

A Multi-Point Cluster for Maximization of Power Constraints in a Downlink Coordinated System

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Abstract—Power is a key challenge for increasing network lifetime and interference reduction while data transmission. Since the IW Clustering algorithm have only 5%cell edge user rate and causes the inter-cell interference. We develop an algorithm which is joint scheduling to increase the cell edge user throughput and power control regulates the transmitted power. The purpose of coordinated multipoint communication is to minimize the inter-cell interference to the cell-edge user and improve their performance. The inter-cell interference can be reduced by assisting to the transmission. Simulation results show that the cell edge user rate is increased by scheduling the users for the communication and power is consumed at the minimum level during transmission and reception.

Keywords—Coordinated Multipoint; Inter-Cell Interference; Joint Scheduling Algorithm; Joint Transmission.

Abbreviations—Cell Edge User (CEU); Cluster Head (CH); Inter-Cell Interference (ICI); Other-Cell Interference (OCI);

I. INTRODUCTION

THE coordinated multipoint is one of the promising concept to improve the cell edge user throughput. The cell edge user increases the reliability of the communication and at the same time, Power is consumed during the data transmission. Base stations are connected at the high speed backbone. Joint transmission share not only Channel State Information (CSI) but also data of all the users. Inter-cell interference occurs at the Cell Edge User (CEU) can be reduced by using the signals transmitted from other cells to assist the transmission instead of acting as interference. In this paper, the problem of designing a joint scheduling and power control algorithm supporting coordinated multi-point joint transmission is addressed. The advantage of coordinated multipoint joint transmission to improve the capacity, cell edge throughput, coverage, group mobility of a wireless networks. The design of a cluster is to get more computing power and coordinate the nodes which just connect various nodes work like a supercomputer.

Examples include the IBM General Parallel file system, Microsoft's cluster shared volumes or the Oracle cluster file system. Here we focus on the cell edge user data rate and control the power in the coordinated system. Multipoint joint transmission is proposed to solve the serious interference problem by joint scheduling and joint transmission. Hence, the Coordinated multipoint joint transmission is solving the interference problem at the cell edge users.

II. RELATED WORKS

This paper proposes a dynamic cell clustering algorithm improves coordination gain and IW clustering algorithm improves 5%cell edge users [Misun Yoon et al., 1]. Block diagonalization is one approach for linear precoding in the multiple-input multiple-output broadcast channel that sends multiple interference free data streams to different users in the same cell. Unfortunately, block diagonalization neglects Other-Cell Interference (OCI), which limits the performance of users at the edge of the cell [Seijion Shim & Jin Sam

Kwak, 2]. In mobile cellular system, throughput is maximized at cell edge users in which power is increased at maximum level [Chi Wan Sung & Kin Kwong Leung, 3]. The Dynamic frequency allocation allow the frequency reuse and reduce the throughput in the cell edge users [Syed Hussain Ali & Victor C.M. Leung, 4]. Power control is a key challenge for effectively operating a modern data center Cluster level power controller that shifts power among servers and features a multipoint and multi output system. It does not guarantee to the power consumption of a computing system [Xiaorui Wang & Ming Chen, 5]. D2D Communication improves the throughput and here power control approach is not enough to guarantee reliable cellular networks [Namyoon Lee et al., 6]. The optimal power solution is a multi-objective optimization task noted as difficult to design the only power control algorithm for a network as a whole in a mobile ad-hoc cells [Yaremko et al., 7]. The optimization of power is difficult to establish globally and causes the interference while transmitting the data to neighboring cells [Taesoo Kwon & Changyong Shin, 8]. The protocol model used in this model do not take energy into an account and determining the trade-offs between throughput delay and energy [ElGamal et al., 9]. Energy is an important issue in the data transmission in the uplink and downlink coordinated system. The optimal power control in a downlink channel was proposed which reduces the level of interchannel interference. However these approaches are not optimal for the integrated optimization of power control for both the channels [Lee et al., 10]. In a Clustering algorithm for a sum rate maximization by using the greedy search was proposed to improve the sum rate without considering cell edge user rate. The whole network is large, the complexity of the algorithm is rapidly increased [Papadogiannis et al., 11]. The FFR Scheme increases the performance at the cell-edge but degrades the overall cell throughput, a coordinated system was proposed in [Zhang & Dai, 12] to overcome the weakness of the FFR scheme. A dynamic clustering algorithm maintains the performance while reducing the transmit power but at the cost of higher complexity [Lee et al., 13]. In the uplink communication system, the base station receives the low intensity signals from cell edge users and signals from users at the edge of adjacent cells simultaneously. In the downlink communication system, the user receives signals from the base station in its own cell and signals from the base station at the adjacent cells with similar power. In this case, both the capacity and the data rate are reduced by the Inter-Cell Interference (ICI) [Andrews et al., 14]. The FSCA is the optimal clustering algorithm selects the best combination in maximizing the sum rate of all users. However, the complexity of the FSCA is very high [Papadogiannis & Alexandropoulos, 15]. Hence the proposed algorithm maximizes the cell edge user throughput and constraints the power in the multipoint clustering system or coordinated multipoint system joint transmission.

