Modulation to Improve Bit error Rate Performance by Analysis of Stationary and Discrete wavelet Transform with Orthogonal Frequency Division Multiplexing

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ABSTRACT:

In this paper, SWT based OFDM is proposed to evaluate the performance of BER. The OFDM communication model overcomes the drawbacks of conventional communicational model and offers the high data rate, and high spectral efficiency. Compared to conventional approaches the 4th generation Long term evolution application has better spectral efficiency in terms of accuracy and high data rate, the 4th generation Long term evolution approach is formed by the collaboration of OFDM and MIMO. Although OFDM has many advantages over FDM but it suffers from inter carrier interference and inter symbol interference when multiple carriers are used and due to this interferences loss of Orthogonality happens, in order to overcome these interferences usage of cyclic prefix has become mandatory. But usage of cyclic prefix shows huge negative impact on bandwidth efficiency as the cyclic prefix approach consumes nearly 20% of bandwidth and BER performance too affected. Inthis paper a novel wavelet based OFDM model is presented which is mainly intended to provide good Orthogonality and better spectral efficiency using various modulation techniques, the unique thing in the usage of wavelet based OFDM is it does notneed any spectral efficiency and absence of the cyclic prefix increases bandwidth efficiency when bandwidth increases simultaneously spectral efficiency increases. Finally the usage of the stationary wavelet based OFDM shows improved BER over discrete wavelet conventional FDM communication model. The simulation results indicates the usage of SWT based OFDM in place of DWT based OFDM in LTE and finally the comparison between DFT based OFDM, DWT based OFDM and SWT based OFDM.

Keywords: OFDM, MIMO, LTE, Cyclic Prefix, ICI & ISI, Spectral Efficiency, Wavelet Transform.

INTRODUCTION

In olden days people used to communicate with distant counterparts by make usage of traditional approaches like sending the information with birds, sending people as ambassador to convey the information. Most of the researchers termed 21st century as Communication arena dueto the high end technological advancement in this area whichmakes communication fast and reliable (1-2). The intense research classified communication into two categories a) wire based communication b) wireless based communications. Wire based communications is considered as most useful tool in world wars to convey information from one end to another in1940's and optical fiber plays a crucial role in wire based communication mechanism and after completion of war the dominance of United States of America (USA) and Union ofSoviet Socialist Republics (USSR) over the world makes the research on communication so fast that in two decades communication research grows from daily life communication to satellite communication and this development mainly because of wireless communication.

RELATED CONTENT

A. OFDM and its Orthogonality: In orthogonal frequency division multiplexing communication model the sub carrier used are orthogonal to each other. The Orthogonality scheme helps in employing the overlapping between the sub carriers in the respective frequency domain. The accuracy of communication model is based on how effective the bandwidth is used and this is technically termed as spectral efficiency or bandwidth efficiency, the acquired bandwidth efficiency is free of Inter carrier interference and the absence of Inter carrier interference (ICI) is mainly because of usage ofOrthogonality in orthogonal frequency division multiplexing.

B. Basic OFDM System: The orthogonal frequency division multiplexing block diagram is illustrated as follows in figure 1. The input random signal data rate streams (high) are converted into data rate streams (low). The important aspect in the OFDM block diagram is the modulation technique which modulates the low data rate streams in parallel way and this parallel stream given input to the IFFT block which transforms the frequency data to time data before it reaches the channel. Adding the cyclic prefix acts as the guard interval and the reverse of transmission is accomplished at receiver end.

C. MIMO OFDM system: The above block diagram shows the basic representation of OFDM. The input data (digital) is generated by binary source generator as shown in below figure and the binary data is modulated with modulation approach such as BPSK, QPSK and QAM with several different constellations. The serial to parallel performs the task to convert the serial data to the parallel mode in N various sub streams. Then these various sub streams are modulated through the IFFT modulation block. The IFFT block in the block diagram in design to transform the frequency to time domain for obtaining the delay related issues at the channel and then guard interval named CP is inserted to tackle the issues like ICI/ISI. The OFDM symbols are initialized in the time domain which has specified length before giving it to the channel then the operation is performed in the inverse direction to remove all the operations which are performed and gets the output as OFDM signal in MIMO format.

