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Effects of Compression Algorithms and Identification of Cancer cell using CT Coronel View Lung Image

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Abstract—Modern radiology techniques provide crucial medical information for radiologists to diagnose diseases and determine appropriate treatments. Hence dealing with medical image compression needs to compromise on good perceptual quality (i.e. diagnostically lossless) and high compression rate. The objective also includes finding out an optimum algorithm for medical image compression algorithm. The objective is also focused towards the selection of the developed image compression algorithm, which do not change the characterization behavior of the image.

Index Terms— CT lung Coronel, Wavelet, Encoding, features, GLCM and Classification

I.INTRODUCTION

Memory demands are always a challenge in Image storage and Image transmission. Compression algorithms area unit applied to beat this, by the reduction of space for storing and therefore cause sharing of documents easier. Compression techniques build use ofvaried transform s and algorithms. The algorithms are often usually classified as lossless and lossy compression [1]. Lung cancer is diagnosed at associate early stage, it's not large and has not extend, is a lot of probable to be treated with success. If cancer spreads, valuable treatment becomes a lot of sophisticated,and usually aperson's probabilities of living areaunit abundant lower.[2]In this work, CT images of lung is taken into account for the study. when the compression technique, the standard of the image is evaluated by each MSE and PSNR. In this work, CT images of lung is considered for the study.[3] After the compression method, the quality of the image is evaluated by both MSE and PSNR. Features extraction methods are also adopted in this work, in order to evaluate the compression algorithm. This paper is planned as follows. Chapter2 elucidates the image data base and chapter 3 enumerates the transformation techniques adopted. Chapter 4 illustrates the encoding techniques adopted in this work. Feature extraction methodology is detailed in chapter 5. Results and discussion is explained in chapter 6. This proposed research work is concluded in Chapter 7.

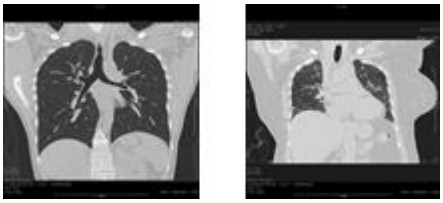

Fig1.bNormal-coronal Fig1.b cancer-coronal

II. WAVELET TRANSFORM

In this proposed work, symlet, a symmetrical wavelet has been chosen to transform the CT images, since, Chest CT scan can be termed as a volumetric image where intensity values,[4] related to the attenuation coefficient of the matter. Generally, an alveolar lung tissue appears as grey homogeneous matter, bright stripes or spots, bright borders, which can be transformed well by symlet. In this work, the Vanishing moments of the symlet are varied from 2 to 10 and the effect of transformation of the image is found.[5] The effectiveness of different mother wavelets are analyzed for various vanishing moments with three encoding methods like EZW, SPIHT ,STW,WDR and ASWDR. The optimum compression algorithm is found based on results obtained. The CT Lung images of size 512X512 pixels with 24 bits per pixel in DICOM format are taken in this work. The sample of image shown in figure 1.

III. ENCODING

Encoding is performed after decomposing the images,for the reduction of the redundant data and elimination of the irrelevant data. In this paper , the following methods are for encoding Embedded zero tree wavelet(EZW), Set Partitioning In HierarchicalTrees(SPIHT),SpatialorientationTreeWavelet(STW),Wavelet Difference Reduction(WDR) and Adaptively Scanned Wavelet Difference Reduction(ASWDR)[6].

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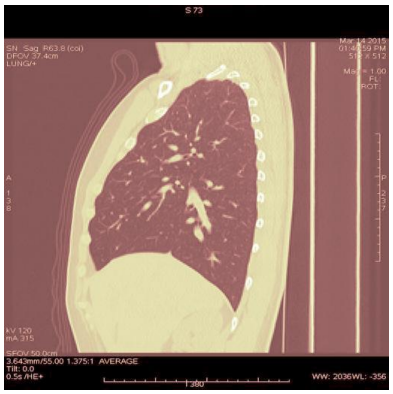
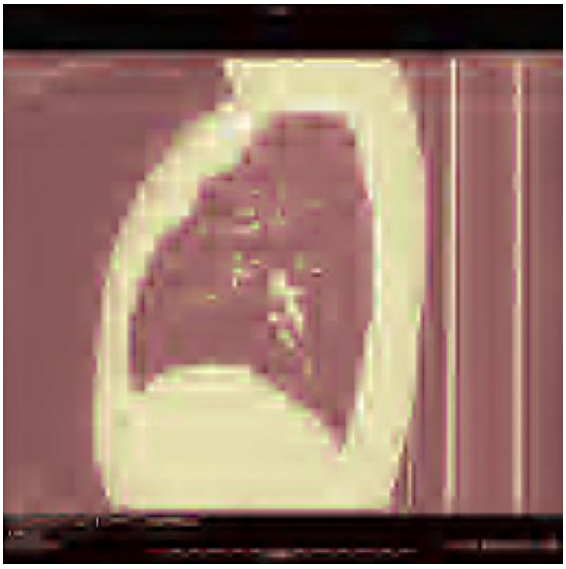
Table 1 Performance Evaluation of Symlet with various Encoding Methods for CT normal lung coronal view