III. SYSTEM ARCHITECTURE

The distribution of nodes connected to the cluster head serve to the base station in the uplink and downlink coordinated system. The cluster head can be any node chosen randomly which have the information of all nodes and routing can be done by Cluster Head (CH). The cell edge user should not undergo handoff strategy from one region to another and performance of the cell edge user can be increased in a mobile ad-hoc networks. The system architecture shows uplink communication system and the nodes are connected at a particular distance. For example, consider a Cluster of three base stations with one transmit antenna each and a cell radius of 500m. Users are uniformly dropped in each base stations. CCUs and CEUs are divided by a path loss window, where the threshold is predefined as 7db. Only cell edge users are considered in the simulation.

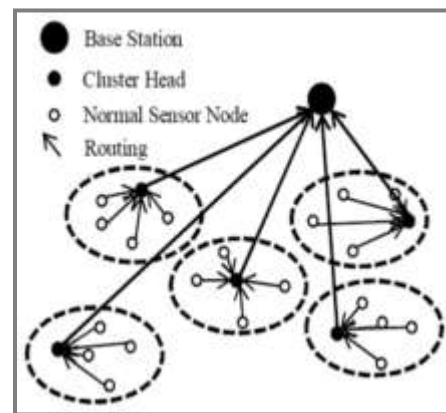


Figure 1: System Architecture where Nodes, Cluster Head are connected to the Base Station

IV. JOINT SCHEDULING AND POWER ALLOCATION

The semi-distributed algorithms are proposed for joint scheduling and power control in a cluster. Complexity is reduced in the semi-distributed algorithm for joint scheduling and power allocation in a cluster, where each base station successively performs a greedy user selection combined with transmit power decision based on decisions made by the previous base station. This algorithm is performed based on the objective function to maximize the cell-edge throughput.

Multi-user MIMO systems, low-complexity user scheduling methods based on the idea of user selection are widely accepted. User selection is a successive procedure by selecting the user with best channel quality, and then iteratively adds a new user from the remaining users until adding one more user reduces the cell throughput. The flat fading channel is used where the bandwidth of the channel is higher than the bandwidth of the signal transmitted from the node. This channel is selected because it fades away all the unwanted signals or noise from the nodes.

4.1. Joint Scheduling Algorithm

1. Start
2. Initialize scheduling $= N(i)$; where N = no of users
3. Consider $i=1$ to n and number of channel $= N(i)$
4. If $N(i)=N(a)$ which is a allocated channel
5. End the program

Initialize the algorithm step by step by scheduling $N(i)$ as N denotes number of channel. Consider i as 0 to n and also N is the number of users. Apply the condition $N(i)=N(a)$ in which the channel is allocated for all the users.

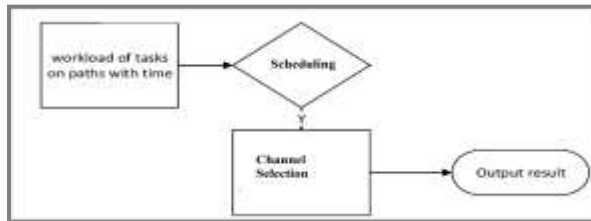


Figure 2: Joint Scheduling Flow Diagram

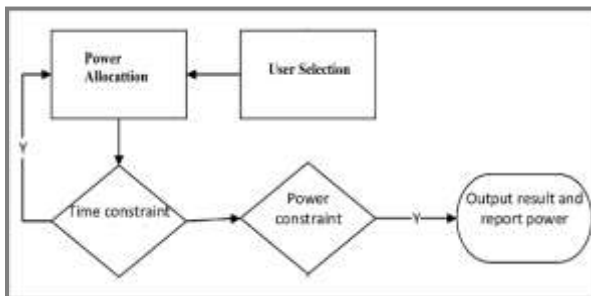


Figure 3: Power Control Flow Diagram

4.2. Power Control Algorithm

1. Start
2. Initialize $P_n(\text{users})=0$
3. Consider $n=0$ to n ;
4. Apply the condition $P_n=P_{\max}(\text{power control})$
5. Or else $P=P_i$;
6. Stop the program.

Initialize the program with the zero power and make n as 0 to n where the condition is applied power of the n users is equal to the power maximum in the algorithm. If the condition fails, it takes power values depends on the i factor of the users.

Inspired by user selection, a low-complexity semi-distributed algorithm is proposed for joint scheduling and power allocation in a coordinated multi-point cluster, where each BSS successively performs a user selection combined with transmit power decision based on decisions made by the previous base-station. This algorithm is performed based on the objective function to maximize the cell-edge throughput.

