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# HYBRID MEDICAL IMAGE COMPRESSION: SURVEY

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*Abstract*— **Medical imaging produces digital form of human body pictures. There exists a need for compression of these images for storage and communication purposes. Current compression schemes provide a very high compression rate with a considerable loss of quality. In medicine, it is necessary to have high image quality in region of interest, i.e. diagnostically important regions. This work discusses a hybrid model of lossless compression in region of interest with high compression rate, lossy compression in other regions. The hybrid technique provides efficient and accurate coding of the medical images. The use of computers for handling image data in the healthcare is growing. The amount of data might be a problem from a storage point of view or when the data is sent over a network. To overcome these problems data compression techniques adapted to these applications are needed.These are few methods which are used in image compression.**

*Index Terms*— **AMBTC, DAUBECHIES WAVELET, IMAGE COMPRESSION, SPHIT.**

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## I. INTRODUCTION

Images play an vital role in the world of medical science and its transmission with storage has become really a big load as it occupy more space in memory[2], [9]. Thus Data compression has become a necessity which will save bandwidth, power, storage space, etc. and it has turned out to be a part of research with so much manpower, time and money involved for its development. Image compression is the method of minimizing the size in bytes of a graphics files which does not degrading the quality of the image. It also reduces the time which is required for images to be sent or use over the Internet or downloaded from Web pages.

There are many different ways in which image files can be compressed. For Internet use, the two most common compressed graphic image formats are the JPEG format and the GIF format. The JPEG method is often used for photographs, while the GIF method is commonly used for line art and other images in which geometric shapes are relatively simple.

Image compression may be lossy or lossless. Lossless compression is preferred for archival purposes and often for medical imaging, technical drawings, clip art, or comics. Lossy compression methods, especially when used at low bit rates, introduce compression artifacts. Lossy methods are especially suitable for natural images such as photographs in applications where minor (sometimes imperceptible) loss of fidelity is acceptable to achieve a substantial reduction in bit rate. The lossy compression that producible differences may be called visually lossless.

*A* Classification of Compression Methods

There have been many types of compression algorithms developed. These algorithms fall into two broad types, lossless algorithms and lossy algorithms. A lossless algorithm reproduces the original exactly. A lossy algorithm, as its name implies, loses some data. Data loss may be unacceptable in many applications.

*B* Hybrid Medical Image Compression

Medical Image Compression cannot afford deficiency in diagnostically important regions (Region of Interest). An approach that brings high compression rate with good quality in region of interest (ROI) is required. A hybrid coding scheme seems to be the only solution to this twofold problem. In other words, two different compression schemes should be used for ROI and non-ROI. The general theme is to preserve quality in diagnostically critical regions, while encoding the other regions so that the viewer can observe the position of the critical regions in the original image. Therefore, a very lossy compression scheme is suitable in non-ROI regions to give a global picture to the user while a lossless compression scheme is necessary for ROI regions.

## II. BACKGROUND

A lot of works were found with the survey of various research papers that have contributed to solve the problem of medical image compression. There is a growing demand of Image Compression in the medical science. This portion of this paper discusses some of the earlier work proposed on image compression the following methods.

### *A. AMBTC*

Block truncation coding (BTC) is a simple and fast lossy compression technique for digitized gray scale images. The key idea of BTC is to perform moment preserving (MP) quantization for blocks of pixels so that the quality of the image will remain acceptable and at the same time the demand for the storage space will decrease. In AMBTC technique image compression is done using absolute moment block truncation coding. It is an improved version of BTC, preserves absolute moments rather than standard moments, here also a digitized image is divided into blocks of n x n pixels. Each block is quantized in such a way that each resulting block has the same sample mean and the same sample first absolute central moment of each original block [6].

AMBTC has been extensively used in signal compression because of its simple computation and better mean squared error (MSE) performance. It has the advantages of preserving single pixel and edges having low computational complexity. The original algorithm preserves the block mean and the block standard deviation. Other choices of the moments result either in less MSE or less computational complexity.

AMBTC has several advantages over BTC one advantage is in the case that the quantizer is used to transmit an image from transmitter to a receiver, it is necessary to compute at the transmitter the two quantities, the sample mean and the sample standard deviation for BTC and sample first absolute central moment for AMBTC [4]. When we compare the necessary computation for deviation information, we will see that in case of standard BTC it is necessary to compute a sum of m values and each of them will be squared while in case of AMBTC it is only necessary to compute the sum of these m values. Since the multiplication time is several times greater than the addition time in most digital processors, thus using AMBTC the total calculation time at the transmitter is significantly reduced.

### B. DAUBECHIES WAVELET

Ingrid Daubechies, one of the brightest stars in the world of wavelet research, invented what are called compactly supported orthonormal wavelets thus making discrete wavelet analysis practicable. The names of the Daubechies family wavelets are written dbN, where N is the order, and db the "surname" of the wavelet [8].

