AN OVERVIEW: PERFORMANCE IMPROVING TECHNIQUES OF MC-CDMA

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***ABSTRACT :** Multi-Code CDMA and Multi-Carrier CDMA have attracted a lot of attention from researchers due to their perceived high rate transmission capability. In Multi-Code CDMA, researchers have investigated the systems performance in different fading channel and suggested many schemes to improve the performance, such as S-ALOHA pre-distortion (PD) system and the minimum mean square error combining (MMSEC) are the techniques to the improve the performance .In this system the input data streams are first split into several sub-streams in parallel and then orthogonal codes are multiplied for each substream.*

Keywords : Multi-Carrier CDMA, Multi-Code CDMA, MC-MC CDMA, MC-MC CDMA S-ALOHA, MMSEC, PD, OFDM.

1. INTRODUCTION

Future wireless systems such as fourth generation (4G) cellular will need flexibility to provide subscribers with a variety of services such as voice, data, images, and video signal. Because these services have widely different data rates and traffic profiles, future generation systems will have to accommodate a wide variety of data rates. Code division multiple access (CDMA) has proven very successful for large scale cellular voice systems, but there is some skepticism about whether CDMA will be well-suited to non-voice traffic. This has motivated research on multi-code CDMA systems which allow variable data rates by allocating multiple codes, and hence varying degrees of capacity to different users. Meanwhile, multicarrier CDMA (MC-CDMA) has emerged as a powerful alternative to conventional direct sequence CDMA (DSCDMA) in mobile wireless communications and has been shown to have superior performance to single carrier CDMA in multipath fading.

In Multi-Carrier CDMA, the input data streams are first split into several sub-streams in parallel, like in Multi-Code CDMA and then modulates several subcarriers with each sub-stream before transmitting the signals. Similarly with Multi-Code CDMA, Multi-Carrier CDMA is analyzed with different fading channels, and researchers have suggested schemes to improve the system performance.

In next generation mobile communications systems, a very high-speed data transmission under severe frequency selective fading environments is required, particularly on the down link (baseto- mobile). Recently, orthogonal frequency division multiplexing (OFDM), that transmits many narrowband data-modulated orthogonal subcarriers in parallel, has gained much attention. Meanwhile, the combination of multicarrier (MC) and code division multiple access (CDMA), called MC-CDMA, has also been attracting increasing attention and is under extensive study. Multicode MC-CDMA can be used for high data rate transmission, where multiple data modulated symbols are code-multiplexed over a number of orthogonal subcarriers using orthogonal spreading sequences defined in the frequency domain. In multicode MC-CDMA, the same data rate as in OFDM can be achieved by transmitting as many as SF data symbols over SF subcarriers in parallel using the code-multiplexing method, where SF stands for the spreading factor.

In a frequency selective fading channel, multicode MC-CDMA can achieve frequency diversity effect but orthogonal property among different spreading codes is partially lost. Orthogonality restoration combining (ORC) can perfectly restore orthogonality but produces noise enhancement. The most promising is the minimum mean square error combining (MMSEC) that can balance the orthogonality restoration and the noise enhancement.

In multi-code multicarrier CDMA S-ALOHA, each user is allow to transmit multiple Orthogonal codes, So the MC-MC CDMA S-ALOHA system can support various data rates as required by the next generation standard . In MC-MC CDMA S-ALOHA the initial data is serial to parallel converted to a number of lower rate data streams. Each stream which consists of part of the initial data called sub packet will be coded to a number of multiple orthogonal codes then modulated using specific spreading code for each user , and all sub stream signal are transmitted in parallel on different sub carrier.

The combination of multicode scheme and multicarrier code division multiple access (MC-CDMA) and ALOHA, called MC-MC CDMA S-ALOHA ,with dual medium, in an AWGN channel. Each medium has different characteristics in data rate transmission. The high rate bit transmitted data user is serial to parallel converted into low rate bit stream and assign with multiple orthogonal code. Each low rate bit stream is transmitted over L orthogonal sub-carrier. And the performance of the system is improved as the number of assign codes and sub-carriers increases.

2. LITRATURE SURVEY

This paper shows the basic performance of multicode multicarrier CDMA system.There have been to our knowledge two previous studies on multi-rate transmission for multicarrier direct sequence CDMA (MC-DS-CDMA) systems.The study of multirate transmission for MC-DS-CDMA systems based on the concepts of multi-code access and variable-spreading gain code access was first presented. In multi-rate MC-DS-CDMA, the data stream of a user with data rate M is first multiplexed into M different serial streams with a base data rate, and each serial stream is treated as an individual user. Each of the M serial streams is then converted into P parallel sub-streams and spread by the same spreading code with a constant spreading factor. Moreover, the system has M times more interference per user, because each of the M data streams is treated as an independent user. Therefore, the system of experiences more interference as the data rate increases, even with a fixed number of users. [4].

This paper cosists of Multicode Multicarrier CDMA S-ALOHA improves the performance of multicode CDMA or multicarrier CDMA .There are two general scheme are used to accommodate the multi-rate system Code Division multiple Access (CDMA), namely the variable spreading gain (VSG) system scheme and the multicode CDMA scheme. The VSG system provides a variety of spreading gain for every user.The disadvantage of this system is that the spreading gain falls very low.The CDMA multicode system is able to accommodates variable data rates which is provided by multicode and different capacity of each user. In a multicode system the spreading factor continuously keep constant. The disadvantage of the system is that the increase of interference because the carrier used to transmit the signal is the same (single carrier) [3].

This paper consists of PD system with MC-MC CDMA gives a good performance improvements compared to MC-MC CDMA signals without PD.The amplitude and phase modulation distortions are minimized using linearization methods. The linearization method requires modeling the characteristics of the amplitude distortion and phase distortion of the HPA. A Saleh model has been used to provide the linearization method and applied to measured data from HPA that characterize the distortion caused by the HPA. The measured data provides a performance curve indicating nonlinear distortion. The forward Saleh model is a math equation that describes the amplitude and phase modulation distortions of the HPA. The amount of desired pre-distortion (PD) linearization is then determined to inversely match the amount of distortion for canceling out the distortion of the HPA[2].

In this paper the MC-CDMA using MMSEC provides a superior performance to OFDM for the same data rate and the same bandwidth. The best performance is obtained using the largest possible spreading factor, which is equal to the number of subcarriers. The reason for this is that by spreading the same data symbol over all subcarriers, the frequency diversity effect can be maximized by using MMSEC. Multicode MC-CDMA can be used for high data rate transmission, where multiple data modulated symbols are code-multiplexed over a number of orthogonal subcarriers using orthogonal spreading sequences defined in the frequency domain[1].

3. CONCLUSION

In this paper an overview of improving techniques of MC CDMA shows that PD system with MC-MC CDMA gives a good performance improvements compared to MC-MC CDMA signals without PD. Also the BER performance of MC-MC CDMA is derived and compared with Multi-Code CDMA system, and Multi-Carrier CDMA system.

From the BER performance and throughput analysis of MC CDMA S-ALOHA in single and dual medium shows that the Multicode Multicarrier CDMA S-ALOHA improves the performance of multicode CDMA or multicarrier CDMA, also from the BER performance and computer simulation shows that the multicode MC-CDMA using MMSEC provides a superior performance to OFDM for the same data rate and the same bandwidth.

4. REFRENCES

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