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IMPROVE IMAGE COMPRESSION RATIO USING DIFFERENT WAVELET TRANSFORM WITH AWGN CHANNEL

Bhushan Kharche[1], Prof. Geetesh Wagadre[2], Prof. Sameena Zafar[3], Prof. Hemant Soni[4]
M. Tech. Scholar[1], Asst. Prof. & HOD[2], Asst. Prof. & Head academic[3], Asst. Prof.[4]
Department of Electronics and Communication Engineering
PATEL COLLEGE OF SCIENCE & TECHNOLOGY, BHOPAL (M.P.) India
bhushank17@mail.com

ABSTRACT
Image compression is now essential for applications such as transmission and storage in data bases. 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. Wireless face recognition is a particular interesting application of image processing for communications, where face recognition is implemented at the application layer, and a customized processing on face images helps correct or tolerate the transmission errors at the lower layers, namely the network layer, the MAC layer, and the physical layer. In this paper analysis of compression techniques and wireless transmission, some type of noise is also induced in compressed image. So we need improving image quality measured by such parameter. These are done by using de-noising filter such as Wiener filter and Median filter at receiving end. The accuracy of compression methods is measured by MSE and PSNR. The AWGN is used as wireless channel for transmission of image on wireless medium with QPSK and 8-PSK modulation. Performance of these systems is measured by SER and BER plot with respect to SNR. The experimental result shows that the proposed scheme maintains the accuracy of compression, transmission and decompression of image.
Keyword: Image compression, PSK, AWGN, Fading channel, Haar-wavelet, Wiener filter, Median filter.

INTRODUCTION
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 two-dimensional signals such as photographs or video. However, image processing brings some new concepts such as connectivity and rotational invariance - that are meaningful or useful only for two-dimensional signals. Also, certain one-dimensional concepts such as differential operators, edge detection, and domain modulation - become substantially more complicated when extended to two dimensions.

IMAGE COMPRESSION
Image compression, the JPEG standard has already been widely used. It uses discrete cosine transform (DCT) and Huffman coding techniques. Its main disadvantage is that when the coded bit rate is lower than a certain value (about 0.25 bits/pixel), there are blocking effects in the decoded image, due to the 8×8 block two-dimensional (2-D) DCT. Also, if the image is directly transmitted over noisy channels which is usually the case for wireless applications it is easy to lose blocks, because Huffman coding is a variable-length-code (VLC). The noisier the channel is, the more blocks are lost. Recently, the wavelet decomposition has been proved to be a better tool for image compression. Especially for very high compression ratios, it performs better than DCT based JPEG. Thus, the new JPEG2000 standards adopt wavelet sub-band coding. There are many types of compression algorithms developed. These all algorithms fall into two broad category, lossless algorithms and lossy algorithms.

A. Lossless / reversible

The lossless (or reversible) compression, decompressed image is identical with the original image. Feature of lossless algorithm is to reproduces the data exactly same as the original one. So the reconstructed image, after compression, is numerically identical to the original on a pixel by pixel basis. Lossless image compression is mainly useful in application area such as image archiving and facsimile transmission. However, only a modest amount of compression is achievable in this technique.

B. Lossy Compression / irreversible

A compression method is called “lossy compression” (or irreversible) if the reproduced image is an approximation of the original image. A lossy methods, its name implies, loses some data. Data loss is unacceptable in many area. For example, compression of text must be lossless because a very small difference can result in different meanings of statements. There are many situations where loss can be unnoticeable or acceptable. In image compression, for example, the exact reproduction value of each sample of the image. The reproduced image contains decrees relative to the original, because redundant information is removed during compression. As a result, much higher compression is achievable and under normal viewing conditions no visible loss is perceived (visually lossless).

DISCRETE WAVELET TRANSFORM

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, Convolutional 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. The
original data sequence is appended with redundant bits to increase the reliability of the system by adding cyclic prefix; which also answers the problem of ISI.

