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IMAGE COMPRESSION USING WIENER FILTER, MEDIAN FILTER WITH DB2-TRANSFORM

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ABSTRACT

Today we live in a digital information society. Exchange of information is a means of knowledge sharing which is vital for the progress of mankind. The technological advancements in digital communication and computer technology have paved the way for all pervading World Wide Web based internet. The development and deployment of 4G technology based mobile communication has provided a powerful multimedia communication device for users. The multimedia signals are alphanumerical text signals, audio signals including speech and music, and video signals including still and moving images. Transducer based sensor data may fall under any one or more of the above categories of signals i.e., text, audio and video. Sensor networks have emerged as an integral part of information technology. In this paper we are done by using de-noising filter such as different filter like Wiener filter and Median filter at receiving end. The accuracy of compression methods is measured by CR and PSNR, with two modulation scheme (QPSK and 8-PSK) on Fading Channel. Performance of these systems is measured by BER plot with respect to SNR through MATLAB R2013a tool used, the experimental result shows that the proposed scheme maintains the accuracy of compression, transmission and decompression of image.

Keyword: Db2, Wiener filter, Median filter, Image compression, PSK, Fading channel.

I. INTRODUCTION

Image Compression has been the major area of research due to the increasing demand for visual communications in entertainment, medical and business applications over the existing band limited channels. For image compression, it is very necessary that the selection of transform should reduce the size of the resultant data as compared to the original data set. Image processing for wireless transmission is a challenging task, because of the amount of image data that need to be processed in real time, the restriction of transmission bandwidth, and other limited resources of the wireless network. One of the most important and challenging goal of current and future communication is transmission of high quality images from source to destination quickly with least error where limitation of bandwidth is a prime problem. By the advent of multimedia communications, the multimedia transmission of multimedia over wireless links is considered as one of the major applications of future communication systems, and such systems require the use of high storage capacity and less error transmission. Image processing includes any form of information processing in which the input is an image. Many image processing techniques derive from the application of signal processing techniques to the domain of images 2-dimensional signals such as photographs or video.

II. PRINCIPAL OF IMAGE COMPRESSION

Image compression techniques are based on reduction of the number of bits required to store or transmit images without any or less loss of information. The main basis of the reduction process is the removal of redundant data or bits. Data redundancy is the major issue in digital image compression.

For data compression, we reduce the number of bits required to represent a given quantity of information. In most digital images, the neighboring pixels are correlated each other so it have redundant information. The most tasks then are to find less correlated pixels representation of the image. If the number of information carrying units in two data sets that represent the same information respectively is denoted by n1 and n2, then the compression ratio (CR) is expressed by this formula:

$$CR = \frac{\text{Number of Bytes in the original data set}(n_1)}{\text{Number of Bytes in the Compressed data set}(n_2)} \qquad (1)$$

In this case, relative data redundancy also called RD of the first data set can be defined as follows:

$$RD = 1 - \frac{1}{CR} \qquad (2)$$

III. DISCRETE WAVELET TRANSFORM (DWT)

Discrete Wavelet Transform (DWT) is broadly considered as an efficient approach to replace FFT in the conventional OFDM systems due to its better time-frequency localization, bit error rate improvement, interference minimization, improvement in bandwidth efficiency and many more advantages. Moreover, Convolution codes are used in DWT based OFDM system which improves the bit error rate performance of the system. In communication systems, when the signal is transmitted over the channel, noise and unwanted interferences are introduced which leads to the distortion of transmitted signal. Hence, error control coding techniques are used to mitigate the effect of such channel distortions.

A. Purpose of Wavelet Analysis

Wavelets transform as the ability to perform local analysis, for localized area of a larger signal. Figure 1, shows the exact location in time of the discontinuity for a plot of when the signal in time for its frequency content is analyzed; Unlike Fourier analysis, in which signals using sins and cosines are analyzed, wavelet functions is used. Wavelet transform can be categorized in two cases:

- Continuous transform Wavelet Transform
- Discrete transform Wavelet Transform.

