Advanced Research in Electrical and Electronic Engineering
Print ISSN: 2349-5804; Online ISSN: 2349-5812 Volume 1, Number 1 (2014) pp. 4-7

http://www.krishisanskriti.org/areee.html

Multi Wavelet Based Image Compression for Tele- Medical Applications

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Abstract: **Analysis and compression of medical image is an important area of biomedical engineering.Analysis of medical image and data compression are rapidly evolving field with growing applications in the teleradiology, Bio-medical, tele-medicine and medical data analysis. Wavelet based techniques are latest development in the field of medical image compression. The ROI must be compressed by a Lossless or a near lossless compression algorithm. Wavelet based techniques are most recent growth in the area of medical image compression. Wavelet multi-resolution decomposition of images has shown its efficiency in many image processing areas and specifically in compression. Transformed coefficients are obtained by expanding a signal on a wavelet basis. The transformed signal is a different representation of the same underlying data. Such representation is efficient if a relevant part of the original information is found in a relative small number of coefficients. In this sense, wavelets are near optimal bases for a wide class of signals with some smoothness, which is the reason for compression.**

Keywords: Image compression, Integer Multiwavelet Transform.

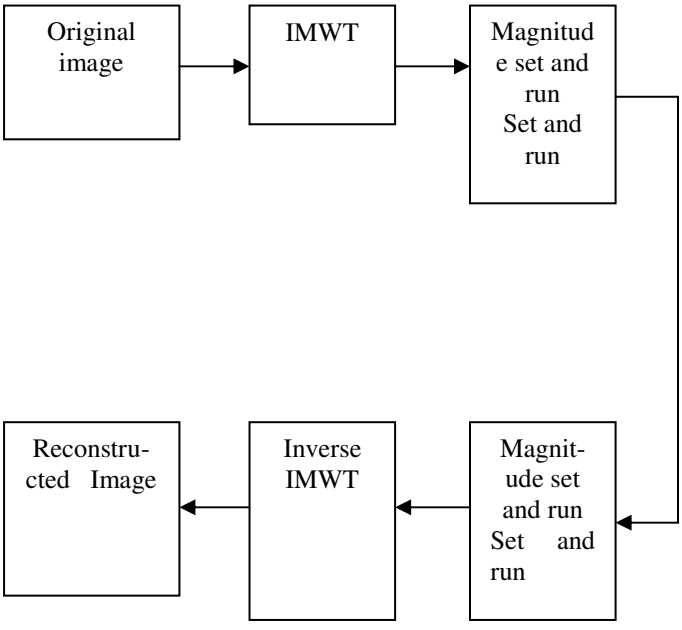
1. INTRODUCTION

Image Compression is used to reduce the number of bits required to represent animage or a video sequence. A Compression algorithm takes an input X and generates compressed information that requires fewer bits. The Decompression algorithm reconstructs the compressed information and gives the original. A compression of medical image is an important area of biomedical and telemedicine.In the medical application image study and data compression are quickly developing field with rising applications services are teleradiology, Bio-medical, tele-medicine. Medical image compression and image analysis of data might be even more helpful and can play a main task for the diagnosis of more complicated and difficult images through consultation of experts [2]. In medical image compression diagnosis and analysis are doing well simply when compression techniques protect all the key image information needed for the storage and transmission called lossless compression. the other scheme is lossy compression is more efficient in terms of storage and transmission needs but there is no guarantee to preserve the information in the characteristics needed in medical diagnosis [3]. To avoid the above problem diagnostically important is transmission and storage of the image is lossless compressed [4, 5]. Region of interest (ROI) is segmentation approach which is very useful for diagnosis purpose [6,7]. These regions of interest must be compressed by a lossless are a near-lossless compression algorithms. Wavelet based techniques are most recent growth in area of medical image compression [8, 9].

2. EXISTING METHOD

Region of interest is an important feature provided by jpeg 2000 standard. The entire image is encoded as single entity by different fidelity constraints. This new method reduces coefficients in a background but high complexity in writing an algorithm, it gives a better image quality when compared to scalar wavelet.

3. PROPOSED METHOD



In this proposed method, image is transformed using integer multi-wavelet transform and lossless compression of transform coefficients.

