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A review article of signal to noise ratio using frequency division multiplexing PSO algorithm

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ABSTRACT

The demand for high-speed mobile wireless communications is growing at a very fast rate. PSO OFDM technology is a key technique for achieving the high data rate and spectral efficiency requirements for wireless communication systems. Frequency Division Multiplexing (PSO OFDM) [3–6] has emerged as a successful air-interface technique. The Frequency division Multiplexing was originally developed from the multi-carrier modulation techniques used in high-Frequency military radios. This thesis presents, a Simulink based simulation system is implemented using Particle swarm optimization (PSO) to study the performance analysis of Bit Error Rate (BER) vs. Signal to Noise ratio (SNR). The model of PSO OFDM with Rician fading channel using Simulink in MATLAB is discussed. This model is used for performance enhancement of the PSO OFDM with QPSK and QAM modulation schemes and channel condition. The throughput and packet error rate is used to evaluate the performance of the MAC layer with the change in the physical layer parameter. The performance analysis of different technologies used in the QAM PSO OFDM is compared by visualizing the BER vs. SNR curve.

Keywords— PSO OFDM (Frequency division multiplexing), QAM, PSO

1. INTRODUCTION

Increasing in telecommunications services that demand large amounts of bandwidth. Services such as interactive multimedia, video conferencing and streaming audio have made the capacity of the existing optical fiber systems insufficient. To increase this capacity, time division multiplexing (TDM) has been used traditionally. However, TDM has a few drawbacks. The important is that the existing electronic technology allows multiplexing only up to about 10 Gb/s. Thus; an alternative optical multiplexing technique that avoids the 10 Gb/s electronic bottleneck is very attractive. PSO OFDM is one such promising technique that can be used to exploit the huge available bandwidth of the optical fiber.

In PSO OFDM, the optical transmission spectrum is divided into a number of no overlapping Frequency bands, with each Frequency supporting a single communication channel operating at peak electronic speed. Thus, by allowing multiple PSO OFDM channels to coexist on a single fiber, the huge bandwidth can be tapped into. PSO OFDM is a technique for simultaneous transmission of two or more optical signals on the same fiber. The signals from different sources are combined by a multiplexer and fed into an optical fiber which is the transmission medium. At the receiving end, different signals are separated by a de-multiplexer and detected by photodetectors. The PSO OFDM scheme increases the transmission capacity of optical communication systems considerably. The two configurations of PSO OFDM systems that are possible are the one-way and the two-way (bidirectional optical fiber) transmission systems as illustrated in figure 1, while the one-way system requires only one receiver or one transmitter per channel at each end, the two-way system requires both receiver and transmitter at each end of every channel. Optical multiplexers and de-multiplexers may be classified into Frequency selective and Frequency nonselective devices. The Frequency selective devices are either active or passive. The active devices are implemented using multi-Frequency light Sources or multi-Frequency photodiodes [5].

2. DIGITAL MODULATION TECHNIQUE

The basic concept behind digital modulation is to identify efficient schemes taking M different symbols in a given digital alphabet and transforming them into waveforms that can successfully transmit the data over the transmission channel. There are three basic types of modulation schemes which are followed as

1. Frequency shift keying (FSK)
2. Amplitude shift keying (ASK)
3. Phase-shift keying (PSK)

This will be described in this thesis one by one.

2.1 Amplitude shift keying (ASK)
Amplitude-shift keying (ASK) is a form of modulation that represents digital data as variations in the amplitude of a carrier wave. The level of amplitude can be used to represent binary logic 0s and 1s.

2.2 Binary FSK Signal and Modulator
In binary Frequency shift keying (BFSK), the Frequency of a constant amplitude carrier signal is switched between two values according to the two possible message states, corresponding to a binary 1 or 0.

2.3 Binary Phase Shift Keying (BPSK)
Binary Phase Shift Keying (BPSK) modulation is a special case of the general *M*ary phase shift keying with $M = 2$. In particular, the binary data selects one of the two opposite phases of the carrier

2.4 QPSK (Quadrature Phase Shift Keying)
QPSK is the type of phase shift keying. Unlike BPSK which is a DSBCS modulation scheme with digital information for the message, QPSK is also a DSBCS modulation scheme but it sends two bits of digital information a time (without the use of another carrier frequency). The amount of radio frequency spectrum required to transmit QPSK reliably is half that required for BPSK signals, which in turn makes room for more users on the channel. Quadrature phase shift keying (QPSK) is another modulation technique, and it's a particularly interesting one because it actually transmits two bits per symbol. In other words, a QPSK symbol doesn't represent 0 or 1—it represents 00, 01, 10, or 11. This two-bits-per-symbol performance is possible because the carrier variations are not limited to two states. In ASK, for example, the carrier amplitude is either amplitude option A (representing a 1) or amplitude option B (representing a 0). In QPSK, the carrier varies in terms of phase, not frequency, and there are *four* possible phase shifts.