Literature Survey: A novel 4G cellular system based approach has been observed. The analysis of the LTE (Advanced) and detailed review on the technologies related to the LTE (advanced) arediscussed in the paper. Initially the optimized evolution from the 3G to 4G is discussed in detailed way based on theproperties and characteristics. The novel thing presents in this paper is development of the advance integration approach which integrates the current and future generation radio access technologies based on the 3GPP network architecture. In the latter step the drawbacks frequently happen are highlighted and necessary approaches are presented to resolve the issues in equipped way [3-4].

This literature review focuses on technologies like enhanced MIMO, carrier aggregation, reception, transmission in terms of multipoint approach and relays. All technologies are analyzed in detailed way to know the benefits in order to tackle the problems and although tremendous amount of research done in past years still lot of problems yet to be solved which needs attention in future works. An optimized multicarrier modulation technique The proposed method in this review work divided the transmission data into several small bit streams based on the principle of transmitting data. These divided small bit streams are used to modify the several carriers according to the properties of the data carriers and the presence of these bit streams are observed [5-6].

The HDSL application has great role various wireless standards and moreover high speed data is considered as the initial parameter for the HDSL. Multi carrier modulation approach is also spelled in different names as following but commonly it is called as multicarrier modulation (MCM). (a) Quadrature amplitude modulation (QAM) which is orthogonal in nature (b) Frequency division multiplexing (FDM) which is orthogonal in nature (c) Dynamically assigned multiple QAM. The digital multicarrier modulation approach changed drastically over the years and moreover the advanced wavelet techniques provides better results with reduced complexity (7-8).

Proposed Method: In this proposed model we are using ISWT and SWT at the place of IDWT and DWT. AWGN channel is used for transmission and cyclic prefixing is not used. Here first of allconventional encoding is done followed by interleaving then data is converted to decimal form and modulation is done next. After modulation the pilot insertion and sub carrier mapping is done then comes the ISWT of the data, which provides the orthogonality to the subcarriers. ISWT will convert time domain signal to the frequency domain.

After passing through the channel on the signal SWT will be performed and then pilot synchronization where the inserted pilots at the transmitter are removed then the demodulation is done. Through AWGN channel. Data of9600 bits is sent in the form of 100 symbols, so one symbol is of 96 bits. Averaging for a particular value of SNR for all the symbols is done and BER is obtained and same process is repeated for all the values of SNR and final BERs are obtained. Firstly the performance of DFT based OFDM and wavelet based OFDM are obtained for different modulation techniques (9-10). Different wavelet types daubechies2 and haar is used in DWT based OFDM for QPSK, 16-QAM, 64-QAM. Demodulated data is converted to binary form and the de- interleaved and decoded to obtain the original data transmitted. higher modulation techniques can be used. Lower forms of modulation (QPSK) does not require high signal to noise ratio. For the purpose of simulation, signal to noise ratio (SNR) of different values are introduced.

SIMULATION RESULTS

By using MATLAB performance characteristic of DFT based OFDM, DWT based OFDM and SWT based OFDM are obtained for different modulations that are used for the LTE, as shown in figures 3-5. Modulations that could be used for LTE are QPSK, 16 QAM and 64 QAM (Uplink and downlink). QPSK does not carry data at very high speed. When signal to noise ratio is of good quality then only.

EXTENSION

The BER ANALYSIS improvement is a challenging task in the orthogonal frequency division multiplexing, in our proposed work we use estimated SWT based OFDM algorithm for BER Performance using AWGN channel. Estimation of BER Performance is done by using the SUI channel for better performance, High spectral efficiency and low run time complexity.

CONCLUSION

In this paper, the performance of BER is evaluated for different modulation techniques such as QPSK and QAM are used under stationary wavelet transform. Wavelet transform is used to avoid the complexities of the signal such that to improve BER performance. In the future work, Stanford University Interim (SUI) model is used in place of AWGN channel to improve the efficiency as well as performance ofa signal.

