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Design of Enhanced Throughput Approach In Noisy Environment Using OFDM

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Abstract

With the concept of 3G services OFDM is one of the important technology that provides a very high speed communication. In this technology multiple users can communicate simultaneously to transfer different kind of data. OFDM enables the best use of available bandwidth and the spectrum to represent a cost efficient network. But in a network there is always the requirement to increase the security and the efficiency or the throughput of a multiuser communication in the OFDM network. The proposed work is about to increase the efficiency in a Noisy channel. Here the work will be performed on impulse noised network. We are here proposing the orthogonal approach along with OFDM to improve the throughput. We are trying to show the results in terms of noise ratio and the derived throughput.

Keywords: OFDM, Noisy, Orthogonal, Throughput, Multiuser

I INTRODUCTION

OFDM is one of the main technology of Third Generation Cellular System. The concept of this technology is introduced in 1999 by ETSI Alpha Group. After this technique is standardized by the ITU. Now it is being recognized by a new name called "IMT-2000 Direct Spread". In short it is called ITMS. In any communication system security and efficiency are the main challenges faced by the system or the user. The OFDM is the solution for both of these problems. Because of these features the OFDM is always represented as a complex system. The main advantage of the OFDM is that a user can transmit data in different data rates simultaneously and user can transfer different types of data also. Instead of using TDMA the OFDM provides higher data transmission rate and provide the services to multiple users without any data loss.

The concept of orthogonal frequency will use the concept of modulation technique to transfer large amount of data using radio waves in a wireless network. As we know the radio signals can be divided into the smaller sub signals that enable the OFDM to transfer the data in multiple data rate slots. It provides the simultaneous data transmission without any user interference.

In last few years the use of wireless network and the communication has become very popular. Lot of new technologies are invented in the mean time and lot of research work is currently going on in the same direction. The wireless systems are now converted from low speed networks to the high speed data transmission system. The channel on which the data is transferred is also been changed. The type of data that can travel over these means now include voice, text , video etc. Now it provides the data transmission speed up Gb per seconds in the latest technologies like cable model, DSL etc.
The evolution of the Wireless communication system is described in figure 1.

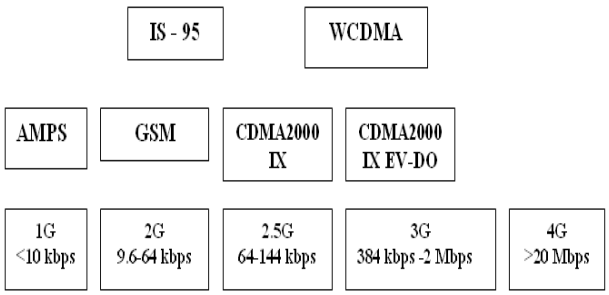

Figure 1 : Evolution of Wireless System

A) 3rd Generation Systems

The most common requirement of third generation mobile systems was to provide the high speed communication for different kind of medias such as audio, video etc. The main features provided by the 3G systems include

- Ensuring the voice quality
- High speed data transmission up to 384 kbps for non moving or slow moving network
- A Data transmission speed up to 144 kbps for high speed moving networks.
- In office network provide up to 2 kbps speed
- Will work on all kind of media like voice, text, audio, video etc.
- Single user can transmit data at different transmission rates
- Will offer both kind of services i.e. packet switched as well as circuit switched.

- Flexible to emerge new technologies into it.

B) OFDM

The concept of a OFDM system is to provide the larger bandwidth and to get the better utilization of it to transfer different kind of data in digitized form. It uses a spread spectrum mechanism that does divide the system in any time slots instead of that each of the OFDM use will get the same frequency to transfer the data and each user can perform a high speed communication on it. The basic features of OFDM system is

- Data transferred over the network is in digital form.
- It provide equal frequency to each user to transfer data.
- It support different media types for the communication over the network.
- As the number of users increases in the network in such case the throughput quality decreases.
- Provides a secure and efficient handover over the network.
- The data link is established for the longer time because of this the overall life of the network increases.

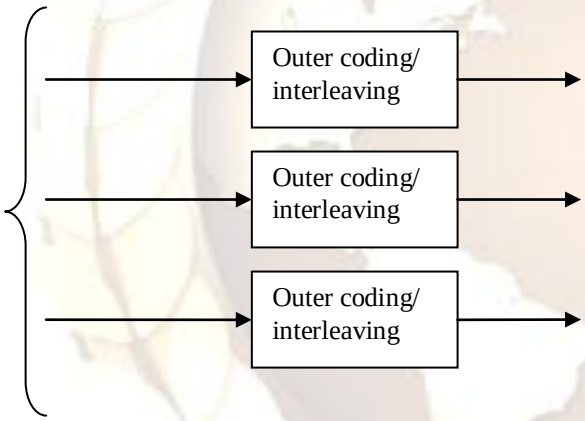

Figure 2 : OFDM System

The basic model of the OFDM is presented in figure 2. The important concept of OFDM is the Spread Spectrum. It provides the process gain. It means the gain of the renovation noise to signal gives the quality of expansion and dispreading process. Because of this the ratio of spread spectrum bandwidth is high and represented by

