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Adaptive Sub-Channel Algorithm Based Spectrum Allocation in MC-CDMA Systems

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A B S T R A C T

Multicarrier direct sequence CDMA (MC-DS-CDMA) transmitter spreads the sequential to resemble changed over information streams in time sp utilizing a spreading code, to improve the BER execution of the System. In this paper by shifting the quantity of pieces to the particular channels in the scope of SNR. With the forecast of channel conditions on the hour of next schedule opening, all these work done on the range of non touching ra portion plot by utilizing versatile Adaptive sub channel grouping (ASG) balance plans for the sub transporters with keeping up BER to improve throughput. By dissecting the LTE guidelines of 3GPP applicant of 4G with two exchanging levels of balances for example 8PSK and 128 QAM. expanding the quantity of clients beginning from 64 QAM to QPSK. For the reproduction Rayleigh channel and auto regression model utilized. improving the system throughput when contrasted with touching plans of gathering arrangement. The conclusion of this paper shows crit improvement of non spreading range distribution conspire is superior to the touching range portion plot.

Keywords: MC DS CDMA, QAM, ASG, Rayleigh fading, CSI, Maximum throughput.

1. Introduction

To provide required high data rates with less inter symbol interference it is advantageous to use multi –carrier cellular systems rather than single carrier cellular systems. The MC-DS-CDMA signal is generated by serial-to parallel converting data symbols into sub-streams and applying DSCDMA on each individual sub-stream. Thus, with MC-DSCDMA, each data symbol is spread in bandwidth within its sub-channel, but in contrast to MCCDMA or DS-CDMA not over the whole transmission bandwidth. An MC-DSCDMA system with one sub-carrier is identical to a singlecarrier DS-CDMA system. MC-DS-CDMA systems can be distinguished in systems where the sub-channels are narrowband and the fading per sub-channel appears flat and in systems with broadband sub-channels where the fading is frequency-selective per sub-channel. The fading over the whole transmission bandwidth can be frequency-selective in both cases. The complexity of the receiver with flat fading per sub-channel is comparable to that of an MC-CDMA receiver, when OFDM is assumed for multicarrier modulation. As soon as the fading per sub-channel is frequency-selective and ISI occurs, more complex detectors have to be applied. MC-DS-CDMA is of special interest for the asynchronous uplink of mobile radio systems, due to its close relation to asynchronous single-carrier DS-CDMA systems. On one hand, a synchronization of users can be avoided; however, on the other hand, the spectral efficiency of the system decreases due to asynchronism. There are many techniques of allocation of these sub carriers to the users. Instead of allocating all subcarriers to all users, these subcarriers may be divided into groups and then these groups can be assigned to the users. Channel fading is different at different sub carriers, this feature can be exploited for allocating the subcarriers to the users according to the instantaneous channel state information (CSI). An appropriate sub-carrier selection technique results in high spectrum efficiency, reduction in high power consumption at the mobile terminal, high data throughput in a multicell environment, improvement in BER performance, reduction in signal processing at the mobile terminal. For the given power, throughput can be maximized by allocating maximum number of subcarriers to the users. 2. Related Work Srinivas Karedla et. al.,[1] proposed a resource allocation scheme called Modified Load Matrix (MLM) is proposed for Multi - Carrier –DS-CDMA systems Load matrix (LM) is a resource allocation approach used in single carrier mobile communication systems in a multi-cell scenario to reduce the interference (both inter-cell and intra –cell) to increase the system throughput decrease the packet delay PATHAN MOHD BASHA KHAN et. al., [2] proposed an adaptive multi-user resource allocation for the downlink transmission of a multi cluster tactical multicarrier DS CDMA network. The goal is to maximize the sum packet throughput, subject to transmit power constraints. Since the objective function turns out to be noncovex and non differentiable, here it proposes a