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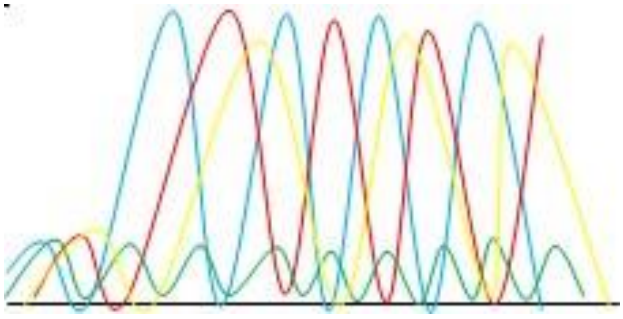


Fig 1. Orthogonality in orthogonal frequency divisionmultiplexing (OFDM).

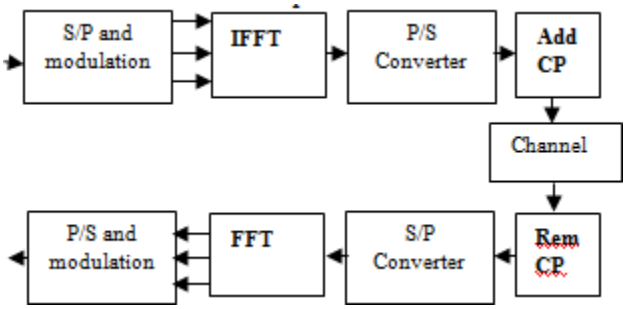


Fig 2. Block diagram of Basic OFDM system

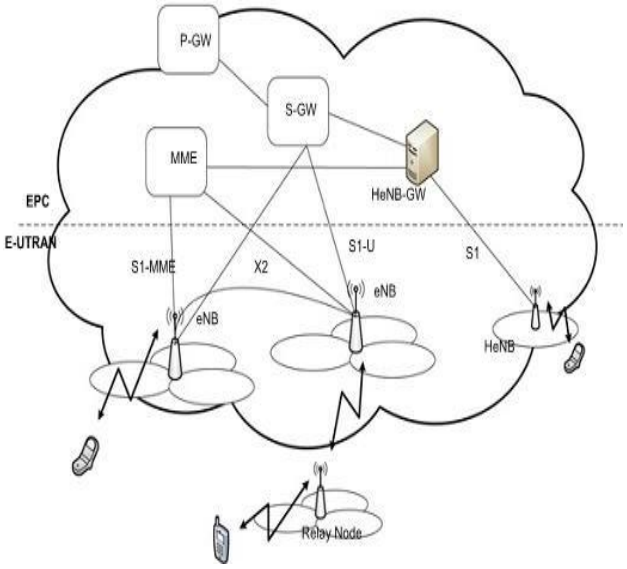


Fig 3. Architecture of the LTE-Advanced E-UTRAN.

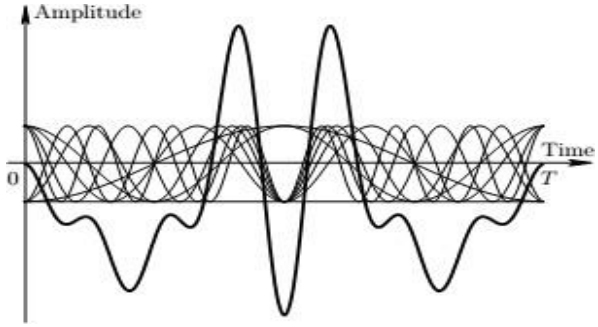


Fig 4. Representation of the multi carrier modulated signal.

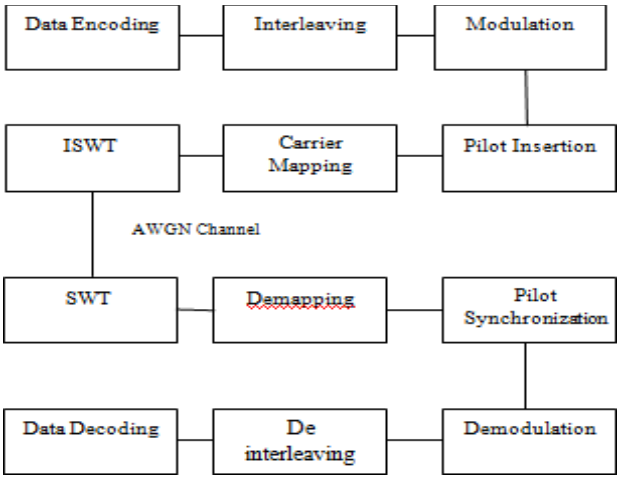


Fig 5. Wavelet based proposed OFDM system design.

