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Improved Wavelet Based Compression With Adaptive Lifting Scheme in Comparison to Traditional Scheme And Optimized Bit Error Rate Analytical Approach Using Different Modulation Techniques

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***Abstract*— In this paper, we've an inclination to propose a spanking new theme for data transmission supported orthogonal frequency division multiplexing (OFDM). In OFDM theme we've an inclination to match fast Fourier Transform (FFT) primarily based OFDM with wavelet based technique. In this technique DWT-HAAR (Discrete wavelet Transform) and ADWT-Adaptive lifting theme (Adaptive discrete wavelet Transform) is used for wavelet decomposition, we've an inclination to match ADWT-Adaptive lifting theme with ancient DWT-HAAR that reduces procedure complexness and conjointly we've an inclination to prove that ADWT-Adaptive lifting theme wavelet will yield higher performance. we've got a bent to match our wavelet based OFDM with state-of-art criteria like FFT based OFDM, ancient DWT-HAAR based OFDM which we tend to prove that our methodology will yield better results compare to previous methodology supported bit error rate calculation in QPSK, 16-QAM, 64-QAM, 128-QAM, 256-QAM theme.**

***Keywords*— OFDM, AWGN, BER, DWT, ADWT**

I. INTRODUCTION

OFDM is one in every of the key technologies that alter non-line of sight wireless services creating it potential to increase wireless access methodology over wide areas. it's a deviation of the Frequency Division Multiplexing theme within which the frequency channel is split into multiple smaller sub-channels. Sub-channelization in FDM needs provisioning of guard bands between 2 sub-channels to avoid interference between them. OFDM divides the frequency information measure in slender orthogonal sub-parts known as sub-carriers. A sub-channel is that the combination of variety of those sub-carriers. The sub-carriers comprise data carriers and pilot carriers in conjunction with a DC. Data carriers are accustomed transmit data and pilot carriers are used for sensing purpose. Sub-carriers are typically modulated with usual modulation techniques like quadrature modulation or phase Shift Keying (PSK). each user is given variety of sub-channels, every of them consists of variety of sub-carriers. Data of the user is carried parallel on every sub-carrier at an occasional rate. the mixture of the parallel sub-carriers at the destination offer for the high data rates. Since the sub-carriers transmit data at an occasional rate and therefore at higher symbol time it's additional durable to multipath effects, therefore this makes a lot of appropriate for wide-area non-line of sight wireless access and additionally, the utilization of overlapping orthogonal sub-carriers without guard bands create it additional capable than FDM theme. OFDM resembles CDMA therein it's additionally a spreadspectrum expertise within which energy generated at a selected information measure is spread across a wider information measure creating it a lot of sturdy to intrusion and electronic jamming.

In OFDM technique, Fourier remodel perform the bottom band modulation and reception because the use of this remodel enlarged the potency of the modulation and reception process. The utilization of the guard area solves the issues of Inter symbol interference to a bigger extent. Though the system pictured intrinsically failed to attain the proper orthogonality between subcarriers in a very time

dispersive channel, nonethless it absolutely was a significant contribution to the evolution of OFDM system.
In quest of resolution the matter of orthogonality over the dispersive channel, cyclic prefix (CP) is introduced. It fills the guard area with the cyclic extension of the OFDM symbol. Though addition of the cyclic prefix causes a reduction of the info rate, this deficiency was over remunerated by the convenience of receiver implementation.

However, there was no approach that gave up the shortcomings of the FFT primarily based approach therefore, the planned presents a completely unique approach that overcomes the misconnects of the FFT-OFDM therefore giving a best output results by combining OFDM in conjunction with DWT and ADWT that we tend to through within the next chapter.

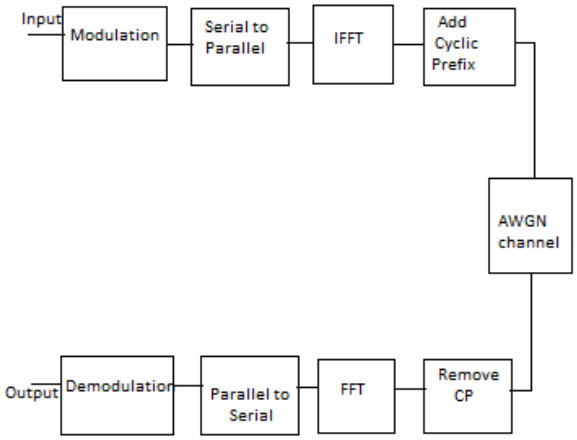

Fig. 1. FFT based OFDM transmitter and receiver

II. PROPOSED SYSTEM

Wavelet rework is employed to research signals by the coefficients of wavelets in each time yet as in frequency domain. Here elementary waveforms don't seem to be sinc and cos waveforms like in Fourier rework. ISI and ICI are caused by loss of orthogonality between carriers caused by multipath propagation of the signal in Discrete Fourier rework (DFT) primarily based OFDM. ISI is between sequent symbols of same subcarriers and ICI is among completely different signals at different subcarriers. Each ISI and ICI are avoided by using cyclic prefix that causes information measure unskillfulness and power loss in DFT primarily based OFDM.