The compressed image is decomposed by the multi-wavelet transform. The encoding is done based on image pixel maximum value. The original value is reduced based on neighboring pixel value. Finally, the image is obtained is an encoded bit stream which is a binary one ('0's and '1's).

The receiver decodes incoming bit stream value, decompresses it and reconstructs original image. The major advantage in this method is the output image contains less Mean Square Error when compared to images obtained from other transforms; the compression ratio is significantly increased.

a. Discrete wavelet transform:

Discrete wavelet transform is used to analyze both numerical and functional methodologies. Wavelet functions are sampled by other wavelet transforms in DWT. The major advantage of discrete wavelet transform over fourier tansforms is temporal resolution.

Capturing both frequency and location information (time) is called Temporal resolution. Two dimensional wavelets are used for image processing applications. The effect of temporal resolution reduces down when it comes to the design of 2D filters. Image contrast enhancement is important in the field of medical image processing. The small coefficients are made smaller and large coefficients are larger. A non-linear mapping function to the coefficients is then applied. By applying DWT, the coefficients in finer scales reduce the effect of noise and enhances the features within a range using non-linear mapping function. The performance of IDWT is mandatory to reconstruct the image.

The wavelet decomposition method is widely based on two types of filters i.e. low pass filters and high pass filters. The length of the filter is same in both LPF and HPF. In this decomposition, DWT image is splitted into several sub bands (LL, LH, HL, HH) for the further decomposition we consider only LL sub band. This subband only because it has low frequency and noise when compared to other sub bands. The wavelet transform produces floating-point coefficients, used to reconstruct an original image by quantization results in a lossy scheme. Recently, irreversible wavelet transforms have been introduced.

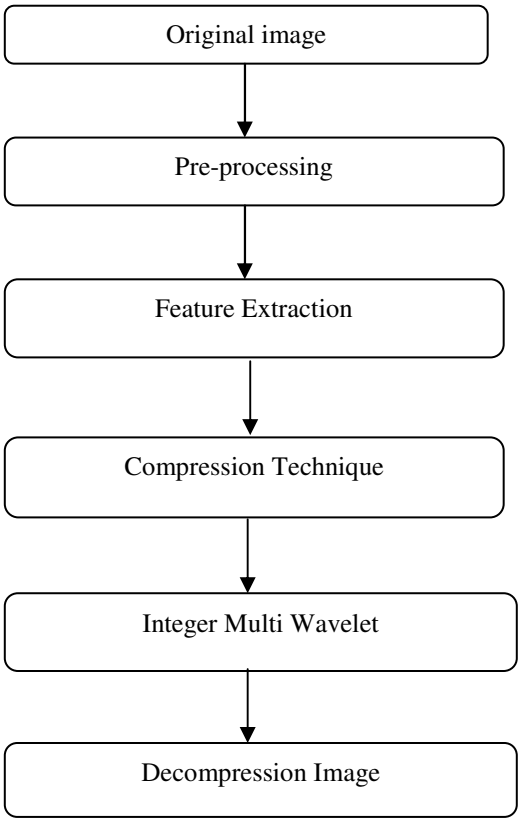
b. Multi wavelet and integer multi wavelet transform:

Multi wavelets are defined by wavelets with scaling functions. In Integer Multi Wavelet Transform, the transform can be implemented using several wavelet functions and scaling functions. So it is useful for multilevel decomposition.

These multi wavelets have some advantages such as, orthogonality, symmetry and approximation in comparison with other multi wavelets.

Multi wavelets have one scaling function and one wavelet function but integer multi wavelets have two or more several scaling and wavelet functions depending on their applications. The other advantage is to increase higher order approximation and dynamic range of coefficients.

c. Flowchart for Proposed Method:



i)STEPS INVOLVED IN THE PROCESS

Step1: Consideration of original image

Initially, the input image is fed to the system, it may be highly non-stationary one. Hence, we convert the image to 256 X 256. Even if the input image is the color image, it will be converted to gray scale using RGB converter in gray scale coding.

Step 2: Preprocessing

In this step, input image is taken and every neighborhood pixel of input image should have new brightness value corresponding to output image. This preprocessing operation also called as Filteration.