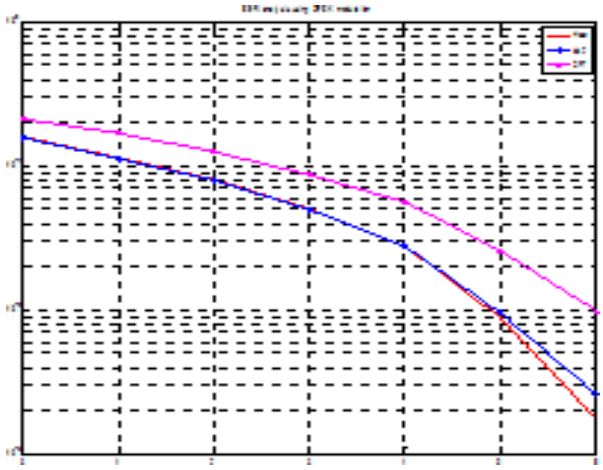


Fig 6. BER performance of DWT and DFT based OFDMsystem using QPSK modulation.

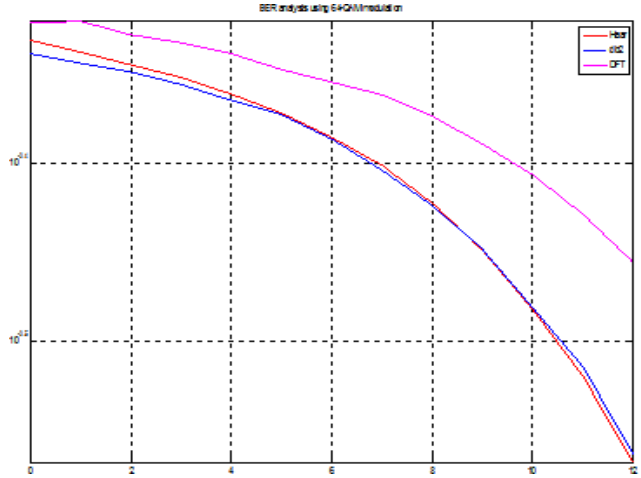
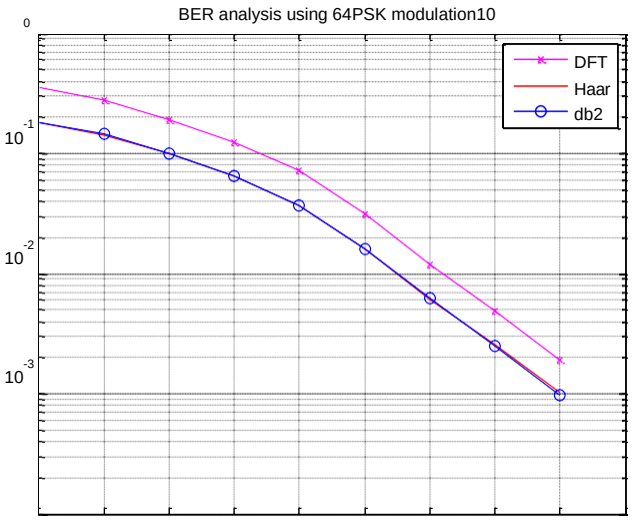
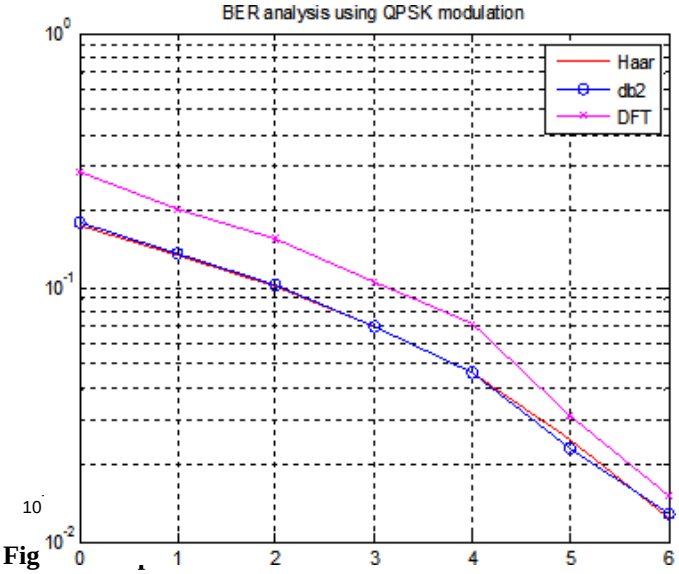