The planned system convolutes OFDM with the prescribed ADWT and DWT to get in time slices with best economical outputs that are so encoded in terms of individual levels of QPSK, QAM (16, 64,128,256) and related to with the traditional approaches of FFT-OFDM to predict the viable results. Further white Gaussian noise is employed within the channel transmission. The elaborate procedure would be as below.

a. Discrete Wavelet Transform

DWT based OFDM is associate efficient approach to switch FFT in standard OFDM systems. DWT is used so as to get rid of the utilization of cyclic prefix that decreases the information measure wastage and also the transmission power is additionally reduced by the utilization of wavelet remodel. The transmission potency of the channels in DWT-OFDM is best than FFT-OFDM. In wavelet remodel, the signal of interest is decomposed into set of basis waveforms, referred to as wavelets, which offer the means for analyzing the signals by investigating the coefficients of wavelets.

A low pass filter and high pass filter is utilized to work and satisfy good reconstruction and orthonormal properties. In rippling based OFDM, the modulated signal is transmitted using zero cushioning and vector transposing. DWT is understood as a versatile and extremely economical methodology for decomposition of signals. Information generator initial generates a serial random data bits stream. This information stream is skillful the encoder that consists of Convolution encoder followed by the bit inter-leaver. The bits are initial interleaved with facilitate of convolution encoder and interleaver and so the information is processed using modulator to map the input data into symbols supported the modulation technique used. In DWT-OFDM, the input info is processed same as in FFT-OFDM however the advantage during this case is that the cyclic prefix isn't needed attributable to the overlapping nature of ripple properties.The remodel is enforced by the employment of filters. One filter of the analysis combine may be a low pass filter (LPF), whereas the opposite one may be a high pass filter (HPF). Every filter consists of a down-sampler to form the remodel economical.

b. Adaptive Discrete Wavelet Transform

The adaptive DWT theme could be a new rule projected for the implementation of the wave remodel. This can be combined with the lifting scheme to envision for the variations with OFDM. It will scale back the process complexness of DWT involved with the convolution implementation. Moreover, the additional memory needed to store the results of the convolution can even be reduced by in situ computation of the wave coefficient with the lifting theme. The lifting theme consists of the subsequent 3 steps to decompose the samples, namely, splitting, predicting, and updating. Split step: The input samples area unit split into even samples and odd samples ;second one is Predict step (P): The even samples area unit increased by

the predict issue and so the results area unit value-added to the odd samples to come up with the detailed coefficients; final one is Update step (U): The detailed coefficients computed by the predict step area unit increased by the update factors and so the results area unit more to the even samples to induce the coarse coefficients.

