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Spectrum Handoff and Power Adaptaion in MIMO-Mobile CRN

N.V.Jagadeesh Babu[1], K.Aparna[2]
Master of technology[1], Assistant Professor[2]
JNTUA college of Engineering Pulivendula Andhrapradesh India

Abstract:
Multiple Input and Multiple Output (MIMO) and Orthogonal Frequency Division Multiplexing (OFDM) system have the potential to achieve a very high capacity relaying on the propagation environment. The main objective of this paper is to allocate resources on MOBILE-CRN using the adaptive resources allocation in MIMOOFDM system by using the water filling algorithm. Water filling solution is implemented to allocate power in order to decrease channel capacity for power consumption. A MOBILE -CRN-Advanced cooperative cellular network where a Type II relay station (RS) is deployed to boost the cell-edge throughput and extend the coverage area. To better exploit the existing resources, the RS and eNodeB (eNB) transmits in same channel (In-Band) with decode-and-forward relaying strategy. For such a type of network, in this paper we propose a joint Orthogonal Frequency Division Multiplexing (OFDM) subcarrier and power allocation schemes to optimize downlink multi-user transmission efficiency.

Keywords: MISO, MIMO, MOBILE-CRN, WATERFILLING.

I. INTRODUCTION

MOBILE-CRN (Cognitive Radio Networks) is the latest mobile communications technology responding to the high demand to broadband data access. Based on MIMO-OFDMA technology, MOBILE -CRN Downlink system gives 100 Mbps (SISO), 172 Mbps (2x2 MIMO), 326 Mbps (4x4 MIMO). The performance evaluation of MIMO-OFDM systems relays on many parameters. The channel estimation plays main role in performance of MIMO-OFDM systems. It has attracted a lot of research interest as in [1]. Most of these research works assume that the power wants to be allocated equal to base station users, So that they need to enhance power allocation by using bit allocation, channel estimation, block coding & pre-coding on Spatial diversity functions. In this paper, we probed the performance of power allocation for a Cooperative Communication node which is far from the near base station. The Cooperative Communication node which is far away from the PU may not perform spectrum sensing with extended efficiency due to fading in channel and may create interference to PU. In this condition, to improve the power allocation efficiency, we propose cooperative network which is based on relay nodes. The performance has been investigated in terms of capacity, throughput and optimal throughput and optimal sensing time. The probability of detection could be improved by cooperative communication, which in turn reduces the power allocation of system.

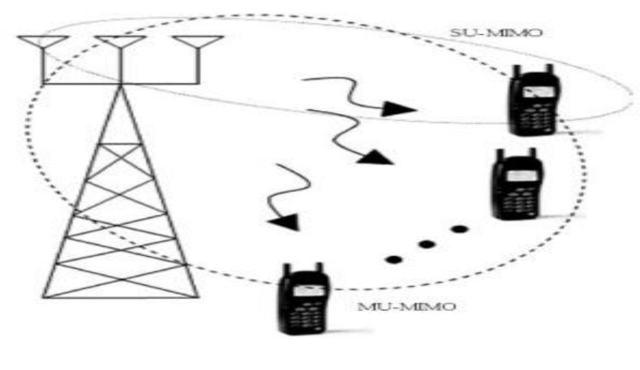

Figure.1. Mimo

If sensing time reduces, the transmission time Cooperative Communication maximises which results in improvement of throughput of CR user [2]. Hence we highlight major contributions of our paper we have scrutinized the power allocation of a MIMO in the proposed model with respect to number of users and capacity consumption on MIMO Using Water filling process.

II. EXISTING METHOD ANALYSIS

In a multiuser OFDM or MIMO-OFDM system, dynamic resource allocation always exploits multiuser diversity gain to improve system performance and it is divided into two types of optimisation problems: 1) To maximise the system throughput with total transmission power constraint ; 2) To minimise the overall transmit power with constraints on data rates or Bit Error Rates (BER). To the best of our knowledge, most dynamic resource allocation algorithms, however only consider the unit cast multiuser OFDM systems. In wireless networks, many multimedia applications comply to multicast transmission from the base station (BS) to group of users. These targeted users consist of a multicast group which receives the data packets of same traffic flow. The simultaneous achievable transmission rates to these users were investigated. Recently the scientific researches of multicast transmission in the wireless networks have been paid more attention.