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simple iterative bisection algorithm. We also provide an optimization algorithm for the downlink transmission under the condition of imperfect channel knowledge, and investigate the effects of both channel estimation error and partial-band jamming. V.Nagarajan et.al.,[3] proposed a novel chaotic spreading sequences for multi-carrier direct sequence code division multiple access (MC-DS/ CDMA) system is proposed. With this spreading sequence in the MC-DS/CDMA system, the effect of multiple access interference can be mitigated by choosing the spreading sequences with appropriate crosscorrelation properties. The studies reveal that the Non Contiguous Spectrum Allocation in MC-DS-CDMA Systems for Improving Throughput 7 proposed system significantly outperforms the Walsh Hadamard code spreading in MC-DS/CDMA system.Jia Shi et al., [4] proposed a novel distributed resource allocation assisted by ICI mitigation scheme referred to as RAIM, which requires very low implementation complexity and demands little backhaul resource. The RAIM algorithm is a fully distributed algorithm, which consists of the subcarrier allocation (SA) algorithm named RAIM-SA, spreading code allocation (CA) algorithm called RAIM-CA and the ICI mitigation algorithm termed RAIM-IM. The advantages of the RAIM include that, its CA only requires limited binary ICI information of intracell channels, and it is able to make mitigation decisions without any knowledge of ICI information. Gnanasekar .A. K et.al.,[5] proposed concatenation coding scheme for Multicarrier Direct Sequence Code Division Multiple Access (MC-DS-CDMA).It is to support high capacity & utilizing less power among all sub channels. A sub-optimal non-cooperative power control game theory concept is proposed to allocate the transmit power, available sub channels and by minimizing the transmit power. Game theory is a mathematical model and techniques developed to analyze interactive decision processes, predict the outcomes of interactions, and identify optimal strategies. Game theory techniques were adopted to solve many protocol design issues are resource allocation, power control, cooperation enforcement in wireless networks.

2. Existing Method

In existing scheme channels are allocated to the users according to the CSI obtained and number of channels allocated to one user forms one group. Autoregressive model is used for Rayleigh fading channel. Performance of ASG is evaluated for the test environment considering future Long Term Evolution (LTE) advanced standard, the 3GPP candidate for 4G. ASG scheme performance is compared with improved scheme and Adaptive channel allocation (ACA) scheme. Demerits: Multicarrier Code Division Multiple Access (MC-CDMA), it only spreads codes in frequency domain, but main disadvantage is no code orthogonality.

3. Proposed Method

This paper specially analyses the BER performance under Rayleigh fading channel conditions of MC-DS-CDMA in presence of AWGN (Additive White Gaussian Noise) using QPSK modulation for different number of subcarrier, different number of users. Multicarrier DS-CDMA (MC-DS-CDMA) system is an orthogonal frequency division multiplexing (OFDM) system in which a direct sequence code-division multiple access (DSCDMA) signal is transmitted on each OFDM subcarrier. So, on each subcarrier, the signal of several users is multiplexed on the basis of the CDMA codes assigned to each user. In a conventional MC-DS-CDMA system, each user has a specific spreading code and the user employs this code to spread the data on each subcarrier. Efficient resource allocation is the major issue in the development of fourth generation mobile communication systems. Out of the available resources spectrum allocation is the main issue in the performance of wireless networks.

Instead of allocating all subcarriers to all users, these subcarriers may be divided into groups and then these groups can be assigned to the users. Channel fading is different at different sub carriers, this feature can be exploited for allocating the subcarriers to the users according to the instantaneous channel state information (CSI).

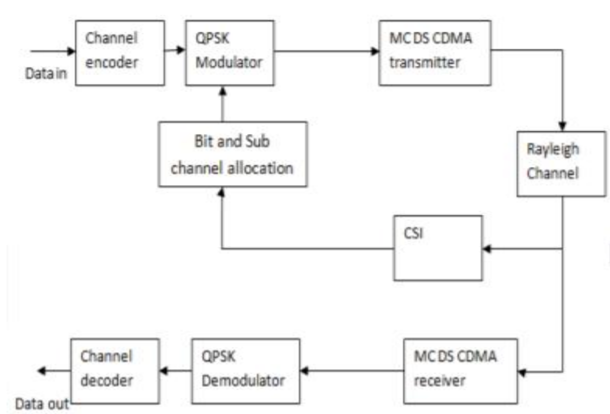

Fig 1. Block diagram of proposed system

This scheme proposes a totally new technique of subcarrier group formation in accordance with the instantaneous CSI for the MC-DS-CDMA systems in the downlink transmission for throughput improvement. Eigen matrix algorithm which allocates the channels to users for high data rates in the uplink and downlink transmission of MC-DSCDMA systems.