	Levels	1	3	5	9
EZW	MSE	0.07	0.43	5.25	97.44
	PSNR	59.69	51.25	40.79	28.24
	BPP	7.35	4.45	1.70	0.23
	CR(%)	91.81	55.58	21.23	6.82
SPIHT	Levels	1	3	5	9
	MSE	9.95	4.70	21.44	237.50
	PSNR	38.15	41.41	34.82	24.38
	BPP	7.82	2.13	0.67	0.07
	CR(%)	47.94	26.64	8.42	2.82
STW	Levels	1	3	5	9
	MSE	0.08	1.55	15.42	213.40
	PSNR	59.63	46.22	36.25	24.84
	BPP	6.04	3.00	0.95	0.08
	CR(%)	75.46	37.62	11.89	1.1
WDR	Levels	1	3	5	9
	MSE	9.95	2.60	6.92	103.90
	PSNR	38.15	43.98	39.73	27.96
	BPP	6.72	4.85	1.86	0.25
	CR(%)	83.95	60.58	23.2	3.08
ASWDR	Levels	1	3	5	9
	MSE	9.95	2.61	6.92	103.90
	PSNR	38.15	43.98	39.73	27.96
	BPP	6.72	4.85	1.86	0.25

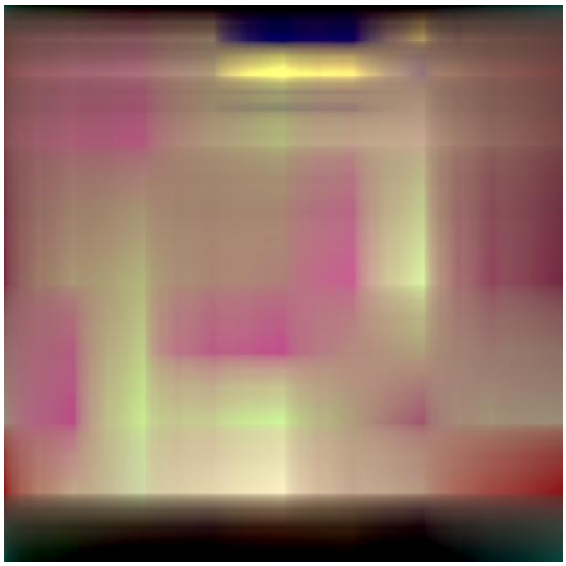
The original image, compressed image with symlet wavelet decomposition with encoding methods Ezw,spiht,stw,wdr,aswdr for decomposition levels is shown in table 1.[7] and compressed image shown in figure 2.



(CR=91.81%, PSNR =59.69)



(CR= 21.23%, PSNR=40.79)



(CR=6.82%, PSNR = 28.24)

Figure 2a. compressed image of CT normal lung coronal view using Symlet with EZW (CR=91.81%, PSNR =59.69) b. compressed image of CT normal lung coronal view using Symlet with EZW (CR=55.58%, PSNR = 51.25) compressed c. Compressed image of CT normal lung coronal view using Symlet with EZW (CR= 21.23%, PSNR=40.79) d. compressed image of CT normal lung coronal view using Symlet with EZW (CR=6.82%, PSNR = 28.24)

IV. FEATURE EXTRACTION

The features, are given as the inputs of non linear neural networks, in order to classify them in to groups or classes. To perform efficient feature extraction, the features must have lesser intra class variance. Hence, the main objective of this work is to identify and formulate the set of features, which must be distinct enough from each class [8]. Further, the network will be trained to classify the corresponding images, which will be categorized as either normal or cancer affected one.

The derived features, which are tabulated in the table 2, give a wide difference between the normal and cancer images as well, the proposed compression algorithms do not affect the values much.[9]

Table 2. Features of the original image and compressed image of CT Coronel Lung

Image Features	Normal Image	Cancer affected image
Entropy	5.22	4.57
Auto correlation	18.9	21.77
Contrast	0.27	0.42
Correlation	0.87	0.84
Cluster prominence	523.07	522.7
Cluster shade	63.09	63.61
Dissimilarity	0.14	0.22
Energy	0.16	0.29
Homogeneity	0.85	0.79

The deviation in between the two classes clearly indicates that this
can be used for identifying the cancer cells .These values are given as inputs to the neural networks for classifying the groups as normal and cancer images.[10][11]

V.RESULTS AND DISCUSSION

The ability of the compression algorithms are evaluated in terms of MSE, PSNR, CR and Bpp, which are tabulated in Table 1[10]. The MSE is often called reconstruction error variance σ_q^2. The MSE between the original image f and the reconstructed image g at decoder is defined as [12]

$$\text{MSE} = \sigma_q^2 = \frac{1}{N}\sum_{j,k}(f[j,k]-g[j,k])^2$$

$$\text{PSNR} = 10\log_{10}\left(\frac{255^2}{MSE}\right)$$

VI. CONCLUSION

The main objective of this work is to attain a high compression amount that is achieved by symlet transform SPIHT. The Levels of decomposition additionally plays a very important role withinthe compression methods that is well-tried by the values of compression amount and PSNR values. It is evident from the results that the more no of filter bank are used at higher decomposition level so more information is lost this leads to a decrease in PSNR value. It seems that compression ratio is same at first level of transforms. Further, it is observed that for all orders of these transforms if level increases the number of zeros also increases. It is found that high compression Ratio at higher Decomposition Level.

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