3. ISSUES OF OLD ARTICLES

Angel David Torres Palencia:"Linear Effects present in a system of radio over optical fiber using Frequency division multiplexing"Because of the large bandwidth that the optical fiber offers as transmission medium of information and the flexibility of communication of the wireless systems, a new mixed infrastructure called radio over fiber system (Radio over Fiber, RoF) have been developed, these have been characterized for implementing division multiplexing Frequency (PSO OFDM) and these work with radio carrier signals in the band of extremely high frequencies (extremely high frequency, EHF.)

T.P. Surekha, T. Ananthapadmanabha, C. Puttamadappa: Members, IEEE, Modeling and Simulation can play an important role during all phases of the design and engineering of communication systems. Frequency division multiplexing (PSO OFDM) was originally developed from the multi-carrier modulation techniques used in high-Frequency Military radios. BER curve with Model simulation is compared with the BER Tool curve. BER Tool is a Graphical User Interface (GUI) for analyzing bit error - rate statistics of a communication model. BER Tool helps us to generate and analyze the BER data for a given system with the theoretical plot [1].

Sai Krishna Borra; Suman Krishna Chaparala: A Frequency Division Multiplexing (PSO OFDM) scheme offers high spectral efficiency and better resistance to fading environments. In PSO OFDM the data is modulated using multiple numbers of sub-carriers that are orthogonal to each other because of which the problems associated with other modulation schemes such as Inter-Symbol Interference (ISI) and Inter-Carrier Interference (ICI) are reduced. This paper deals with the analysis of PSO OFDM System utilizing different modulation techniques (QAM and BPSK) over Rayleigh, Rician and Additive White Gaussian Noise (PSO) fading environments with the use of pilot-aided arrangement and finally the results are conveyed.

In this paper, we compare the performance in terms of BER using different modulation schemes on Rayleigh, Rician and PSO Channel. This system model that is presented in this paper uses BPSK and 16-QAM as sub-carrier modulation technique

Ashutosh Kumar Mishra, Rashmi Pandey: This review work based on the Performance analysis of OAM-PSO OFDM system in PSO Channel. In Digital communication system with multicarrier modulation technique can play a very important role in all phase of designing and engineering. In this work, we discuss the performance analysis of 16QAM-PSO OFDM system. We compare the performance analysis of different technique used in the 16 QAM PSO OFDM and discuss the BER vs SNR Ratio.
In the previous work which was discussed in the literature review shows that there is a need for improvement in the system in terms of Noise level. If Noise level will the BER should be decreased so that in higher level QAM will be implemented at higher noise level such as 32 QAM, 64 QAM as so on. The recent advancement has improved the bit error rate some extent but the system that analyzed for more no of carriers that decreased the ISI and ISF using deferent technique [3].

K. Shamganth and M. P. Reena: Increasing demand for high-performance 4G broadband wireless is enabled by the use of multiple antennas at both transmitter and receiver ends. Multiple antenna technologies enable high capacities suited for Internet and multimedia services, and also dramatically increase range and reliability. The combination of multiple-input-multiple-output (MIMO) signal processing with Frequency division multiplexing (PSO OFDM) is regarded as a promising solution for enhancing the data rates of next-generation wireless communication systems operating in Frequency selective fading environments. In this paper, we focus mainly on Internet users in hotspots like Airport etc. requiring high data rate services. A high data rate WLAN system design is proposed using MIMO-PSO OFDM. In the proposed WLAN system, IEEE 802.11a standard design is adopted but the results prove a data rate enhancement from the conventional IEEE 802.11a.

In this paper, a high data rate WLAN system design is proposed using MIMO-PSO OFDM, in which IEEE 802.11a standard design is adopted and the results prove a data rate enhancement from the conventional IEEE802.11a.Shao-Hua Chu, Hsin -Piao Lin and Ding - Bing Linin their paper explorer about excess delay spread and inter-symbol interference problems in indoor radio propagation channel, the performance of WLAN is also evaluated using Frequency selective fading channel. In their paper, they had used Monte-Carlo simulation based on the IEEE 802.11a physical layer specification. The paper analyzes the performance of using the Ommiad switch-beam antenna in a real office indoor environment. Compared with using Omni antenna, the simulation results show that utilizing switch-beam antenna in AP the BER performance improve about 2dB in light-of-sight (LOS) case, and 6dB in non – light – of–sight (NLOS) case [4].

