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EFFICIENT COOPERATIVE OF OFDMA OEC-MAC NETWORK

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Abstract— **Orthogonal Frequency Division Multiplexing (OFDM) or Multi-carrier Modulation (MCM) is a digital modulation technique that supports high-rate data with sufficient robustness to radio channel impairments (especially multi-path propagation). Due to that, it is emerging as the modulation technique used for the new generation of wireless communication systems (IEEE802.11a and DVB-T). However, one of the arguments against OFDM is that it is highly sensitive to synchronization errors. This raises up the need for optimum synchronization algorithms for OFDM applications such as IEEE802.11a and DVB-T. In this thesis several synchronization algorithms are presented. We focus on the implementation aspects of synchronization algorithms and propose optimizations which lead to well performing and robust fixed point implementations. In addition, complexity and cost needed for such a project are analyzed leading to a model for classifying different algorithms depending on cost, time-to-market, and performance.**

Keywords— Orthogonal Frequency Division Multiplexing, Digital Audio Broadcast, Intersymbol Interference,

I.INTRODUCTION

As high data-rate communication systems tend to play an increasing role in our daily life, more and more research is being done on them. The vast number of applications involving high data-rate systems made it essential to achieve the best possible performance with the lowest possible cost. Normally, these high data-rate systems suffer from the presence of multipath channels. This leads to the fact that the receiver is no longer able to distinguish the different symbols due to the delays occurring in each separate copy of the transmitted signal that arrives at the receiver. Thus complex equalizers are needed at the receiver end. A solution to that problem is the use of OFDM. OFDM stands for Orthogonal Frequency Division Multiplexing. It is a digital modulation technology used in many of the high data-rate systems such as DAB (Digital Audio Broadcast), DVB-T (Digital Video Broadcast - Terrestrial), high speed telephone line communication such as Xdsl (Digital Subscriber Line), and WLAN (Wireless Local Area Network). One OFDM symbol is a set of a large number of orthogonal waves. The transmission is divided into smaller sub-bands, each having a low separate rate and is insensitive to dispersive multipath channels. Thus complex equalizers are not needed and a lower complexity is accomplished. Intersymbol Interference (ISI) is avoided by introducing a guard interval between successive symbols. This is the price to be payed for simple receiver structures. Whereas OFDM solves the above mentioned problem, it introduces new problems itself. By using high numbers of narrow sub-carriers, the system becomes very sensitive to time and frequency offsets and thus a precise synchronization is needed.

II. LITERATURE SURVEY

A. Evaluation of Distributed Multi-User MIMO-OFDM with Limited Feedback

The technology used is CDMA receiving base station,M beamforming to handle M subscribers in a cell. Purpose is to find a weight vector that provides an appropriate beam pattern to each subscriber in a given cell/sector,the weight vector which is computed by the algorithm produces a suboptimal beam pattern that generates its maximum gain along the direction of the target user.The methodology used is to utilize lagrange formula,to compute weight vector of the array in iteractive manner,derived analytically the required condition on the adaptive gain for the algorithm to converge.The conclusion is it does not require training symbols,mathematically valid number of antenna elements and interfers,the signal coherence does not affect the performance or complexity of the proposed algorithm.

B. Performance of Wireless MC-CDMA System With Antenna Array in a Fading Channel:Reverse Link

The technology used is of reverse link,the problem being addressed is multi user interference and fading channel.The methodology used is of optimal beam former for the proposed MC-CDMA system is constructed using non-direction finding technique similar to the filtering technique,derived in the reverse link using preprocessing array covariance matrix and post processing covariance matrix.The

contribution is to propose a MC-CDMA system employing an antenna array sat the base station,and analyze the performance in fading channel.The key results are increase in system capacity as number of antenna elements increase.The conclusion is when the non-direction finding technique is used for antenna array in MC-CDMA and DS-CDMA,the performance of MC-CDMA is shown to be better than DS-CDMA ,confirmed by computer simulation that analytic formula approximate real situation when number of user is large and substantial increase in system capacity is possible by incorporating antenna array ay base station.

