs) has made a similar impact. There is therefore a need to extend the coverage to include these techniques. This book is aimed at doing just that. The book "Discrete Cosine and Sine Transforms: General properties, Fast algorithms and Integer Approximations" is aimed at both the novice and the expert. The fervent hopes and aspirations of the authors (V. Britanak, P.C. Yip and K.R. Rao) are that the latest developments in the general DCT/DST field further lead into additional applications and also provide the incentive and inspiration to further modify/customize these transforms with the overall motivation to improve their efficiencies while retaining the simplicity in implementations. About the Author V. Britanak graduated in mathematics in 1978, received the RNDr. degree in Theoretical cybernetics and Mathematical informatics in 1987 from the Faculty of Mathematics and Physics of Comenius University in Bratislava, and the CSc. degree (equivalent to PhD) in Computer science in 1995 from Slovak Academy of Sciences in Bratislava. He is currently with the Institute of Informatics of Slovak Academy of Sciences, Bratislava, where he works as senior researcher. His research interests include digital image and signal processing, discrete orthogonal sinusoidal transforms and perfect reconstruction cosine/sine modulated filter banks (MDCT/MDST): fast algorithms, matrix factorizations and integer approximations. He has published several articles in refereed journals. He is a member of IEEE. Before his retirement in 2004, Pat Yip has been active in the area of digital signal processing. He has published numerous articles in technical journals and has taught courses in Engineering Mathematics. Several doctoral candidates have completed their research under his supervision. K. R. Rao received the PhD degree in electrical engineering from The University of New Mexico, Albuquerque in 1966. Since 1966, he has been with the University of Texas at Arlington where he is currently a professor of electrical engineering. He, along with two other researchers introduced the Discrete Cosine Transform in 1975 which has since become very popular in digital signal processing. He is the co-author of the books "Orthogonal Transforms for Digital Signal Processing" (Springer-Verlag, 1975). Also recorded for the blind in Braille by the Royal National Institute for the blind: "Fast Transforms: Analyses and Applications" (Academic Press, 1982), "Discrete Cosine Transform:

Algorithms, Advantages, Applications” (Academic Press, 1990). He has edited a benchmark volume “Discrete Transforms and Their Applications” (Van Nostrand Reinhold, 1985). He has coedited a benchmark volume, “Teleconferencing” (Van Nostrand Reinhold, 1985). He is co-author of the books, “Techniques and Standards for Image/Video/Audio Coding” (Prentice Hall, 1996), “Packet Video Communications over ATM Networks” (Prentice Hall, 2000) and “Multimedia Communication Systems” (Prentice Hall, 2002). He has coedited a handbook “The Transform and Data Compression Handbook” (CRC Press, 2001), “Digital Video Image Quality and Perceptual Coding”, (with H. R. Wu), Taylor and Francis, Nov. 2005, “Introduction to Multimedia Communications: Applications, Middleware, Networking” (with Z. S. Bojkovic and D. A. Milovanovic), Wiley, 2005. Some of his books have been translated into Japanese, Chinese, Korean and Russian and also published as Asian (paperback) editions. He has been an external examiner for graduate students from Universities in Australia, Canada, Hong Kong, India, Singapore, Thailand and Taiwan. He was a visiting professor in several Universities - 3 to 7 weeks and 1/2 months (Australia, Japan, Korea, Singapore and Thailand). He has conducted workshops/tutorials on video/audio coding standards