Preprocessing methods:

1. Image enhancement for shape detection.
2. Image restoration i.e. relative motion of camera image , wrong lens focus etc.
3. Image compression to eliminate redundant information.

Step 3: Feature extraction

In this process the input image is segmented and the input data will be transformed into a reduced set of features. Ths process is useful on a selection of situations where it helps to stem data information that is not important to the specific image processing task. Feature extraction is the process in which transforming the input data into a particular set of features.

Step 4: Compression technique

Basically there are two types of compression techniques used in digital image and video, lossy and lossless. Lossy compression methods include discrete cosine transform, Huffman coding and vector quantization. Lossless compression method include run length coding and LZW (Lempel Ziv Welch). This method proposes lossy compression scheme than lossless compression scheme because in the lossy compression technique, it provides better compression ratio when compared to lossless scheme.

Step 5: Integer multi wavelet transform

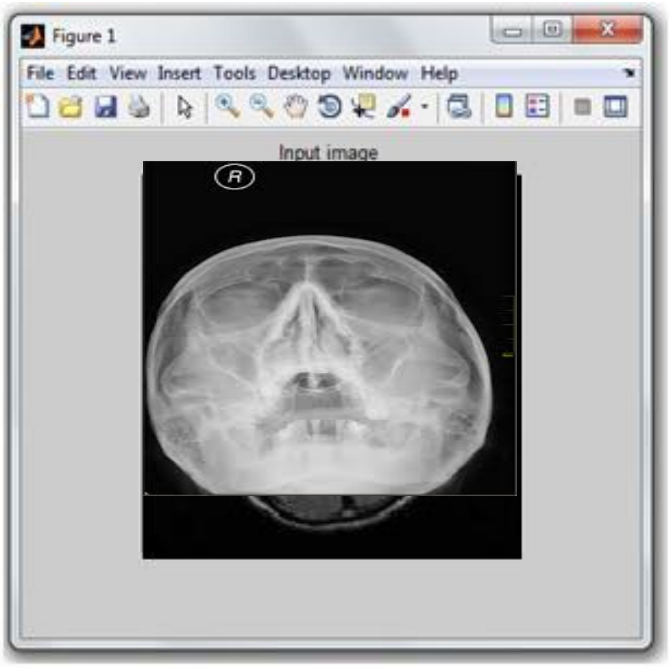
The IMWT is proposed for integer implementation of multi wavelet system based on multi scalar function.

Step 6: Decompressed image

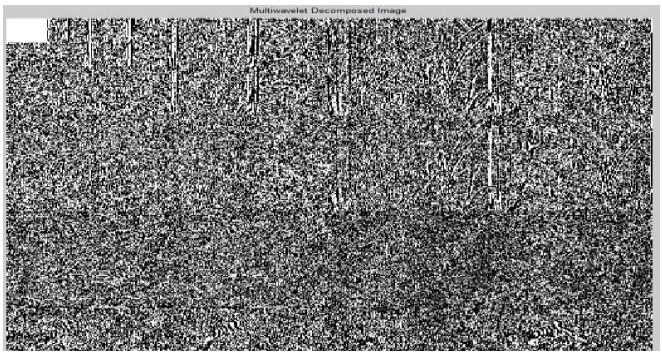
In this decompression process the encoded binary data which is compressed can be extracted.

4. RESULTS

The original image is taken as attest image of size 256 X 256.