4.Methodology

4.1 MC-DS-CDMA

Multi-carrier spread spectrum can be realized using two schemes. The first realization scheme is MC-CDMA which is a referred to as CDMA-OFDM and second is MC-DSCDMA. In both schemes, by using different spreading codes which are user specific, the different users utilize the same spectrum at the same time and the separation of the user signals is carried out in the code domain. Moreover, to reduce ISI multi-carrier modulation is used by both schemes to condense the symbol rate and amount of ISI per subchannel. The difference between MC-CDMA and MC-DSCMDA is the allocation of the chips to the sub-channels and OFDM symbols.

In this paper a Multi-carrier-DSCDMA(MC-DS-CDMA) mobile communication system is considered with N cells and M users in each cell where the radio access technology used in uplink and downlink is MCDSCDMA. The main reason to use MC-DS-CDMA is it is having advantage of Low peak to average power ratio in uplink than MC-CDMA

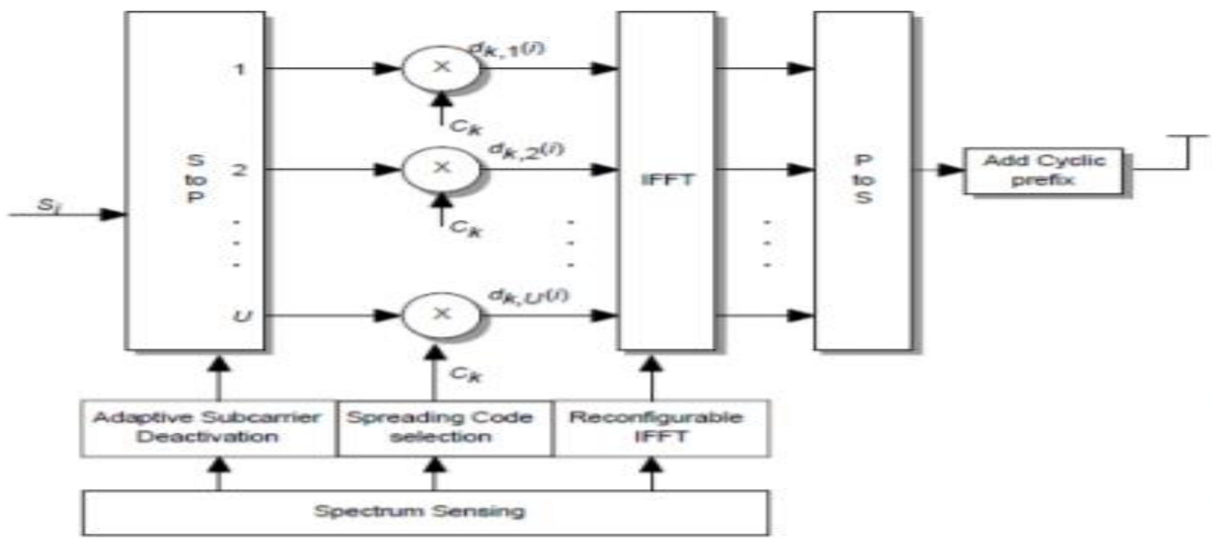

Fig 2.MC-DS-CDMA transmitter.

4.2 Adaptive Sub channel Grouping (ASG) algorithm

In this scheme the subcarriers in each group are not fixed and can be changed as the wireless channel changes. Also channels in one group are not neighboring frequency bands and the number of channels per group is not equal. Each user experiences different fading on different channel. This feature has been exploited for forming the subcarrier groups. The channel groups are formed according to the channel gain „f„„ therefore the required transmit power decreases and more number of channels get allocated for the

given transmit power at the base station, resulting in improved throughput. "Fig.2"shows that the total number of subcarriers are „N‟ i.e. the given bandwidth has been divided into N number of channels. These „N‟ number of channels will get divided into „G‟ number of groups in accordance with the channel fading „f‟ experienced by a user on a particular channel. The total number of channels assigned to one user will form one group. Therefore number of groups will be always equal to the number of users. The steps in proposed ASG scheme are given below, assuming the instantaneous CSI is available at the base station,

Step1: Start from the first channel, it will scan all the users and user experiencing minimum fading on it; will be allotted that first channel.