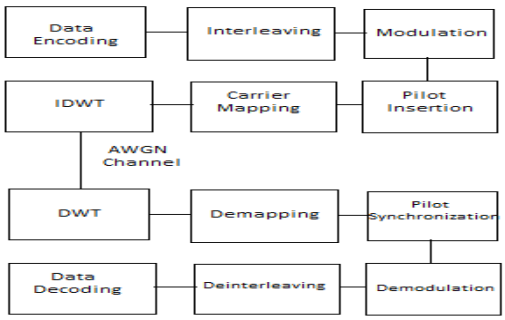

Fig.2.DWT based Proposed OFDM system Design

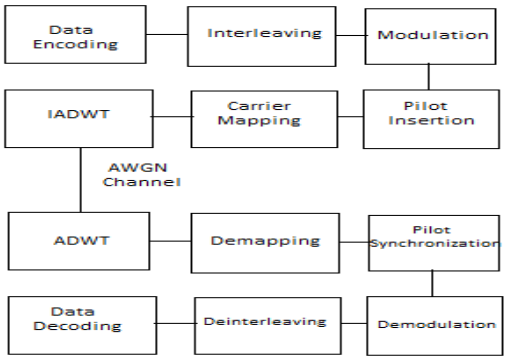

Fig.3.ADWT Based Proposed OFDM system Design

III. RESULTS AND DISCUSSION

The below figure(1, 2, 3, 4, 5) shows the comparison of bit error rate for orthogonal frequency division multiplexing biased over with FFT, DWT, ADWT for QPSK, QAM (16, 64,128, 256). By exploitation of Matlab, performance characteristics of FFT based OFDM and wavelet based OFDM area unit obtained for various modulations as shown in figure. Modulationsthat would be used area unit QPSK, 16-QAM, 64-QAM, 128-QAM, 256-QAM (Uplink and Downlink). QPSK doesn't carry information at terribly high speed. once signal to noise quantitative relation is of fine quality then solely higher modulation techniques will be used. Lower styles of modulation (QPSK) doesn't need high signal to noise quantitative relation. Signal to noise quantitative relation (SNR) of various values area unit introduced through AWGN channel. information of 9600 bits is distributed within the kind of a hundred symbols, thus one image is of ninety six bits. Averaging for a selected price of SNR for all the symbols is finished and BER is obtained and same method is perennial for all the values of SNR and final BER square measure obtained.

Firstly the performance of FFT based OFDM and Wavelet based OFDM are obtained for different modulation techniques. Different Wavelet transforms like DWT(HAAR) andADWT(Adaptive Lifting scheme) is used in Wavelet based OFDM for QPSK, 16QAM, 64QAM, 128QAM & 256QAM respectively.

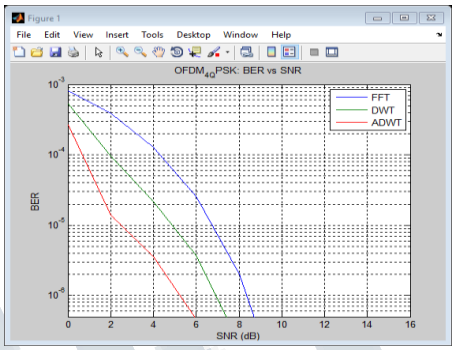

Figure 4: The BER performance of wavelets based OFDM and FFT based OFDM system using QPSK modulation

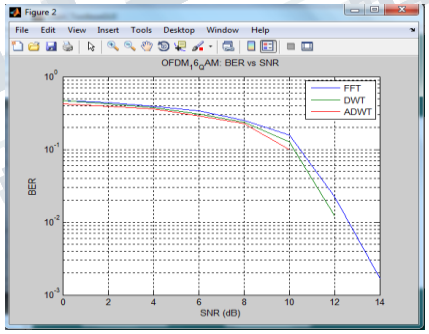

Figure 5: The BER performance of wavelets based OFDM and FFT based OFDM system using 16 QAM modulation

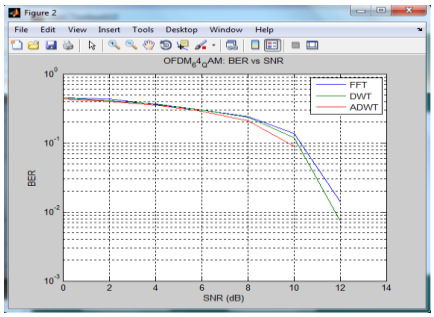

Figure 6: The BER performance of wavelets based OFDM and FFT based OFDM system using 64 QAM modulation

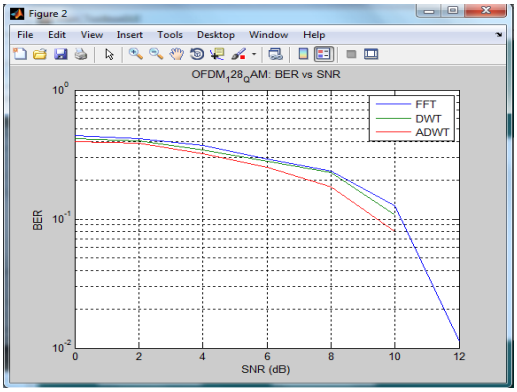

Figure 7: The BER performance of wavelets based OFDM and FFT based OFDM system using 128 QAM modulation

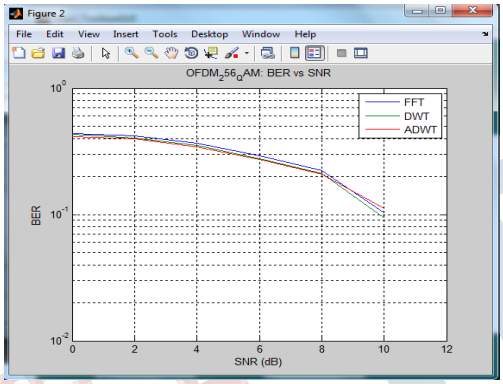

Figure 8: The BER performance of wavelets based OFDM and FFT based OFDM system using 256 QAM modulation.