Process Gain = Transmission Bandwidth after transferring Data / Bandwidth of data being sent

C) W-OFDM

OFDM is the one kind of 3G based mobile communication system. W-OFDM system uses a direct sequence code division multiple access for the transmission to high speed and provide more space of the subscriber than the old TDMA transmission system. W-OFDM uses two types of duplex method. One is called Frequency Division Duplex (FDD) to function for the paired bands and the other type is Time Division Duplex (TDD) for the unpaired bands [1]. 3.84 Mcps is the chip rate of the system. Total frame size of 10 ms and each frame is divided into 15 slots. So in total 2560 chip/slot at the chip rate 3.84 Mcps. W-OFDM uses from 256 to 4 for the uplink of spread factor and for the down link from 512 to 4. So modulation symbol rates are from 960 k symbols/s to 15 k symbols/s or 7.5 k symbols/s for Frequency Division Duplex uplink. Orthogonal Variable Spreading Factor (OVSF) is used to separate channels from the same source. For the Frequency Division Duplex down link Gold codes introduce to separate the various cells. Gold code has its length of 218-1 chips. It takes 10-ms period (38400 chips at 3.84 Mcps) to separate the various cell. For the uplink Gold codes has its length of 10 ms period, or substitute short codes with a 256-chip period, are used to differentiate the various subscribers. W-OFDM system uses three different channel coding. These are convolution coding, turbo coding and no channel coding. Channel coding selection is indicated by upper layers. To minimize the random transmission errors bit interleaving is used and uses QPSK technique as a modulation technique [1].

II LITERATURE SURVEY

In year 2011, Amir R. Forouzan, Member, IEEE, LeeM. Garth, has proposed "Novel Orthogonal Codes for Spectrally-Encoded OFDM Systems in Fading Channels. In this paper, a novel orthogonal spreading code has been proposed for spectrally-encoded (SE) OFDM, a.k.a., spread-time (ST) OFDM with arbitrary pulse shape. It has been shown that it is possible to retain the orthogonally of the code in the presence of tail truncation by time windowing and in a general multipath fading channel in which users experience different frequency selectivity just by modifying the user code words. Simulation results show that the proposed codes can achieve single user performance when the code length is twice the number of users[2]. In year 2011, Markus Laner, Philipp Svoboda, Markus Rupp has presented a model for OFDM links error Statistics. They analyzes error-gap and error-burst statistics of the OFDM dedicated channel (DCH) and provides respective models. We start with an analytical study of the outer-loop power control mechanism (OLPC), which gives directions to this work, revealing that the OLPC strongly influence error behaviour. We prove this by large-scale measurements at the Iub-interface of a live UMTS network. Beside statistical evaluation of the measurement data we provide a simple generative hidden Markov model for emulation of DCH errors. It is able to characterize any arbitrary DCH by only two parameters, with an accuracy below 1%, in terms of Kullback-Leibler divergence. This novel model

presents an accurate light-weight alternative to complex tools for simulation of OFDM DCH connections. It also covers all other communication technologies deploying a similar power control mechanism[3]. In year 2010, L.Nithyanandan, S.Thirunavukarasu and P. Dananjayan, has defined a phase and frequency synchronization algorithm for MC OFDM system. He defined the system respective Capacity of OFDM based systems can be increased by decreasing BER, which is possible through interference reduction and interference suppression. Error performance and capacity of OFDM based system can be improved through proper synchronization. In this paper, virtual sub carrier based frequency and phase synchronization algorithm is proposed which reduces the BER of MC OFDM systems indeed without any transmission overhead[4].

Current research on MC-OFDM focuses on direct time spread MC-OFDM, spectral encoding-decoding, pulse-position modulation MC-OFDM, asynchronous phase encoding MC-OFDM and frequency hopping MC-OFDM. However, in chromatic dispersion of fiber is not considered. Chromatic dispersion can reduce system performance and occurs when increasing the inter-chip interference and decreasing the receiver optical power[5]. At present, the performance of an asynchronous phase encoded MC-OFDM system considering fiber chromatic dispersion has been reported in the case of standard single mode optical fiber, while systems with dispersion shifted optical fiber are presented Intensity modulation with direct detection On-Off Keying (OOK) MC-OFDM and Pulse Position Modulation (PPM) MC-OFDM systems are analyzed in . The capacity of these networks is limited because the number of signature sequences available with good correlation properties for a given sequence length is small[6]

III RESEARCH MTHODOLOGY

WideBand-OFDM provides a quality communication over the wireless network. It provides the communication in multiple users. But as the number of users in the network increases, the communication increases so there are the chances of some data loss over the network. In case of noisy channel the rate of data loss in the network also increases. As we know the W-OFDM will provide the transmission at different data rates to all users. The chances of data loss in noisy network increases very much in case of high data transmission rate. The proposed work is about to reduce this packet loss and to increase the throughput in the noisy network. To overcome this drawback and to increase the throughput we are using the concept of OFDM along with OFDM. This concept is represented as the Orthogonal OFDM.

