INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

New Transmission Channel Scheme for MIMO-OFDM System

Shrikant G. Vaidya
Department of Computer and Wireless Communication & Computing Engineering
ABHA Gaikwad Patil College of Engineering, Nagpur University, India

Abstract:
In this paper, presentation on channel coding scheme for MIMOOFDM systems. Multiple-input Multiple-output (MIMO) combination with orthogonal frequency division multiplexing (MIMOOFDM) wireless technology is forming an attractive air-interface solution for wireless metropolitan area networks (WMANs), wireless local area networks (WLANs) and mobile cellular wireless system. It increases bit error rate (BER) performance and data rate. The new scheme is efficient for symmetric channels like radio beam transmission link between two antennas between or two base stations. The principle is based on the channel parameter of a pilot data send by the receiver to the transmitter. It adapts the signal to the channel variation which occupies by the transmitter code signal using estimation of channel parameters. In case of symmetric channel it compared to the conventional MIMOOFDM scheme has better complexity and bandwidth efficiency.

1. Introduction

MIMOOFDM technique increases link reliability with improved throughput and link reliability, it also increases spectral Efficiency. We want to use the MIMO concept for increasing capacity than we need to send the different MIMO antenna without the automatic transmission. It advantages of MIMO diversity to overcome the fading by using some signal through the no. of MIMO antenna will receive the same signals Alamouti space, time Block Coding (STBC) [5], Golden Space-Time Trellis Code (Golden STTC), The Fast Fourier Transform (FFT) algorithm and MIMO encoding , like the Vertical Bell-Labs layered Space Time Block Code VBLASTSTBC. Other implementation can be achieved for achieving the performance close to information theoretical limits by using the bit interleaves coded modulation (BICM). This BICM contain bit intralever and QAM symbol at the transmitter. There for combining BIC and STBC can help to achieving low frame error rate and high capacity over block fading channel. One major drawback of such scheme is that the detection complexity increases exponentially with the modulation spectral efficiency and the number of transmit antennas. This drawback can be controlled by using the STBC technique. OFDM use to convert the channel into flat fading due to multicarrier modulation technique such channel is achieving frequency selective flat fading channel [1]. So OFDM has been adapted in wireless fidelity (WIFI) Worldwide Interoperability for Microwave Access (WIMAX), Long Term Evolution (LTE), and Digital Video Broadcasting (DVB) In this new MIMOOFDM Model, the special channel coding estimated parameters from pilot data transmitted signal to the divers channel impairments and variations from the conventional MIMOOFDM scheme, we have removed the pilot extraction, the pilot insert, the MIMO decoder and the MIMO Encoder for reduce system complexity.

1.1. Proposed Walsh Block Coding Scheme

Orthogonal Walsh sequences possess inherent symmetry properties that can be exploited in the generation and decoding process. We use these sequences to produce a high performance and low complexity block coding scheme. Consider a sequence of bits (c1, c2, cN) at the input of the Walsh encoder at the transmitter. The encoding operation consists of using the following operation to choose one of 2N Walsh sequences:
PN = c1 (1)
PN-j = xor (cj, cj+1) (2)
Where j = 1, 2,N-1 and (p0, p1, …, pN) is the
Binary equivalent of an index in the Hadamard table of order 2N. The sequence corresponding to that index will be the output of the Walsh encoder. At the receiver, we exploit the symmetry properties of Walsh functions by using a fast Walsh transform (FWT) operation to decode the incoming sequence of length 2N. The operation can be summarized as follows:

- Correlate every group of bits of length 2k-1 with the reverse of the following group of length 2k-1, where k = 1,2,…, N.
- Take the sum of the correlation measures.
- Decide whether the majority symmetry is odd or even according to whether the sum is negative or positive, respectively.

- For odd symmetry, decide jk as 1. For even symmetry, decide jk as 0.