Effects of Location Awareness on Simultaneous Transmissions for Cognitive Ad Hoc Networks Overlaying Infrastructure-Based Systems

Through wide-band spectrum sensing, cognitive radio (CR) identifies the opportunity of reusing frequency spectrum of other wireless systems [3]. However, wide-band spectrum sensing requires energy consumption processes. In this paper, we are aiming to relieve the burden of spectrum scanning in a CR system with the help of location awareness. We investigate what extent a CR system with location awareness capability can establish a scanning-free region where peer-to-peer connection of the secondary CR users can coexist with an infrastructure-based connection of primary user. We compute concurrent transmission probability of a peer-to-peer connection and an infrastructure-based connection in a system based upon the carrier sense multiple access with collision avoidance (CSMA/CA) medium access control (MAC) protocol. It has been shown that frequency band of the legacy system can be reused up to 45% by overlaying cognitive adhoc network if certain location techniques help CR users locate primary and other secondary users. In summary, a Cognitive Radio system equipped with location awareness techniques can dramatically reduce the need of spectrum sensing thanks to capability of identifying the concurrent transmission region in a hybrid infrastructure-based and adhoc overlaying systems. Hence, from another aspect, the issue of wide-band spectrum sensing in CR systems is resolved fundamentally.

Proactive Spectrum Handoff in Cognitive Radio Ad Hoc Networks Based on Common Hopping Coordination

Cognitive radio (CR) is a promising solution which improves the spectrum utilization by enabling unlicensed users to exploits the spectrum in an opportunistic manner. However, because unlicensed users are considered as temporary visitors to the licensed spectrum, they required to vacate the spectrum when a licensed user reuses the current spectrum. Due to the randomness of reappearance of licensed users, disruptions to both licensed and unlicensed communications are difficult to prevent, which leads to a high spectrum switching overhead. In this work, a proactive spectrum handoff framework in a CR adhoc network scenario is proposed [4]. Based on channel usage statistics, proactive spectrum handoff criteria and policies are devised. CR users proactively predict the future spectrum availability status and perform spectrum switching before a licensed user again reuses the spectrum. In addition, a channel coordination scheme is investigated and incorporated into the spectrum handoff protocol design. To eliminate collisions among CR users, a novel distributed channel selection scheme in a multi-user scenario is proposed. Simulation results show that the proposed proactive spectrum handoff protocol outperforms the conventional sensing-based reactive spectrum handoff approach in terms of higher throughput and fewer collisions to licensed users. It is also shown that the proposed channel selection scheme outperforms the purely random channel selection scheme in terms of shorter average service time and higher packet delivery rate.

III. PROPOSED SYSTEM MODEL

In this section, we elaborate on the system model of the multiuser fixed relay system. First we describe the system block diagram and main assumptions of the system, and then we present the downlink signal model.

MIMO System:-Where there is more than one antenna at either end of the radio link, this is termed MIMO - Multiple Input Multiple Output. MIMO can be used to provide improvements in both channel robustness as well as channel throughput.

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Cmimo (M) = Cmimo (M) + log2 (real (det (eye (M) +
SNR/M*Hmimo*Hmimo')));
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Figure.2. Tx and Rx

In order to be able to benefit from MIMO fully it is necessary to be able to utilise coding on the channels to separate the data from different paths. This requires processing, but provides additional channel robustness / data throughput capacity.

Power Allocation on MIMO Using Water filling Process:-

Considering a multiuser MIMO-OFDM system with downlink beam forming, it is assumed that base station can acquire perfect CSI, employed the SUS (Semi- orthogonal User Selection) algorithm proposed in to minimise the total transmit power satisfying the QoS of users. But in the size of OFDM group was fixed, therefore, Orthogonality of channels of users in a group was not well guaranteed. In order to guarantee the orthogonality of channels of users in a group [5]. The OFDM communication model is of the form

Y_n = H_n*X_n+N_n(n=0,1,2….N-1)

Where $x_n[m]$ is the input, $y_n[m]$ is the output, $w[m]$ is AWGN and h_n is the channel gain. The normal water filling problem consist of optimizing capacity in the by allocating the power such that

$$C_n = \max_{P_0,\ldots P_{N-1}} \sum_{n=0}^{N-1} \log\left(1+\frac{P_n|h_n|^2}{N_0}\right)$$