V. RESULT AND DISCUSSION

The joint scheduling and power allocation is simulated for 40 nodes spread randomly in a $1500 \times 1500\text{m}$ area network; transmission range for each node is random. Nodes are positioned randomly on the plane. Nodes start its travel from

a random location to a random direction with a random speed. Nodes are arranged with three cluster heads as distribution of nodes selects one cluster head in a group before transmission of data occurs. The figure 4 shows the nodes indicated by different colours to show the difference between the cluster nodes that the data is transmitted from one node to another.



Figure 4: Nodes are Arranged with Cluster Head after Data Transmission

The figure 4 shows the transmission of data for which the power is consumed. We can calculate the energy efficiency of data transmitted from source to destination. The nodes are denoted by different colours in the figure like pink, green, red.. ie., just an identification. The graph 5 shows the cell edge throughput and the power consumed while message sending in the uplink and downlink coordinated system. The existing algorithm ie, IW clustering algorithm improves 5% cell edge user rate. Therefore, the performance of cell edge users and power is controlled by using algorithm. The cell edge user rate is improved as 17% in our algorithm.

In downlink coordinated system, the power is highly consumed at the reception antenna and the total energy consumed to exchange a packet over a wireless during a single transmission and reception of packet Power consumption depends on the packets send and received at the transmitter and reception respectively.

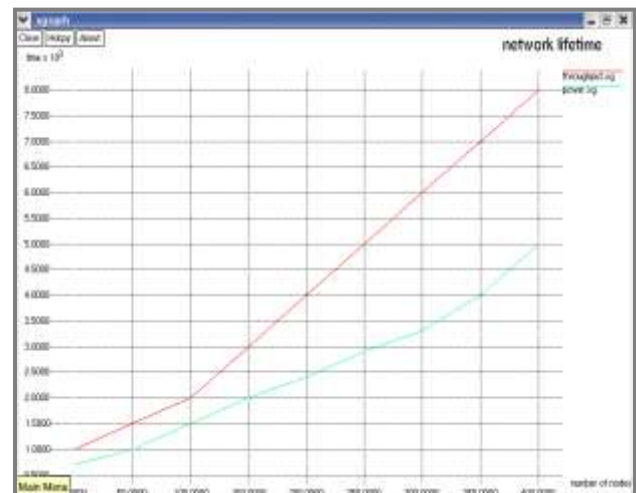


Figure 5: Graph for Throughput vs Power in which the 100 nodes Transmit Data at 2×10 seconds, The Power Consumed is 15W

The GSCA algorithm explains the static clustering algorithm do not guarantee the performance of the cell edge users and do not reflect the change of environment. The MAX-CG algorithm improves both the sum rate and the weak user's rate and it catches up with the performance of the FSCA. Never the less complexity of the MAX-CG Clustering algorithm is higher than the GSCA because it calculates the sum rate of all the combinations.

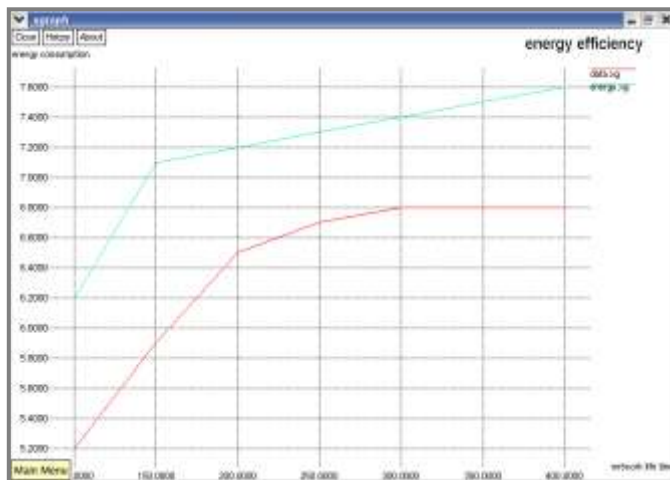


Figure 6: Graph for Data vs Energy Consumption in which 150kbps Data Transmission, The Energy Consumed is 7.1 V and Energy Increases with Increase in Data

Thus, the cell edge user rate is improved as 17% without any handoff problem. At the same time, power is constraint to 5V so that the efficiency of the network lifetime is improved. The cell edge users in a mobile ad hoc networks enables good signalling between transmitter and reception. The inter-cell interference is reduced by pre-scheduling the packet transmission from one node to another. The interference is assisted to the transmission for the cell edge users by joint scheduling and power control algorithm restricts the power for the packets movement by using proper channel and the output is displayed in the graph with comparison of existing algorithm.

VI. CONCLUSION

In this paper, the downlink and uplink of a coordinated cluster with neighboring base station sectors. To joint scheduling and power control algorithms are presented in order to maximize the cell-edge sum throughput under a per base station sector power constraint. A low-complexity semi-distributed algorithm is proposed for practical implementation. It is demonstrated by the simulation results that the proposed algorithms can offer a good balance between Coordinated multipoint joint transmission and interference coordination, which provides a substantial cell-edge performance improvement.

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