Fig 7. BER performance of DWT and DFT based OFDMsystem using 64- QAM modulation.

8. BER performance of DWT and DFT based OFDMsystem using 16-QAM modulation.





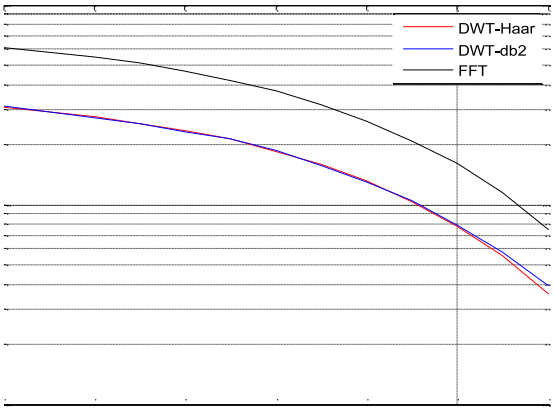
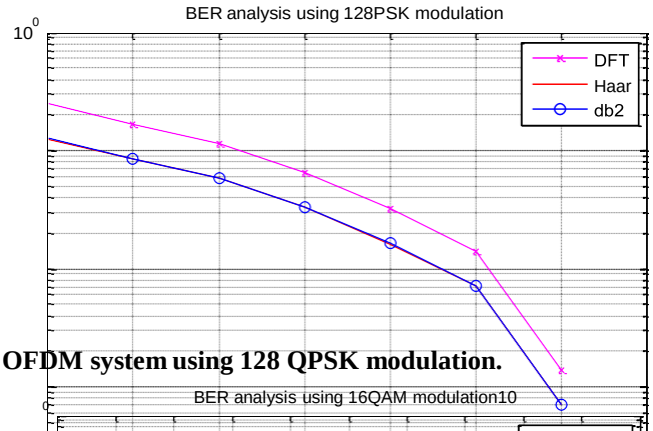


Fig . system using 64 QPSK modulation.



OFDM system using 128 QPSK modulation.

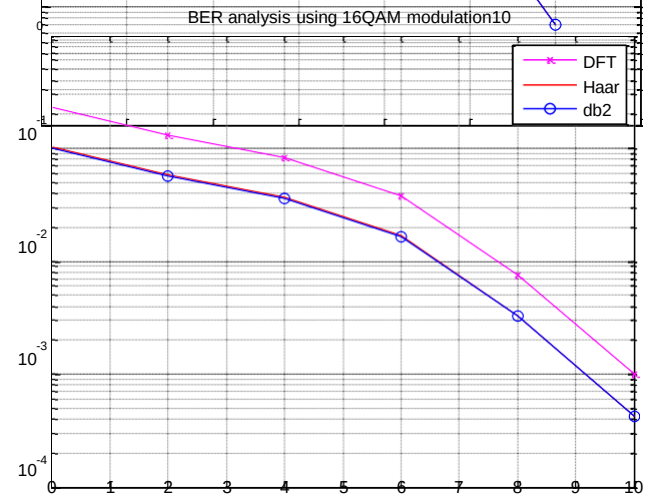


Fig11. BER performance of SWT and DFT based OFDMsystem using 16-QAM modulation.