1.2. Brief Review of the VBLAST Algorithm

Consider the single carrier communication system. Let a = (a1, a2, aMT) T denote the vector of transmitted symbols where "T" stands for the transpose operation. The received signal vector for all MR receive antennas is given by

r1 = Ha + v (4)

Where H is the MR × MT (MT ≤ MR) matrix whose elements h,ji represents the complex transfer functions from transmit antenna i to the receive antenna j and v is the noise vector. As we mentioned before, VBLAST relies on SIC to detect the symbols. Therefore, for optimum performance, at each stage we choose the sub stream that gives the maximum post-detection SNR. Using zero-forcing (ZF) nulling, the VBLAST algorithm can be compactly described as initialization:

2. Conventional MIMO-OFDM System

The Conventional MIMOOFDM system is shown in the Figure 1.The proposed system consist of Two receiver and Two transmit antennae. Antenna signal obtained by Fast Fourier transform (FFT) [5]. Pilot sequence, Cycle prefix is inserted for channel estimation and the OFDM symbol modulation block. The Prefix is called the guard interval of the OFDM due to the function of the cyclic prefix is to guard the OFDM symbol against Inter Symbol Interference (ISI) The MIMO coding can use several encoders. The conventional MIMO-OFDM system is implemented using Alamouti STBC with two receives and two transmits antennas.

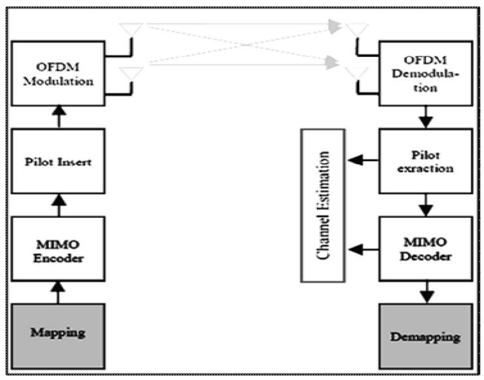

Figure 1: MIMO-OFDM System Model

3. New Transmission Model

The new transmission model is the transmission between microwave links, or radio beam transmission and two base stations, In this new MIMO-OFDM model, the channel parameters are estimated from a pilot data transmitted by the receiver end., the special channel coding estimated parameters from pilot data transmitted signal to the divers channel impairments and variations from the conventional MIMOOFDM scheme, we have removed the pilot extraction, the pilot insert, the MIMO decoder and the MIMO Encoder for reduce system complexity. The channel coding is based on the channel variations, it occurs due to two transmit antennae and two receive antennae the proposed MIMO-OFDM model is shown in the following figure 2.

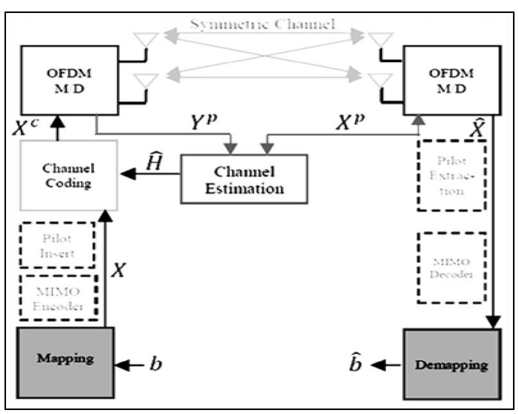

Figure 2: Proposed MIMO-OFDM System Model for Symmetric Channel

4. Simulation Results

The simulation Result parameters of proposed MIMO-OFDM transceiver system shown in Table these parameters are based on transmission between two base station systems. Table 1 represents the details of simulation parameters which are represented by authors of [6].

Parameters	Specifications
System	MIMO-OFDM
Constellation	17-QAM
Ts (μs)	63
Fc(GHz)	3.15
δf(KHz)	25
B(MHz)	6
Size of DFT/IDFT	612
MIMO encoder	Alamouti STBC (2Tx 2Rx

Table 1: Simulation Parameters

Figure 3 shown the Alamouti STBC coding for Bit Error Rate as a function of Signal to Noise Ratio. The new proposed scheme is compared with the conventional MIMOOFDM system in the case of symmetric channel based on Alamouti STBC coding [5] In addition, to the simplification of the conventional MIMO-OFDM transceiver structure, bandwidth efficiency can be highly increased. The proposed scheme has better performances than the standard MIMO-OFDM system. Besides the performance of this scheme, its complexity is low and there are no needs of complicate MIMO encoder or channel estimation at the reception.