Under the constraint

$$\sum_{k=0}^{N-1} P_n = P_{total} \quad P_n \geq 0, n = 0,1,\ldots,N-1$$

The above conditions are solved using Lagrangian multipliers using the Kuhn- tucker condition to get the optimum solution such that the model is modified to suit an OFDM based cognitive radio system described above by adding a following constraint of maximum power i.e.$\sum_{i\epsilon I_i} P_i = F_j \leq G_j$where P_i is the power allocated to that subcarrier and G_j is the maximum power transmission capacity of that particular sub channel

$$P_n = \begin{cases} 0 & if\ \frac{1}{\lambda} < \frac{N_0}{(|h_n|)^2} \\ \frac{1}{\lambda} - \frac{N_0}{(|h_n|)^2} & otherwise \end{cases}$$

We derive bounds of achievable sum rates of MIMO fixed relay system using coding, which has been shown to be sum capacity optimal [6]. The sum rate using dirty paper coding can be expressed as a function of pre-coding matrix F and the relay processing matrix approach is to directly optimize the sum rate with respect to matrices F and W, however, this approach optimizes large number of parameters and has a very high computational cost. Further, in this formulation, the optimizers may not be unique. Thus finding a globally optimum solution is too difficult. To resolve this problem, we introduce several design structures for the parameters F and W. This follows to sum rate lower bounds that can be computed using low complexity algorithms. The concept of the water filling can be extended to multiple users, where one resource is allocated to one user. The number of resources for any user could be limited to improve the performance of cell-edge users at the expense of sum throughput. The algorithm takes power budget of each user as a parameter (again, for example one may allocate more power to cell-edge users). The mode parameter switches in between fixed-power allocation as shown in Figure 2 part 2) and water filling as shown in Figure 2 part 4). The code can be further optimized for fixed power allocation by replacing iterative "water fill ()" subroutine with another one which splits a user's power evenly between resources allocated to the user [7].

Table.1. antenna

	2 Antenna	4 Antenna	8 Antenna
SISO	4.2674	4.2565	4.2681
SIMO	4.915	5.7067	6.5878
MISO	4.4347	4.5919	4.7181
MIMO	6.1909	10.1027	17.9687

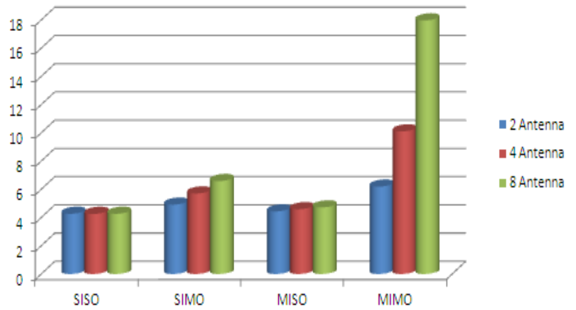
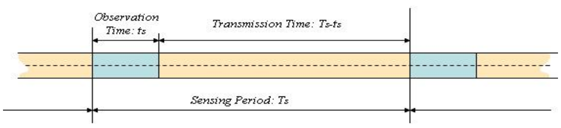


Figure.3.spectrum mobility

Spectrum Mobility: As CR networks have capability to support flexible usage of wireless radio spectrum, cognitive radio (CR) techniques have attracted increasing attention in recent years. In CR networks, secondary users may dynamically access underutilized spectrum without interfering with primary users, which is called spectrum handoff. Spectrum handoff refers to the procedure invoked by the cognitive radio users when they users wish to transfer their connections to an unused spectrum band. Spectrum handoff occurs when:1. When primary user is detected or 2. current spectrum condition becomes worse



IV. RELAY COMMUNICATION

No Co-operative communication:-

One Input One Output. This is effectively a standard radio channel or Mobile communication, in this the transmitter operates with one antenna as does the receiver. There is no diversity and no additional processing required

Equal Power Allocation:-

We derive bounds of achievable sum

rates of MIMO fixed relay system using coding, which has been shown to be sum power optimal [8]. The sum rate using dirty paper coding can be expressed as a function of pre-coding matrix F and the relay processing matrix approach is to directly optimize the sum rate with respect to matrices S and R, however, this approach optimizes large number of parameters and has very low cost.

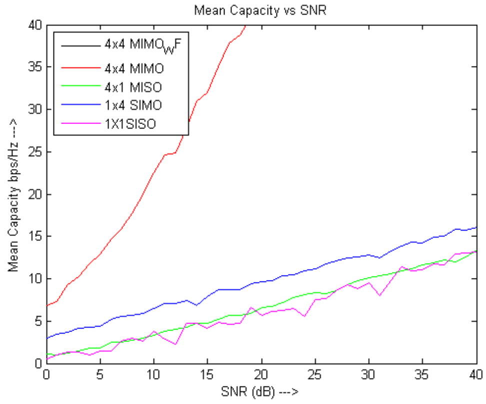


Figure.4. Comparison of Multi-user achievable rates with SISO SIMO MISO in Rayleigh fading environments.