Table: 1 Showing CR values on various stage

Wavelet	CR	
	Wiener filter	**Median filter**
Haar	6.2114	8.1726
Db2	6.1680	8.3208

ADDITIVE WHITE GAUSSIAN NOISE (AWGN) CHANNEL

The simplest radio environment in which a wireless communications system or a local positioning system or proximity detector based on Time of-m flight will have to operate is the Additive-White Gaussian Noise (AWGN) environment. Additive white Gaussian noise (AWGN) is the commonly used to transmit signal while signals travel from the channel and simulate background noise of channel. The mathematical expression in received signal:

$$r(t) = s(t) + n(t)$$
(1)

That passed through the AWGN channel where $s(t)$ is transmitted signal and $n(t)$ is background noise.

If the average received power is $P'[W]$ and the noise power spectral density is N_0 $[W/hz]$, the AWGN channel capacity is:

$$c_{awgn} = W \log_2\left(1 + \frac{p'}{N_0 W}\right) \text{ Bit/Hz}$$
(2)

SIMULATION RESULTS

we will discuss our simulation results and important Parameters related to our project. During our simulation we used Wavelet transform algorithms and different filters also used modulation in PSK techniques through Matlab 2013a simulation toll. With the help of above modulation techniques we got the analysis parameters like the SNR Represent in X-axis, BER in Y-axis, also we have used AWGN channel.

A. Compression Ratio (CR) For finding Compression Ratio, we used number of bit to represent the size of original image and the number of bit to represent the size compressed image. So, Compression ratio show that how much times the image has been compressed.

By the ratio of the size of original data set to the size of the compressed data set, compression ratio is find out, defined in equation 3.

$$CR = \frac{A}{B} \times 100 \quad (3)$$

Where A = Number of Bytes in the original data set, B = Number of Bytes in the Compressed data set.

The simulation result presented in the thesis focuses mainly on Compression ratio, PSNR and MSE 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 and 512 × 512). The Results are shown in a quality measures such as PSNR and MSE for decompressed “Cameraman.tif” image are calculated and compared.

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Table 2: PSNR Performance

PSK Modulation	Wavelet technique	PSNR	
		Wiener filter	Median filter
4-PSK	Haar	16.9664	17.1439
8-PSK	Haar	15.8570	16.8940
4-PSK	Db2	17.0431	17.0608
8-PSK	Db2	15.9821	16.6518

Table shows the comparison of the results with the proposed technique of discrete wavelet techniques, Haar wavelet and

Db2 wavelet with De-noising filter, Wiener filter and Median filter to the existing network respectively. In the figure 1show the Original image, compressed image and De-compressed image.

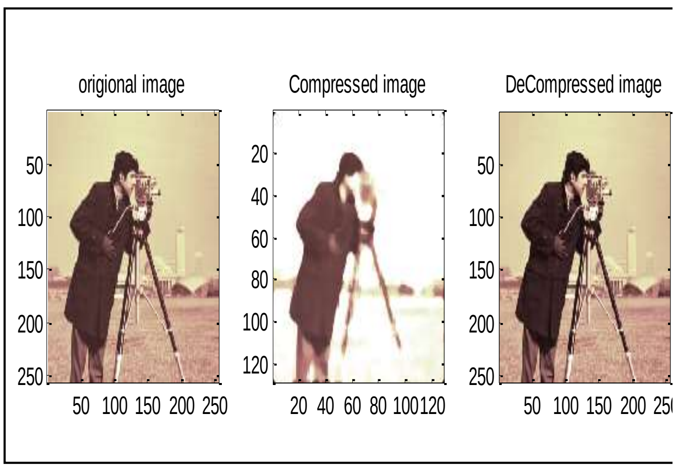

Fig. 1 Original image, (b) Compressed image, (c) De-compressed image.

