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Energy-Efficiency Optimization for MIMO-OFDM Mobile Multimedia Communication Systems with QoS Constraints

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ABSTRACT

Wireless communication is the fastest growing segment of the communications industry. As such, it has captured the attention of the media and the imagination of the public. Cellular systems have experienced exponential growth over the last decade and there are currently around two billion users worldwide. Indeed, cellular phones have become a critical business tool and part of everyday life in most developed countries, and are rapidly supplanting antiquated wire line systems in many developing countries. In addition, wireless local area networks currently supplement or replace wired networks in many homes, businesses, and campuses. Many new applications, including wireless sensor networks, automated highways and factories, smart homes and appliances, and remote telemedicine, are emerging from research ideas to concrete systems. The mobile multimedia communication system is rapid development in the recent years. The main parameter is energy efficiency optimization and quality of service constraint for Multiple Input and Multiple Output(MIMO-OFDM)communication. The various algorithm to be minimize the energy level for the transmitted signal. But it have some limitation. So Energy efficiency optimized power allocation (EEOPA) algorithm is proposed to improve the energy efficiency for MIMO-OFDM mobile multimedia communication system. The EEOPA algorithm used to solve the problem of multi-channel optimize to multi target in single channel optimization. The method to calculate the channel characteristics using singular variable decomposition method (SVD).

An energy-efficiency model is first proposed for MIMO-OFDM communication systems with statistical QoS constraints. By using (SVD) method, to view their channel characteristics. Furthermore, the optimization problem is in solved by grouping all sub channels. Therefore, a solution is derived for MIMO-OFDM systems.

INTRODUCTION

The gap between current and emerging systems and the vision for future wireless applications indicates that much work remains to be done to make this vision a reality. Based on the probability density function(pdf) and the cumulative density function(cdf) of the maximum eigenvalue of double-correlated complex Wishart matrices, the exact expressions for the pdf of the output SNR were derived for MIMO maximal ratio combining (MRC) communication systems with Rayleigh fading channels. The closed-form expressions for the outage probability of MIMO-MRC communication systems with Rician fading channels were derived under the condition of the largest eigenvalue distribution of central complex Wishart matrices in the non-central case. Furthermore, the closed-form expressions for the outage probability of MIMO-MRC communication systems with and without co channel interference were derived by using cdfs of a Wishart matrix. Meanwhile, the pdf of the smallest eigenvalue of a Wishart matrix was applied to select antennas to improve the capacity of MIMO communication systems. However, most existing studies mainly worked on the joint pdf of eigenvalues of a Wishart matrix to measure the channel performance for MIMO communication systems. In this paper, sub channels' gains derived from the marginal probability distribution of a Wishart matrix is investigated to implement energy-efficiency optimization in MIMO-OFDM mobile multimedia communication systems.

In conventional mobile multimedia communication systems, many studies have been carried out. In terms of the corresponding QoS demand of different throughput levels in MIMO communication systems, an effective antenna assignment scheme and an access control scheme were proposed. A downlink QoS evaluation scheme was proposed from the viewpoint of mobile users in orthogonal frequency-division multiple-access (OFDMA) wireless cellular networks.

Address for correspondence:

LITERATURE SURVEY

C.-X. Wang el[8] explain Accurate and efficient simulation of multiple uncorrelated Rayleigh fading waveforms in various local minima lead to various disjoint sets of discrete frequencies. Its derivatives are of deterministic nature, which has the advantage of simulation efficiency, they still retain some undesirable properties. The drawback with the above selection is that very large values have to be chosen. This greatly the complexity of our channel simulator, when uncorrelated Rayleigh processes are simulated.

L. Xiang el[9] explains Energy efficiency evaluation of cellular networks based on spatial distributions of traffic load is that the largest amount of traffic load while satisfying the required quality of service (QoS) using limited radio resources. The required total transmission power exhibits a significant degree of bustiness, indicating higher demand for large transmission power to support self-similar traffic load. The drawback is convex optimization problem and a set of link parameters were derived to maximize energy efficiency under given QoS constraints. This problem, energy is also an important type of radio resource, except that the objective now becomes to minimize energy Consumption per traffic bit, for energy efficiency.