C. Beamforming in Combination with Space -Time Diversity for Broadband OFDM Systems

The problem being addressed is multi path fading problem.The proposed technique modifies the transmission signal in a way that the received signal can be detected more reliably by the receiver than in conventional technique.The negative impact of fading is minimized and therefore the needed transmission power is reduced,implicity minimizing the cell interference.The methodology used is simulation ,compare BER of different beamforming scenarios and CDD in Rayleigh fading channel,MRC also taken into account in performance analysis.The conclusion is in comparisons to conventional schemes with adaptive antennas,the novel approach alters the spectrum and error distribution at the receiver.

D. Existing System

OFDM has been recognised as a suitable candidate for cognitive radio systems. However, the high sidelobe leakage in OFDM systems can cause serious interference to primary users (PUs) operating in adjacent bands. The existing techniques are either computationally intensive or spectrally inefficient. Various sidelobe suppression techniques have been proposed. Many of them include windowing , Adaptive Symbol Transition (AST) , Active interference cancellation(AIC) , Cancellation carriers (CC) , Subcarrier weighting(SW), N-Continuous precoder , Least square notch precoder (LSNP) , Sidelobe Suppression with Orthogonal Projection (SSOP) , Mask Compliant Precoder Weighted-Least square notch precoder (WLSNP) , Orthogonal Precoder. Windowing is a conventional and computationally efficient scheme which extends the symbol in time domain for sidelobe suppression, but it reduces system throughput. Similar to Windowing, AST also extends the symbol in time domain, but the extension is data dependent which is evaluated by solving a nonlinear optimization problem, thus increases complexity.

III. PROPOSED SYSTEM

The existing schemes are not well balanced between complexity and EVM , so we propose a low complexity mask compliant precoder that provides spectrum minimizes error-vector-magnitude (EVM) of secondary user while constraining the transmitted waveform below the prescribed spectral mask. We also present a sub-optimal approach for solving the proposed problem which reduces both on-line as well as off-line complexity to the great extent. In addition to that we introduce a parameter namely “mask offset” to control the trade-off between complexity and EVM. The suitability of the proposed algorithm in multiple PUs having different mask requirements and multiple cognitive user scenario is also presented in this paper.

A. OFDM Systems

In OFDM systems, many narrowband signals are multiplexed in the frequency-domain, then converted to time-domain and transmitted over wireless channel. Pilot tones are inserted in the transmitted signal to estimate and equalize the wireless channel impulse response. In the receiver, signals are converted back to frequency-domain by Fast Fourier Transform (FFT) operation for demodulation. From the frequency-domain sig-nals, channel's frequency response is rst estimated and then equalized to remove the effect of the channel using pilot tones over a series of symbols at specific time/frequency locations.

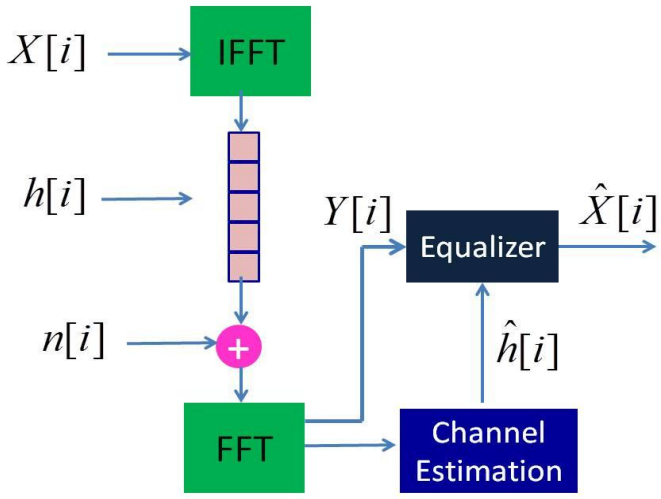

Fig.1 Adversarial Model

B. Roubstness of OFDM Systems

One of the key strengths of OFDM systems is its ability to handle multipath propagation. It is capable of combating multipath fading with greater robustness and less complexity. The inter-symbol interference (ISI) caused by multipath propagation is less of a problem with OFDM systems because

low data rates are carried by each carrier (also called subcarriers). Since the duration of each symbol is long, it is feasible to insert a guard interval (GI) between the symbols. Using a cyclic pre x (CP) greater than the coherence bandwidth during the GI ensures eliminating most ISI.