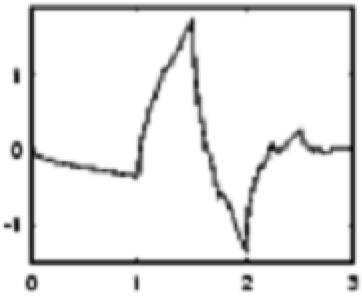


Fig 1 DAUBECHIES WAVELET

Daubechies wavelets use overlapping windows, so the high frequency coefficient spectrum reflects all high frequency changes. Therefore Daubechies wavelets are useful in compression and noise removal of audio signal processing [5].

### C. SPIHT

SPIHT (Set Partition in Hierarchical Trees) [1] is one of the most advanced schemes, even outperforming the state-of the art JPEG 2000 in some situations. The basic principle is the same; a progressive coding is applied, processing the image respectively to a lowering threshold [7]. The most efficient algorithm in the area of image compression is the Set Partitioning in Hierarchical Trees (SPIHT). It uses a sub-band coder which produces a pyramid structure where an image is decomposed sequentially by applying power complementary low pass and high pass filters and then decimating the resulting images.

SPIHT algorithm is a powerful, efficient and computationally simple image compression algorithm. It provides a better comparison standard for all subsequent algorithms. SPIHT was designed for optimal progressive transmission, as well as for compression [10].

To perform the operation of compression using improved SPIHT (ISPIHT), following algorithm is used by the author:

Step1: Read the image as a matrix.

Step2: Apply MFHWT, along row and column wise on entire matrix of the image.

Step3: Computes the approximation coefficients matrix and details coefficients matrices obtained by wavelet decomposition MFHWT of the input matrix.
First average sub signal (aí =a1, a2, an/2), at one level for a signal of length N i.e. f = (f1, f2, f3,f4Öfn) and first detail sub signal (dí= d1, d2,d3Ö.dn)

Step4: After applying MFHWT we get a transformed image matrix of one level of input image.

Step5: For reconstruction process, applying the inverse.

Step6: Calculate MSE and PSNR for reconstructed image.

## REFERENCES

[1] Amir Said, William A Pearlman, "A New Fast and Efficient Image Codec Based on Set Partitioning in Hierarchical Trees", IEEE in Transactions on Circuits and Systems for Video Technology, Vol 6, June 1996.

[2] D. Anthony, E. Hines, D. Taylor, and J. Barham, "A study of data compression using neural networks and principal component analysis," in Colloquium on Biomedical Applications of Digital Signal Processing, 1989, pp. 1–5.

[3] D.Harihara Santosh, U.V.S. Sitarama Varma, K.S.K Chaitanya Varma, Meena Jami, V.V.N.S Dileep, "Absolute Moment Block Truncation Coding For Color Image Compression", International Journal of Innovative

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Volume 5, Issue 4, April 2016

Technology and Exploring Engineering (IJITEE), ISSN: 2278-3075, Volume-2, Issue-6, May 2013.

[4] Doaa Mohammed, Fatma Abou-Chadi (Senior Member, IEEE.), "Image Compression Using Block Truncation Coding", Cyber Journals: Multidisciplinary Journals in Science and Technology, Journal of Selected Areas in Telecommunications (JSAT), February Edition, 2011.

[5] Dipalee Gupta, Siddhartha Choubey "Discrete Wavelet Transform for Image Processing", International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 3, March 2015.

[6] E. Elharar, Adrian Stern, Ofer Hadar, Member, IEEE, and Bahram Javidi, Fellow, IEEE, "A Hybrid Compression Method for Integral Images Using Discrete Wavelet Transform and Discrete Cosine Transform" in Journal of Display Technology 2006.

[7] Mr. Chandrashekhar Kamargaonkar and Dr. Monisha Sharma, "Hybrid Medical Image Compression Method Using SPIHT Algorithm and Haar Wavelet Transform" in International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT) – 2016.

[8] Ms. Sonam Malik and Mr. Vikram Verma, "Comparative analysis of DCT, Haar and Daubechies Wavelet for Image Compression" International Journal of Applied Engineering Research, ISSN 0973-4562 Vol.7 No.11 (2012).

[9] N. M. Nasrabadi and Y. Feng, "Vector quantization of image based upon a neural-network clustering algorithm," in SPIE Vol. 1001 Visual Communications and Image Processing '88, 1988, pp. 207–213.

[10] Navjot Kaur, and Preeti Singh "A New Method of Image Compression Using Improved SPIHT and MFHWT" in International Journal of Latest Research in Science and Technology,ISSN Online):2278-5299, Vol.1, Issue 2, Page No124-126 , July-August(2012).

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