I. Ku el [12] explains Spectral-energy efficiency tradeoff in relay-aided cellular networks using Hadamard's inequality. This proved that MIMO-MRC achieves the maximum available spatial diversity order in double-correlated channels. The drawback in uncorrelated Rayleigh fading was considered, and the output SNR statistical properties were derived based on maximum eigenvalue statistics of complex central Wishart matrices. In uncorrelated Rician channels were characterized using maximum eigenvalue properties of complex non central Wishart matrices

EXISTING SYSTEM

The QoS statistical exponent is fixed as the impact of the average power constraint on the energy efficiency and the effective capacity of MIMO-OFDM mobile multimedia communication systems. The energy efficiency decreases with the increase in the average power constraint, and the effective capacity increases with the increase in the average power constraint. An average transmission power constraint is configured for each sub channel; thus, the transmission power allocation threshold of each sub channel should satisfy the subsequent constraint.

This result implies that there is an optimization tradeoff between the energy efficiency and effective capacity in MIMO-OFDM mobile multimedia communication systems: As the transmission power increases, which leads to larger effective capacity, the energy consumption of the system also rises; therefore, the larger power input results in the decline of energy efficiency. The drawback in the existing system is that the multichannel joint optimization problem in conventional MIMO-OFDM communication systems is transformed into a multi target single-channel optimization problem by grouping all sub channels. To improve energy efficiency with a QoS constraint is an indispensable problem in MIMO-OFDM mobile multimedia communication systems. There has been few research works addressing the problem of optimizing the energy efficiency under different QoS constraints in MIMO-OFDM mobile multimedia communication systems. The sub channels in different groups, which simplifies the multichannel optimization problem to a multi target single channel optimization problem.

PROPOSED SYSTEM

Based on the Wishart matrix theory numerous channel models have been proposed in the literature for MIMO communication systems. In conventional mobile multimedia communication systems, many studies have been carried out in terms of the corresponding QoS demand of different throughput levels in MIMO communication systems, an effective antenna assignment scheme and an access control scheme were proposed. A downlink QoS evaluation scheme was proposed from the viewpoint of mobile users in orthogonal frequency-division multiple-access (OFDMA) wireless cellular networks. On the effective capacity of the block fading channel model, a QoS driven power and rate adaptation scheme over wireless links was proposed for mobile wireless networks. Furthermore, by integrating information theory with the effective capacity, some QoS-driven power and rate adaptation schemes were proposed for diversity and multiplexing systems. Simulation results showed that multichannel communication systems can achieve both high throughput and stringent QoS at the same time. Aiming at optimizing the energy consumption, the key tradeoffs between energy efficiency and link-level QoS metrics were analyzed in different wireless communication scenarios. On the effective capacity of the block fading channel model, a QoS driven power and rate adaptation scheme over wireless links was proposed for mobile wireless networks. Furthermore, by integrating information theory with the effective capacity, some QoS-driven power and rate adaptation schemes were proposed for diversity and multiplexing systems.

The performance of high spectral efficiency MIMO communication systems with multiple phase-shift keying signals in a flat Rayleigh fading environment was investigated in terms of symbol error probabilities. Simulation results showed that multichannel communication systems can achieve both high throughput and stringent QoS at the same time. This happens because the larger values of θ correspond to the higher QoS requirements, which result in a smaller number of sub channels being selected to satisfy the higher QoS requirements. The flow diagram is shown in fig1