V. EXPERIMENTAL RESULTS

To evaluate performance of our scheme, numerical results are generated using a MATLAB simulation. Relay selection is performed per SU since SU is the smallest resource unit for the MOBILE-CRN networks. The relay locations are varied to show the effect of relay locations on the performance. Here, we only consider random variations of the relay distance from the eNodeB as the first step.

However, relay placement can be modelled as another optimization problem which is not studied in this paper [9]. Then the effective channel gain over an SU is deduced from the subcarrier granularity. The 3GPP MOBILE -CRN path loss models with log-normal shadowing of an 8dB standard deviation are assumed.

Throughput Calculation:-

To illustrate the superiority of our resource allocation scheme in terms of the cell overall throughput improvement, we compare the throughput achieved by the optimal resource allocation of MIMO 4X4 and MIMO 8X8 with the MIMO Water filling are operated in multi SNR [10].

Figure.5. Comparison of overall throughput when MIMO-4x4 and MIMO 8x8 with MIMO water filling

In order to evaluate the performance of our proposed suboptimal sub channel and power allocation algorithm in time duration, the rest of the network parameters are unchanged.

VI. CONCLUSION

Although the performance of MISO-WF has been studied in existing literature, its analysis in this paper shows the great impact it has on data transmission. The results show that by using Water filling an improvement is made in radio resource allocation. By analyzing the results of our proposed algorithm, we show here through our model that upon implementation, this algorithm would be efficient and also achieve its objectives of optimizing the data rate of both cell edge users and those close to the cell centre that are however starved of resources. Our approach provides user satisfaction by sacrificing some amount of total system throughput. It supports a heterogeneous traffic. The computational complexity of our algorithm is higher, but the base station can easily perform optimization.

V. REFERENCES

[1] H. Ekstrom, A. Furuskar, J. Karlsson, M. Meyer, S. Parkvall, J. Torsner, and M. Wahlqvist, “Technical solutions for the 3G long-term evolution,” IEEE Commun. Mag., vol. 44, no. 3, pp. 38–45, 2006.

[2] A. Ghosh, R. Ratasuk, B. Mondal, N. Mangalvedhe, and T. Thomas, “MOBILE -CRN-Advanced: next-generation wireless broadband technology,” IEEE Trans. Wireless Commun., vol. 17, no. 3, pp. 10–22, 2010.

[3] S. Peters, A. Panah, K. Truong, and R. Heath, “Relay architectures for 3GPP MOBILE -CRN-Advanced,” EURASIP J. Wireless Commun. Netw. vol. 2009, 2009.

[4] A. Lo and P. Guan, “Performance of in-band full-duplex amplify-and forward, decode-and-forward relays with spatial diversity for next generation wireless broadband,” in Proc. 2011 IEEE ICOIN, pp. 290– 294.

[5] X. Deng and A. Haimovich, “Power allocation for cooperative relaying in wireless networks,” IEEE Commun. Lett. vol. 9, no. 11, pp. 994–996, Oct. 2005.

[6] A. Host-Madsen and J. Zhang, “Capacity bounds and power allocation for wireless relay channels,” IEEE Trans. Inf. Theory, vol. 51, no. 6, pp. 2020–2040, May 2005.

[7] T. C. Y. Ng and W. Yu, “Joint optimization of relay strategies and resource allocations in cooperative cellular networks,” IEEE J. Sel. AreasCommun., vol. 25, no. 2, pp. 328–339, 2007.

[8] W. Rhee and J. Cioffi, “Increase in capacity of multiuser OFDM system using dynamic subchannel allocation,” in Proc. 2000 IEEE VTC, vol. 2, pp. 1085–1089.

[9] X. Zhang, Z. Zheng, J. Liu, X. Shen, and L.-L. Xie, “Optimal power allocation and AP deployment in green wireless cooperative communications,”in Proc. 2012 IEEE Globecom.

[10] Y. Liang, V. Veeravalli, and H. Poor, “Resource allocation for wireless fading relay channels: max-min solution,” IEEE Trans. Inf. Theory, vol. 53, no. 10, pp. 3432–3453, 2007.