The OFDM systems, due to the avoidance of ISI, can easily adapt to severe channel conditions without the need for complex channel equalization algorithms being employed.

C. Interferences ON OFDM Systems

The current state of interferences on OFDM systems deployed as part of various wireless communications standards. The impact of these interferences on OFDM systems.The unwanted structured (or colored) signals are known as interferences. Interferences can be either intentional or unintentional. Only the unintentional interferences are referred as interferences, whereas the intentional interferences are termed as interference jamming attacks (or simply jamming attacks).

CORDIC Algorithm

This section provides an overview on the CORDIC (Coordinate Rotation Digital Computer) algorithm and how it is used in the fixed point implementation of the IEEE802.11a synchronizer. The cordic algorithm is usually used to compute trigonometric, hyperbolic and logarithmic functions. The basic principle of the cordic algorithm is to rotate a vector in particular steps. That is a complex valued vector $r = x + j \cdot y$ is rotated by the transform $r\_ = r \cdot ej\varphi$. The idea is to execute the rotation in N steps each with a predetermined angle φi, this angle decreases with every iteration i and is set so that $tan\varphi i = \pm 2-i$.

The advantage is that the multiplication with $2-i$ can be implemented by a single shift operation

Neural Network Toolbox Applications

It would be impossible to cover the total range of applications for which neural networks have provided outstanding solutions. This topic describe only a few of the applications in function fitting, pattern recognition, clustering, and time series analysis. The following table provides an idea of the diversity of applications for which neural networks provide state-of-the-art solutions.

Fuzzy Logic

Fuzzy logic tools are efficient in situations where characteristics of the system to be modeled are unknown or too difficult to predict using classical methods. Fuzzy techniques have been proved to be robust even when implemented on non invariant systems. Moreover, fuzzy techniques have been successfully combined with other types of computational intelligence methods. Fuzzy logic tools are integrated in end to end wireless transmission chains and to access their performance.

Fig.2 Simulation result

IV.CONCLUSION

Synchronization algorithms for IEEE802.11a WLAN and DVB-T systems was done. It included time and frequency synchronization. The implementation aspects were mostly investigated. The aim is an efficient fixed point implementation in SystemC of an IEEE802.11a synchronizer as well as a DVB-T synchronizer, which can lead to a high-level synthesis. Therefore, algorithmic optimizations in terms of complexity are done for the two applications (IEEE802.11a and DVB-T). In addition, some methods for estimating effort and manpower in projects are investigated, then tuned to be used for estimating effort in such projects. the OFDM technique is introduced as used in the IEEE802.11a standard and the DVB-T standard. In addition, the synchronization errors in both systems and the synchronization procedure are explained. This is the introduction to the other chapters in which the synchronization problem is investigated in more detail deals with the synchronization of the IEEE802.11a WLAN. Three different metrics are studied for an IEEE802.11a synchronizer. These are the MC, MNC and ML metrics. The MC metric has the drawback that it does not take into account the power of the signal. Therefore, setting a threshold for detecting the maximum of the metric signal in this case is very difficult due to the large variety of signals. This arises the idea of using the MNC metric where the power of the signal is used to normalize the metric signal. The MNC metric shows to perform very well. It is preferred over the ML metric due to some drawbacks of ML like false alarm in the burst mode transmission. In addition, the ML metric requires the estimation of the current *SNR* which

is not possible before estimating the time offset. On the other hand, the already calculated *psch* is outdated. Therefore, the MNC metric is chosen for the fixed point implementation. The correlator is a main block, therefore it is more optimized for an efficient implementation Three ways for implementing it are investigated. The basic implementation and two iterative methods using one or two multipliers respectively. The implementation using two multipliers is preferred on the other two due to complexity reasons.

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