Step 2: Next second channel will scan again all the users and user experiencing minimum fading on it, will be allotted that second channel.

C = {1, 2,…, G }, cug = 0 for

u = 1… U and g = 1… G.

Adaptive group formation

For c= 1……..N gu ={uc} End

N - Total no. of subcarriers.uc - uth user„s channel fading (path gain) on the cth subcarrier. gu - uth user„s group of subcarriers.

Step 3: Continuing in this manner till the last channel scan all the users (U), channels are allocated to users randomly depending on channel fading experienced by users.

Step 4: The total number of channels allocated to one user will form one group of channels. Therefore number of groups will be equal to the number of users. G = U

Step 5: For each group formed find out the required transmit power using ― (2), again given here for reference, P u g = βNoS-2

Where, S – Total number of subcarriers in gth group. P u g - The required transmit power for uth user on one channel of the gth group. β - Target threshold of

SNR. – u th user‟s channel fading on the sth subcarrier of the desired group, - u th user‟s frequency domain combining weight for the signal on the sth subcarrier of the desired group.

Step 6: Select the group with the lowest transmit power requirement. min{ P u g}

Step 7 : Allocate the channels within the selected group as given below,

Channel allocation

While C ≠0, t = argmin∀ g∈C{pugmin g } select the group with lowest power requirement c utmin

t = min(⌊Pr/Putmint⌋ ,S) calculate the available channel number

PR = PR – c utmin t putmin t

calculate the residual transmit power

C = C/{utmin }

If cutmin

t = 0 since the residual transmit power is not enough, terminate channel allocation. break the loop ,end if ,end while.

5. Results and discussion

The simulation results have proved a good performance of MC-DS-CDMA system; by the graphs of BER performance and throughput at maximum transmit power

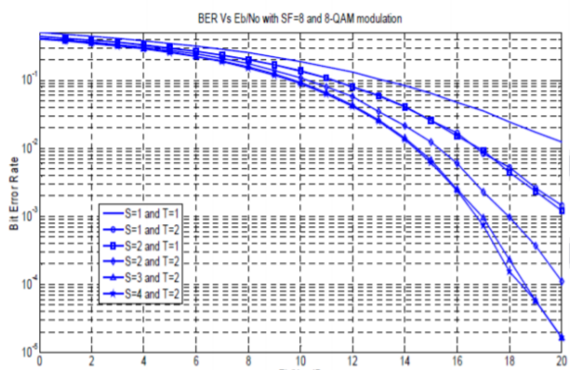

Fig 3. Bit error rate (BER) performance of the MC-DS-CDMA system.

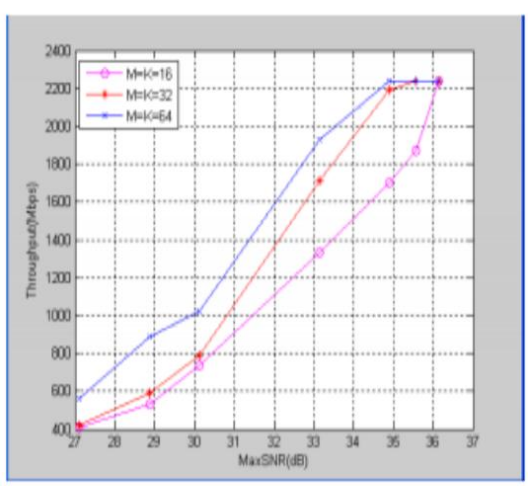

Fig 4.Throughput versus the maximum transmit power

6. Conclusion

The ASG resource allotment procedure is proposed for MCDS-CDMA frameworks in consistence with 4G LTE principles. The impedance blackout execution of the system is diminished by utilizing ASG and the total throughput and bundle delay is essentially improved contrasted and different schedulers utilized in LTE. The proposed system execution can be improved by compelling the nature of administration (QoS) of the dynamic clients. In MC-DS-CDMA versatile correspondence system stays as future investigation.

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