Mehdi Ahmadi, Ehsan Rohani, Pooya Monshizadeh Naeeni and Sied Mehdi Fakhraie: IEEE 802.22, also called Wireless Regional Area Network (WRAN), is the newest wireless standard being developed for remote and rural areas. In this paper, an overview of the standard and more specifically its PHY layer is introduced. In order to evaluate the performance of the system, we model the PHY layer in MATLAB/SIMULINK and extract the Bit Error Rate (BER) of the system for different code rates and modulation schemes with the noisy channel.

4. SIMULATION AND EXPECTED RESULTS

Simulink, developed by the Mathworks, is a tool for multi-domain simulation and Model-based design for dynamic and communication systems. Communication block set of Simulink is helpful in simulating the modeling. The simulation model of 16 QAM- PSO OFDM is the input data bits are mapped onto corresponding QAM symbols using grey coding which the Constellation diagram for the 16-QAM system. Where binary words are assigned to adjacent symbol states and differ by only one digit. The complex modulation scheme is best viewed using a scatter diagram. The scatter diagram allows us to visualize the real and imaginary (in-phase and quadrature) components of the complex signal.

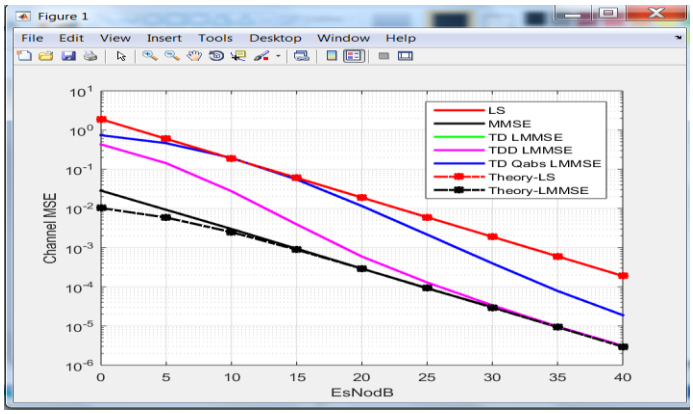

Fig. 1: Channel MSE and E/N Plot

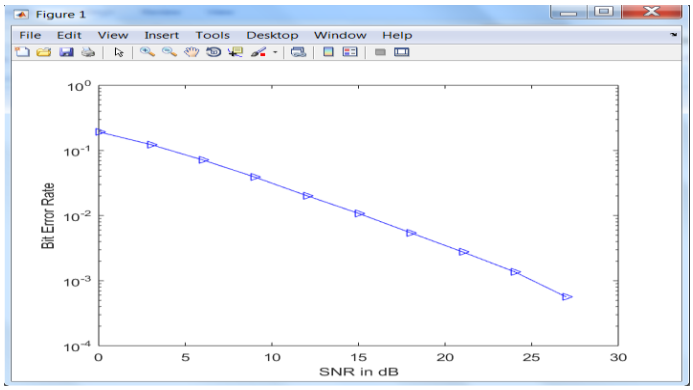

Fig. 2: BER and SNR channel error reduction

5. CONCLUSION AND FUTURE SCOPE

In the previous work which was discussed in literature review shows that there is a need for improvement in the system in terms of Noise level .as we have seen the results of base paper in terms of simulation model (Fig4.19) and the graph of BER Vs E_b/N_o (Fig4.20), our modified work has enhanced the performance of the newly designed simulation model. Higher level QAM is implemented by which the noise level is decreased. To compare the performance in terms of BER & Packet error Vs. Doppler shift using different modulation schemes on PSO Channel and Rician Channel, This system model that is presented in this thesis QAM-PSO OFDM in this system model we adopted PSO OFDM, which is advantageous and so shows the better performance.

Table 1: Parameters

K value	Allow of SNR
K=1	0.010
K=10	0.015
K=100	0.045

The simulation results are provided and from which we can evidently conclude that the QAM gives better performance under PSO and Rician Channel compared to other modulation schemes and channels. Performance of the system is analyzed under different K factors with different FEC techniques. Simulation results show satisfactory results in terms of better BER values. The throughput and packet error is used to evaluate the performance of the model with different k factor parameter. The performance of MAC Layer is improved with the change in the physical layer parameter.

6. FUTURE SCOPE

A lot of works can be done for future optimization of Wireless communication especially in PSO OFDM system.

- This work can be extended to increase the performance of the QAM-PSO OFDM system by using the other channel types and other variants of the convolution encoder (2/3, 3/4).
- Furthermore, work can be carried out by using the Power line communication system as the channel. The transfer characteristic performance analysis of the channel is worth being invested.
- Another implementation can be studied by using the pilot-based channel. The performances and properties can be tested and verified.
- MIMO is the emerging field these days. MIMO-PSO OFDM has become a research hotpot in the world.

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