IV. CONCLUSION

This work aims at giving an entire procedure for examination orthogonal frequency division multiplexing at completely different procedure levels of QPSK and QAM(16, 64, 128, 256) for varied frequency domain of DWT, ADWT. For outlook work , the OFDM equivalent to FFT is taken into account and compared employing a procedure practiced DWT and ADWT square measure investigated. The investigations of OFDM using DWT and ADWT square measure found to be additional sturdy in transmission wise and performance wise than OFDM-FFT model due do the low signal to noise quantitative relation in OFDM based mostly DWT and ADWT.

REFERENCES

[1] C. V. Bouwel, et. al, Wavelet Packet Based Multicarrier Modulation, IEEE Communications and Vehicular Technology, SCVT 200, pp. 131-138, 2000.

[2] B. G. Nagesh, H. Nikookar, Wavelet Based OFDM for Wireless Channels, IEEE Vehicular Technology Conference, Vol. 1, pp. 688-691, 2001.

[3] Haixia Zhang, et. al, Research of DFT-OFDM and DWT-OFDM on Different Transmission Scenarios. Proceeding of the second international conference on Information Technology for Application (ICITA 2004)

[4] P. Ray and J.Wimalasiri, "The need for technical solutions for maintaining the privacy of EHR," in Proc. IEEE 28th Annu. Int. Conf., New York City, NY, USA, Sep. 2006, pp. 4686–4689.

[5] [3] M. C. Mont, P. Bramhall, and K. Harrison, "A flexible role-based secure messaging service: Exploiting IBE technology for privacy in health care," presented at the 14th Int. Workshop Database Expert Syst. Appl., Prague, Czech Republic, 2003.

[6] L. Zhang, G. J. Ahn, and B. T. Chu, "A role-based delegation framework for healthcare information systems," in 7th ACM Symp. Access Control Models Technol., Monterey, CA, USA, 2002, pp. 125–134.

[7] L. Zhang, G. J. Ahn, and B. T. Chu, "A rule-based framework for rolebased delegation and revocation," ACM Trans. Inf. Syst. Security, vol. 6, no. 3, pp. 404–441, 2003.

[8] D. Boneh and M. Franklin, "Identity-based encryption from the Weil pairing. Extended abstract in CRYPTO 2001," SIAM J. Comput., vol. 32, no. 3, pp. 586–615, 2003.

[9] J. Sun, C. Zhang, Y. Zhang, and Y. Fang, "An identity based security system for user privacy in vehicular ad hoc networks," IEEE Trans. Parallel Distrib. Syst., vol. 21, no. 9, pp. 1227–1239, Sep. 2010.

[10] J. Sun, X. Zhu, and Y. Fang, "Preserving privacy in emergency response based on wireless body sensor networks," in Proc. IEEE Global Telecommun. Conf., Dec. 2010, pp. 1–6.

[11] J. Sun, X. Zhu, C. Zhang, andY. Fang, "HCPP: Cryptography based secure EHR system for patient privacy and emergency healthcare," in Proc. IEEE Int. Conf. Distrib. Comput. Syst., Jun. 2011, pp. 373–382.

[12] Anuradha, Naresh Kumar, "BER Analysis Of Conventional And Wavelet Based OFDM In LTE Using Different Modulation Techniques", RAECS UIET Panjab University Chandigarh, IEEE 2014.

[13] Juhi Khetrapal, Raj Tiwari, "Improving BER Performance Of HAAR And Le-Gall Wavelet Based OFDM", International Journal Of Modern Engineering And Management Research Technology, vol.2, issue 1,2015.

[14] Rakesh Pathak, K.Narender, "A Novel Ber Analysis Approach For Different Modulation Schemes For Conventional And Wavelet Based OFDM System", International Journal Of Engineering And Computer Science, vol.4, Issue 7, pp. 12980-12986, 2015.

[15] Vikas Kumar, Er.Mukesh Kumar, Prof. A.K. Jaiswal, Dr. Rajeev Paulus, Er.Rohini Saxena, Bhupendra Kumar, "Bit Error Rate Analytical Approach For Different Modulation Techniques Based On Comparison Of Conventional And Wavelet Based OFDM LTE Mechanisms", International Journal Of Engineering And Computer Science, vol.4, Issue 6, pp. 12258-12263, 2015.