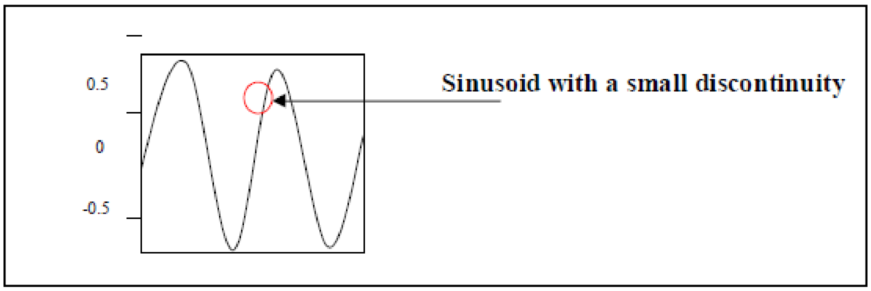

Fig. 1 Sinusoidal Signal

B. Continuous Wavelet Transform

Fourier transform mathematically expressed as in show equation number 3.3. The sum over all time of the signal $f\ (t)$ multiplied by a complex exponential is$F(w)$. It is clear that a complex exponential is broken down into real and imaginary sine components. When multiplied by a sine of frequency w yields the constituent sine components of the original signal, so results are the Fourier coefficients$F(w)$.

$$F(\omega) = \int_{-\infty}^{\infty} f\ (t) e^{-j\omega t}\, dt \qquad (3)$$

Similarly, the continuous wavelet transform (CWT) is defined as the sum over all time of signal multiplied by scaled, shifted versions of the wavelet function shown in equation3.4

$$C(Scale, position) = \int_{-\infty}^{\infty} f\ (t) \psi(scale, position, t) dt \qquad (4)$$

C. Daubechie wavelet (Db)

In general the Daubechies wavelets are chosen to have the highest number A of vanishing moments, (this does not imply the best smoothness) for given support width N=2A, and among the 2A−1 possible solutions the one is chosen whose scaling filter has external phase [3]. The wavelet transform is also easy to put into practice using the fast wavelet transform. Daubechies wavelets are widely used in solving a broad range of problems, e.g. self-similarity properties of a signal or fractal problems, signal discontinuities, etc.

IV. SIMULATION RESULT

The simulation result presented in the thesis focuses mainly on Compression ratio and PSNR which typically affects the picture quality. Most of the times as researchers go on increasing the compression ratio the quality of the resulting image use to go down for the proposed technique, test image "Cameraman.tif" size 256 × 256. The Results are shown in a quality measures such as SNR and BER for decompressed "Cameraman.tif" image are calculated and compared. Table 5.1 shows the comparison of the results with the proposed technique of discrete wavelet techniques, Db2 wavelet with De-noising filter, Wiener filter and Median filter to the existing network respectively with fading channel.

A. Fading Channel on QPSK and 8-PSK Modulation with Db2 Transform

In this performance we consider flat fading channel on different modulation techniques with Db2 wavelet transform. Most of the times as researchers go on increasing the compression ratio the quality of the resulting image use to go down for the proposed technique, test image "Cameraman.tif" size 256 × 256.In the figure 2 (a) show the (a) Original image, Compressed image and De-compressed image.