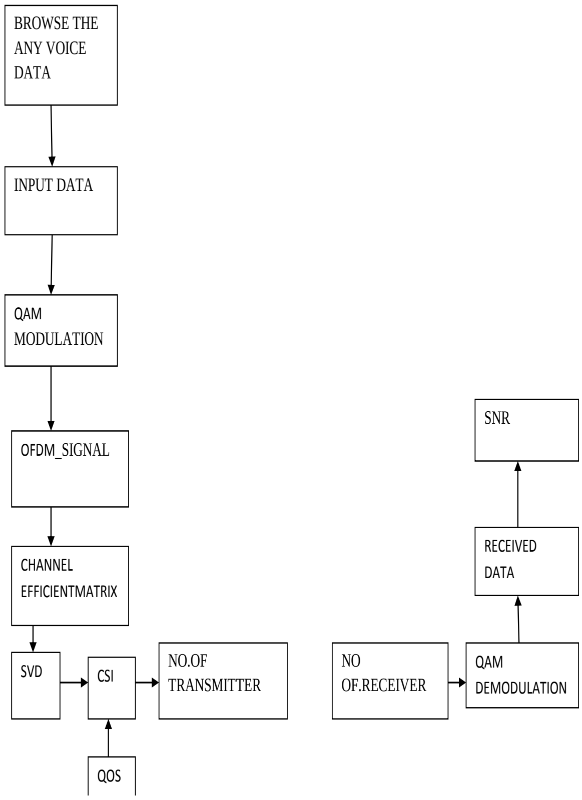

Fig1. *Flow diagram of MIMO-OFDM*

ALGORITHM DESIGN

The core idea of Energy-efficiency optimized power-allocation algorithm (EEOPA) with statistical QoS constraints for MIMO-OFDM mobile multimedia communication systems is described as follows. First, the SVD method is applied for the channel matrix Hk, k = 1, 2, . . . , N , at each orthogonal subcarrier to obtain M × N parallel space–frequency sub-channels. Second, sub-channels at each subcarrier are pushed into a sub-channel gain set, where sub-channels are sorted by the sub-channel gain in descending order, and then, the sub-channels with the same order position in the sub-channel gain set are selected into the same group. Since the sub-channels within the same group have the identical pdf, the transmission power-allocation threshold for the sub-channels within the same group is identical. Therefore, the optimized transmission power allocation for the grouped sub-channels is implemented to improve the energy efficiency of MIMO-OFDM mobile multimedia

Algorithm 1 EEOPA.

Input: M_t, M_r, N ,H_k, $\bar{P}$, B, T_f , θ;

Initialization: Decompose the MIMO-OFDM channel ma-trixH_k (k = 1, 2, . . . , N) into M × N space–frequency sub-channels through the SVD method.

Begin:

1) Sort sub-channel gains of each subcarrier in decreasing order as follows:

$\lambda_{1,k} \geq \lambda_{2,k} \geq \bullet\bullet \geq \lambda_{M,k}$ (k = 1, 2, . . . , N). (1)

2) Assign $\lambda_{n,1}, \lambda_{n,2}, \ldots, \lambda_{n,N}$ from all N subcarriers into the nth-group sub-channel set as follows:

Group_n = $\{\lambda_{n,1}, \lambda_{n,2}, ,\lambda_{n,N}\}$, n = 1, 2, , M. (2)

3) for n = 1 : M do

Calculate the optimized transmission power-allocation threshold Λn for Group_n

according to the average power constraint as follows:

$$\int_{\Lambda_n}^{\infty}\left(\frac{1}{\Lambda_n^{\frac{1}{\beta+1}}\lambda^{\frac{\beta}{\beta+1}}}-\frac{1}{\lambda}\right)P\Gamma_{m,k}(\lambda)d\lambda \leq \bar{P} \quad (3)$$

Execute the optimized transmission power-allocation policy for Group_n as follows:

$$\mu_{opt\_n}(\theta,\lambda)=\begin{cases}\frac{1}{\Lambda_n^{\frac{1}{\beta+1}}\lambda^{\frac{\beta}{\beta+1}}}-\frac{1}{\lambda} & ,\lambda \geq \Lambda_n\\ 0 & ,\lambda < \Lambda_n\end{cases} \quad (4)$$

Calculate the optimized effective capacity for Group_n: as follows:

$$C_e(\theta)_{\text{opt\_n}} = -\frac{N}{\theta}\log\left(\int_0^{\infty} e^{-\theta T_f B \log_2(1+\mu_{\text{opt\_n}}(\theta,\lambda)\lambda)} p_{\Gamma_n}(\lambda)d\lambda\right) \quad (5)$$

4) Calculate the optimized energy efficiency of the MIMO-OFDM mobile multimedia communication system as follows:

$$\eta_{\text{opt}} = -\frac{1}{\theta \times \overline{P} \times M}\sum_{n=1}^{M}\log \times \left(\int_0^{\infty} e^{-\theta T_f B \log_2(1+\mu_{\text{opt\_n}}(\theta,\lambda)\lambda)} p_{\Gamma_n}(\lambda)d\lambda\right) \quad (6)$$