To satisfy the orthogonally there are some rules to be satisfied:

1. The receiver and transmitter have to be entirely synchronized. In order to satisfy this requirement it is necessary to guess the same modulation frequency and the same time scale for transmission which is not really possible.
2. It is also necessary to have the best quality of the analogue transmitter and receiver part.

The aim of our thesis was to optimize Parallel Cooperative Spectrum sensing in order to make it more efficient technique of sensing. To achieve this goal we have tried to create an environment in which parallel sensing can be done.

As we know that CDMA Network usually suffers from the problems of Noise, Channel Interference and some other instrumentation noise or variation,so in such case to perform an optimal and loss less communication and that too in parallel fashion, it is required to perform the early decision about the Signal Rectification. But, Signal Rectification is effective if the channel Sensing is done in effective way. The proposed work is in same direction to analyze the channel and rectify the signal in effective way to improve network throughput.In our proposed work we are dealing with a network with multiuser working on multiple channels and subcarriers.So,in order to handle the multiple communication over the network Parallel sensing is required on each subcarrier.

In the proposed work we have created an environment for parallel sensing by generating an CDMA spectrum and then dividing the channel into various sub-channels so that signals can be send through these sub-channels in parallel manner and can be monitored simultaneously. For producing some variation in the signals we have included some interference in the signals in the form of noise and also added some randomness to the signals to investigate signal variations. Before transmission the signals are modulated through BPSK modulation method. At the sender side we have applied FIR filters to the signal. The signals are converted into digital form and are send in the form of 0's and 1's.Between the sending and receiving phase sensing is being performed at specified sensing time. At receiver side, the signals are received collectively as I-waveforms and Q-waveforms. The received signals are then filtered using Kalman filtering method to remove the noise and improve the signal quality. The received signals are then analysed on the basis of various parameter like sensing time, throughput. The achieved overall throughput of the proposed scheme is observed to be higher than the previous scheme.

Various methods/schemes used in the proposed work

CDMA Spectrum: Orthogonal Frequency Division Multiplexing method has been used for spectrum generation. The main reason of using CDMA spectrum is that is distributes the data over large number of carriers that are spaced apart at different precise frequencies. The spacing between the various sub-carriers provides orthogonality and prevents demodulators from seeing other frequencies. One major requirement of CDMA is that the signal must be liner because non-linearity can cause interference between the subcarriers. Along with this CDMA has following benefits:

- It has higher spectral efficiency.
- It saves bandwidth of the spectrum.
- It has lower multipath distortion.
- It has multimode modulation based on sub-carriers' SNR which can maximize the channel throughput.

BPSK(Binary Phase Shift Keying): This is one of the most efficient modulation method. In this scheme modulation of data is performed by changing the phase of the particular signal. It uses finite number of distinct signals to represent digital data. It modulate 1bit/symbol. BPSK is most robust of all schemes as it takes highest level of noise or distortion.

IV RESULTS

The presented work is simulated under NS2 environment. The simulation scenario consists of a test area covered by WiMAX BS, and MSs which are randomly dispersed in the test area with overlapped contiguous areas. The position of each MS is random but there are ten MS served by each BS. The traffic model that each MS requests is a non real time Polling Service (nrtPS) at 50 kbps. Table 1 lists the main parameters of the simulation scenario.

Table 1 : Wimax Senario

PARAMETER	VALUE
Frequency Band	5 MHz OFDM
Modulation Scheme	1/2 BPSK
No of BS	1
No of MS	10
Simulation duration	20 s
Requested data rate	50 kbps
BS coverage	1000 m
Frame duration	20 ms
MS Speed	20 m/s

The results obtained after implementation of proposed approach is presented in the form of Reduced BER in the signal. The obtained results are shown as under

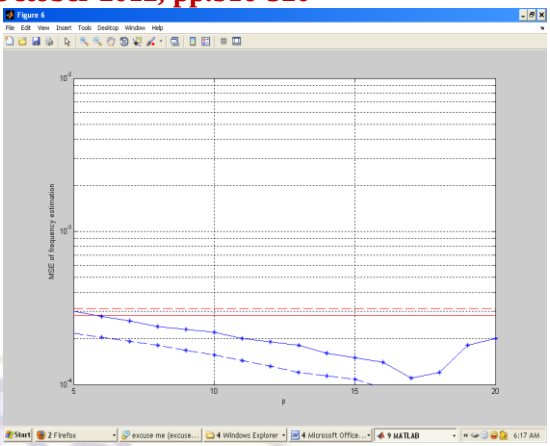

Figure 3 : Proposed Outcome

Figure 3 shows that after implementation of proposed approach the error rate is reduced up to some extent.

V CONCLUSION

In this research work we have studied the OFDM with Wimax network. In his system to view the high speed network we have implemented the Broadcasting over the network. We also include some error in the form of noise in he signal. As the communication begin the transmission is recorded over the network with effect of error rate. In this work the modulation scheme is proposed to improve the output ratio and to decrease the error rate over the network

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