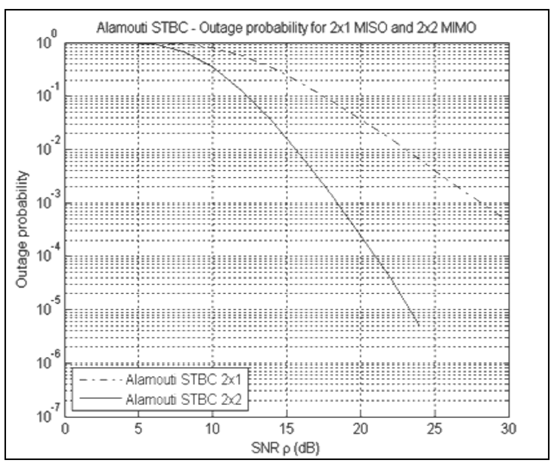

Figure 3: Alamouti STBC coding for Bit Error Rate as a function of Signal to Noise Ratio

5. Conclusion

The new transmission channel scheme Multiple Input Multiple Output (MIMO) Orthogonal Frequency Division Multiplexing (OFDM) systems. It compared to the conventional MIMOOFDM system using Alamouti STBC Coding. This scheme is based on channel coding using estimated channel parameters from a transmitted pilot data from the transmitter to the receiver end. The coding scheme will help the transmitted signal to adapt to the channel impairments and be more resilient to noise and interference. The Simulation results of the proposed scheme confirm the low complexity and the high performance

6. References

1. Jun Ma, Philip V. Orlik, Member, IEEE, Jinyun Zhang, Fellow, “Reduced-Rate OFDM Transmission for Inter-Sub channel Interference Self-Cancellation over High-Mobility Fading Channels” IEEE Transactions on wireless communication ,vol.11,no.6, June 2012
2. T.Y. Al-Naffouri,K.M.Z. Islam, N. Al-Dhahir, and S. Lu, “A modelreduction approach for OFDM channel estimation under high mobilitycondition.” IEEE Trans. Signal Process, vol.58, pp. 2181-2193, Apr.2010.l. 58, pp. 2181–2193, Apr.2010.
3. A. Stamoulis, S. Diggavi, and N. Al-Dhahir, “Intercarrier interference in MIMO OFDM,” IEEE Trans. Signal Process., vol. 50, pp. 2451–2464, Oct. 2002.
4. H. Hussein and R. Laurent, “Polynomial estimation of time-varying multipath gains with intercarrier interference mitigation in OFDM systems,”IEEE Trans. Veh. Technol., vol. 58, pp. 140–151, Jan. 2009.

5. S.M. Almouti “A simple transmite diversity technique for wirless communication,” IEEE J. Select Areas communication vol 16, pp. 1451-1458, oct 2010.
6. Z. J. Tang, R. C. Cannizzaro, G. Leus, and P.Banelli, “ Pilot-assisted Time –varying channel estimation for OFDM systems,” IEEE Trans. Signal Process., vol. 55, pp. 2226–2238, May 2007.
7. H. Senol, H. A. Cirpan, and E. Panayirci, “A low-complexity KL expansion-based channel estimator for OFDM systems,” EURASIP J. Wireless Communication. Network. vol. 2005, pp. 163–174, Feb. 2005.
8. P. W. Wolniansky, G. J. Foschini, G. D. Golden and R. A. Valenzuela, “V-BLAST: an architecture for realizing very high data rates over the rich-scattering wireless channel, ” IEEE International Symposium on Signals, Systems and Electronics (ISSSE), October 1998, page(s): 295 – 300.
9. J. Adeane, M. R. D. Rodrigues, I. Berenguer and I. J. Wassell, “Improved detection methods for MIMOOFDM CDM communication systems,” IEEE Vehicular Technology Conference (VTC), volume 3, September 2004, page(s): 1604 – 1608.
10. R. Trepkowski, Channel Estimation strategies for Coded MIMO Systems, M.A. Sc. thesis, Virginia Polytechnic and State University, June 2004