SIMULATION RESULTS

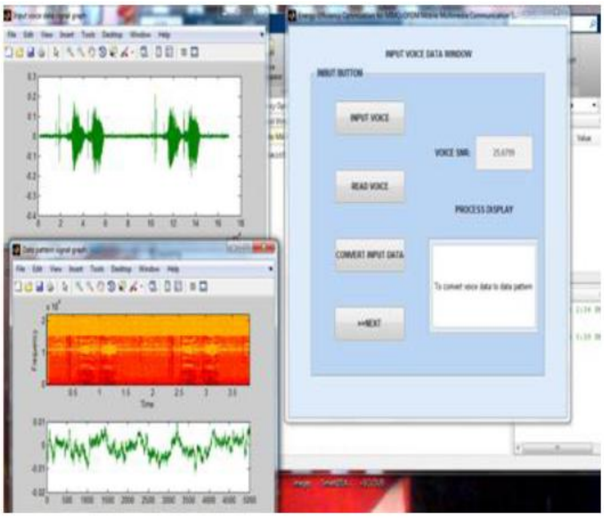

Fig. *GUI Screen for the input audio signal*

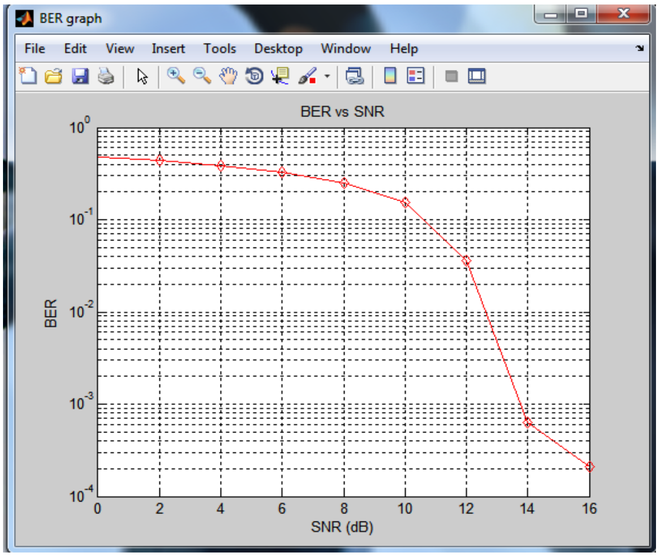

Fig. *Signal to noise ratio to BER*

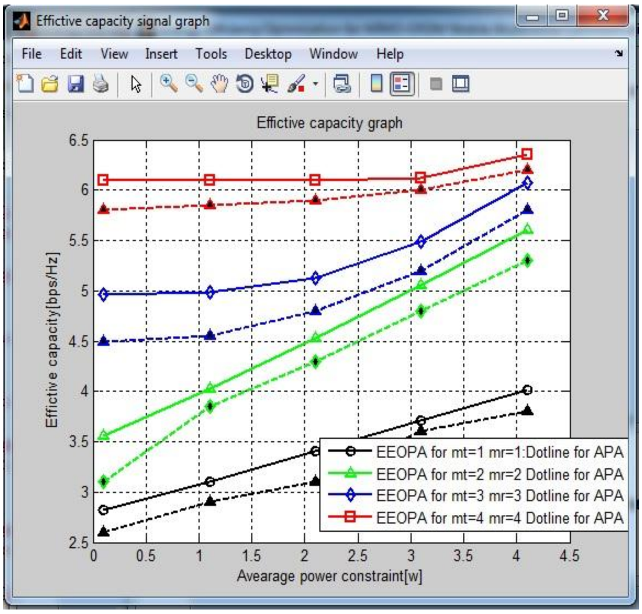

Fig. *Comparison effective capacity to power*

Table. *Comparison of EEOPA Vs APA*

Effective Capacity for	Average Power Constraint for		
	P=1	P=2	P=3
EEOPA(mt=1, mr=1)	3.107	3.403	3.706
APA (mt=1, mr=1)	2.9	3.1	3.6
EEOPA(mt=2, mr=2)	4.031	4.83	5.055
APA (mt=2, mr=2)	3.85	4.3	4.8
EEOPA(mt=3, mr=3)	4.98	5.126	5.48
APA (mt=3, mr=3)	4.55	4.8	5.2
EEOPA(mt=4, mr=4)	6.10	6.102	6.126
APA (mt=4, mr=4)	5.85	5.9	5.6

CONCLUSION

In this paper, an energy-efficiency model is proposed for MIMO-OFDM mobile multimedia communication systems with statistical QoS constraints. An energy-efficiency optimization scheme is presented based on the sub-channel grouping method, in which the complex multichannel joint optimization problem is simplified into a multi target single-channel optimization problem. A closed-form solution of the energy-efficiency optimization is derived for MIMO-OFDM mobile multimedia communication systems. Moreover, a novel algorithm, i.e., EEOPA, is designed to improve the energy efficiency of MIMO-OFDM mobile multimedia communication systems. Compared with the traditional APA algorithm, simulation results demonstrate that our proposed algorithm has advantages on improving the energy efficiency and effective capacity of MIMO-OFDM mobile multimedia communication systems with QoS constraints.

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