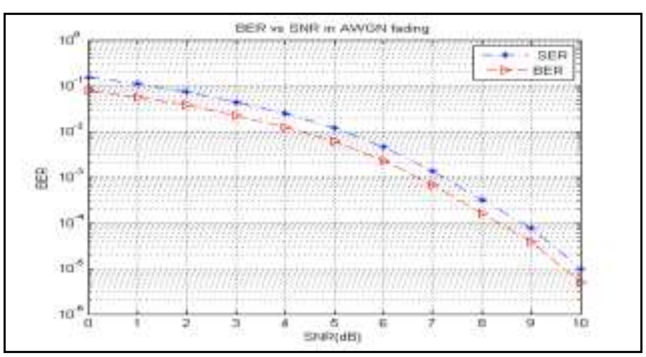

Fig. 2 AWGN of QPSK in Haar with median filter

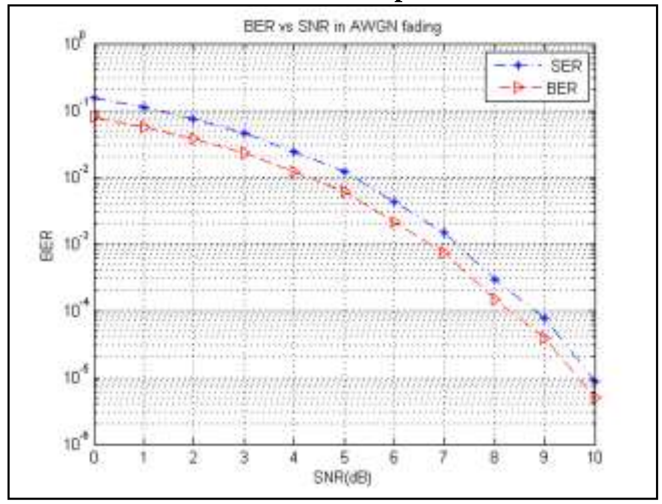

Fig. 3 AWGN of QPSK in Haar with wiener filter

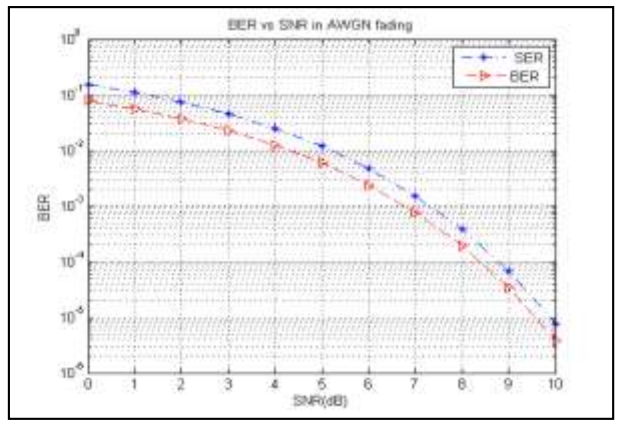

Fig. 4 AWGN of QPSK in Db 2 with median filter

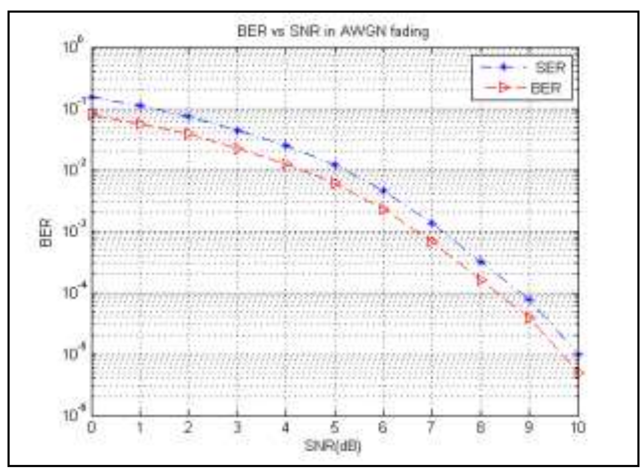

Fig. 5 AWGN of QPSK in Db 2 with wiener filter

CONCLUSION

We get results of different wavelet image compression techniques (Haar wavelet and Db2 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 MSE also get simulated result of wireless channels model AWGN channel with QPSK. From the above results this condition is cleared. We have finally get minimum BER for AWGN Channel of QPSK in Haar wavelet compression technique with denoising (Wiener filter) is 4.9821×10^{-6}. We also find maximum compression ratio is 8.3208 by using Db2 compression technique with Median filter and PSNR is 17.1439 by using AWGN Channel of QPSK in Haar wavelet compression technique with Median filter.

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