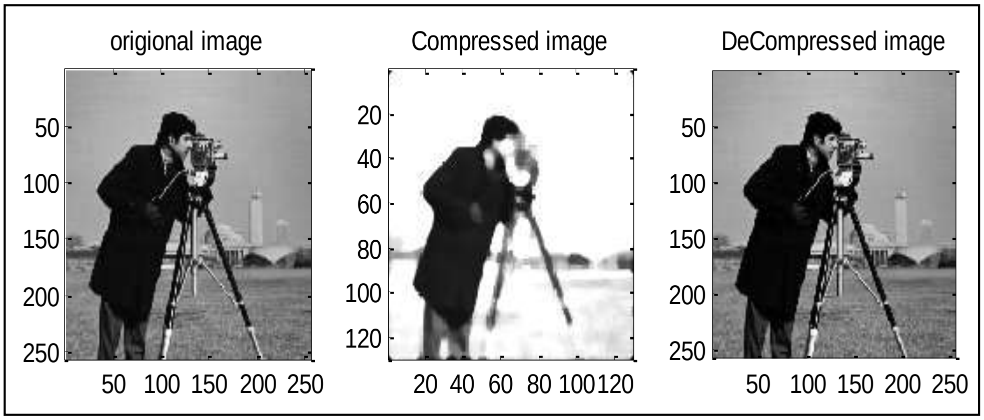

Fig. 2 (a) Original image, Compressed image and De-compressed image

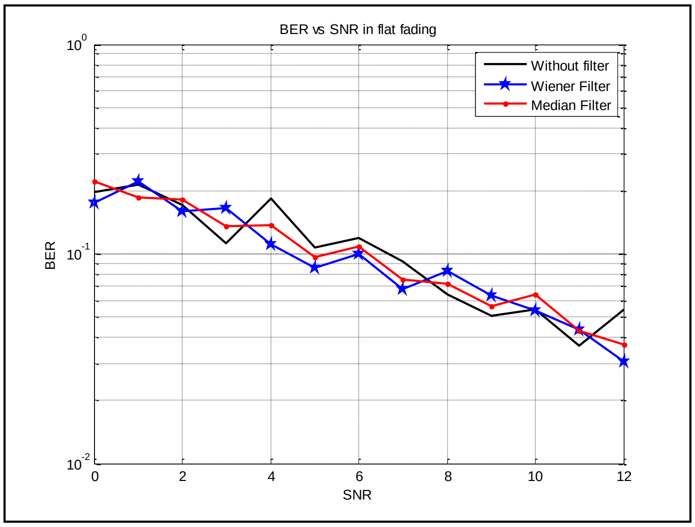

Fig 3: Performance of Db2 Wavelet Transformer on QPSK Modulation with Fading Channel

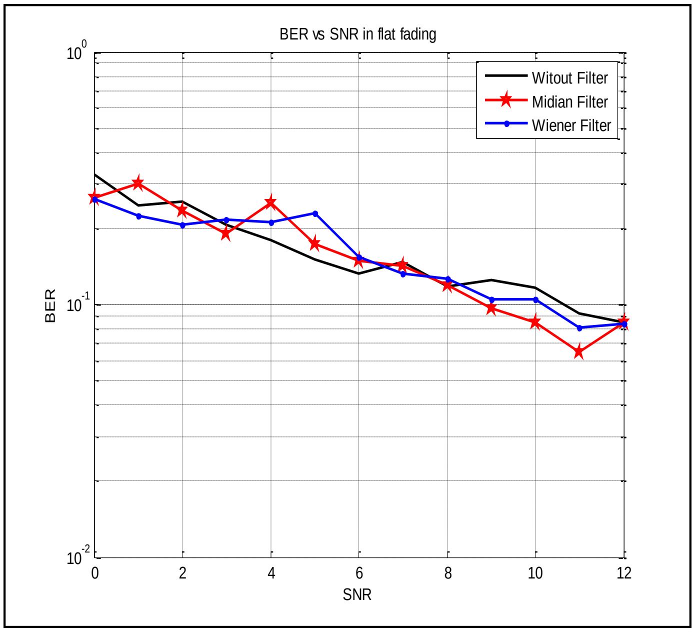

Fig 4: Performance of Db2 Wavelet Transformer on 8-PSK Modulation with Fading Channel

Table 1: Image Compression ratio with different filter

S. No.	Wavelet	Modulation	Channel	CR		
				Without filter	Wiener filter	Median filter
1	Db2	QPSK	Flat fading	7.3192	6.1780	8.4726
2	Db2	8-PSK	Flat fading	7.0192	6.0195	8.3036

Table 1: PAPR Calculation ratio with different filter

S. No.	Channel model	PSK modulation order	Wavelet technique	PSNR		
				Without filter	Wiener filter	Median filter
1	Flat fading	QPSK	Db2	15.2458	15.6548	16.1604
2	Flat fading	8-PSK	Db2	14.7627	14.8627	15.3723

V. CONCLUSION

We get results of different wavelet image compression techniques (b2 wavelet are presented and compared their effect. We also compare the result of de-noising filter (Wiener filter and Median filter). Our focus on increase Compression Ratio (CR) and Pick to signal ratio (PSNR) and decrease BER also get simulated result of wireless channels model (Flat fading channel) with QPSK and 8-PSK modulation techniques and compared their effect, focus on decrease Bit Error Rate (BER). In the further techniques can be implement along with modified SPIHT for improved image compression.

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