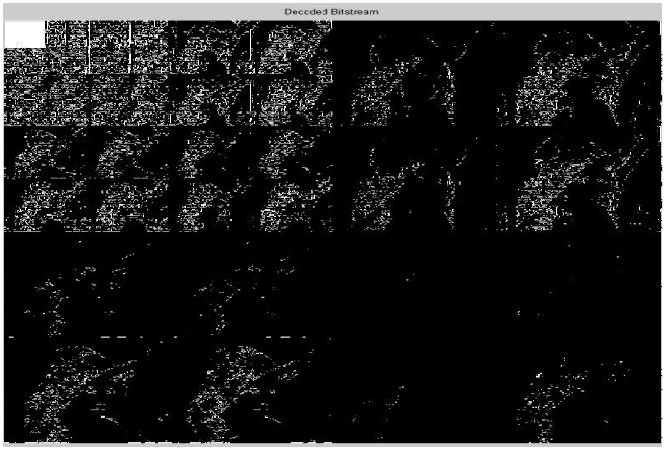


Input image

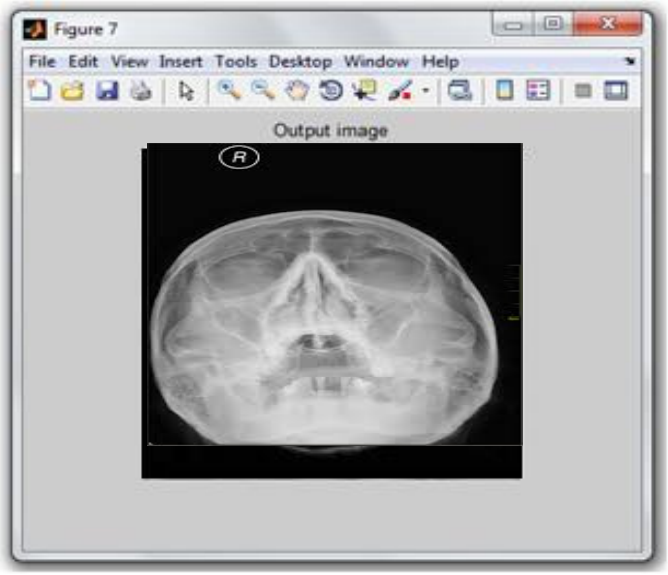


Multilevel decomposition image

Encoded Bit stream data



Decoded Bit Stream data



Reconstructed Image

Performance Metric Measurements of PSNR,MSE,CR

5. CONCLUSION

In this paper focus is on the implementation of lossless image data codec, when the input image data is encrypted before using compression technique. Hence this is more suitable for the transmission of Medical images for Telemedicine application. We propose multi wavelet based compression for this problem, which shows to have much better coding efficiency and less computational complexity than existing approaches. The success of high PSNR is due to enabling partial access to the current source at the compression to improve the compression ratio. Our future work focus on compression of color images and to be obtained high PSNR and Mean Square Error and Correlation. We feel due to multi wavelet we can achieve better output for compression.

6. REFERENCES

[1] Stephen Wong et al, - Radiologic Image Compression – A Review, IEEE Trans. On Medical Imaging, vol 83, Febraury 1995.

[2] Ali M, (2000). Medical Image Compression using SPIHT for Telemedicine Applications", IEE seminar on Time scale and Time – Frequency Analysis and Applications, pp:22/1-22/5.

[3] Liang, S, Rangaraj, M, Rangayyan, (1997) A segmentation – based Lossless Image Coding method for high Resolution Medical Image Compression, IEEE Trans on Medical Imaging, 16.

[4] Sumalatha, R, Subranyam, MV (2009). Lossless Compression of MRI Images using Integr Wavelet and SPHIT algorithm, International Journal of Computational Intelligence Research & Applications,3: 237- 240.

[5] Gargour, CS and Ramachandran, V (1997). A Scheme for teaching wavelets at the Introductory level, ASEE/IEEE Frontiers in Education conference. .

[6] Calderbank, AR, Daubechies I, Sweldens W and Leo BL (1998). Wavelet Transforms that Map Integers to Integers. ApplComputHarmon Anal 5:332 – 369.

[7] Martin, MB and Bell, AE (2001). New Image Compression Techniques using Multi wavelets and Multiwavelet packets, IEEE Transactions on Image Processing, 10: 500 – 511.

[8] Said and Pearlman, WA (1996). A new, fast, and efficient image co-dec based on set partitioning in hierarchical trees, IEEE Trans.Circuits Syst. Video Technol, 6:243 – 250.

[9] Shapiro, JM (1996) Embedded image coding using zerotrees of wavelet coefficients, IEEE Trans. Image Processing, .6:243 – 250.

[10] Chine, C-F and Kuo-Jung (2003). LiScalable Medical Data Compression and Transmission using Wavelet transform for Telemedicine applications, IEEE transactions on information technology in biomedicine, 7101.