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# MAXIMIZATION OF CO-ORDINATION GAIN IN UPLINK SYSTEM USING THE DYNAMIC CELL CLUSTERING ALGORITHM

Ms.Neeththi Aadhithiya(AP/ECE),
Electronics And Communication engineering,
M.Kumarasamy College of Engineering, Karur.
neethiece@gmail.com

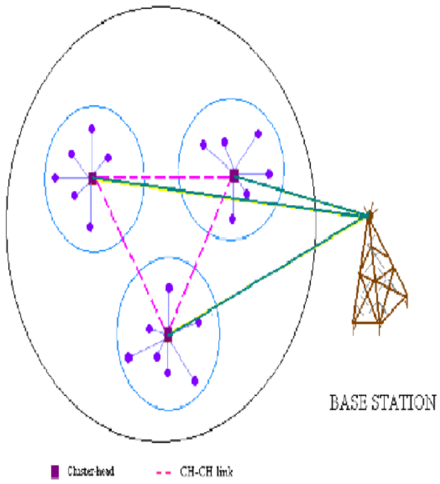
Ms.M.keerthana
Final Year, Electronics And Communication engineering,
M.Kumarasamy College of Engineering, Karur.
Keethimahi95@gmail.com

Ms.K.Kavitha
Final Year, Electronics And Communication engineering,
M.Kumarasamy College of Engineering, Karur.
replymekavi@gmail.com

***Abstract*--The dynamic clustering algorithm changes the composition of clusters periodically. We consider two well-known dynamic clustering algorithms the full-search clustering algorithm (FSCA) and the greedy-search clustering algorithm (GSCA). The coordinated communication system as a new parameters are to maximize the coordinated communication system. Two well-known dynamic clustering algorithms in this paper: the full-search clustering algorithm (FSCA) and the greedy-search clustering algorithm (GSCA. Simulation results show that the MAX-CG clustering algorithm improves the average user rate and the edge user rate and IW clustering algorithm improves the edge user's rate and reduces the complexity to only half of the existing algorithm**

## I. INTRODUCTION

In the uplink communication system, the base station (BS) receives 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 BS in its own cell and signals from the BSs at the adjacent cells with similar power. The received signals from other cells act as interference and cause performance degradation. In this case, both the capacity and the data rate are reduced by the inter-cell interference (ICI)[1]. In the past, the fractional frequency reuse (FFR) scheme, which is a simple ICI reduction technique, has been used to achieve required performance in interference limited environment . Since the FFR scheme increases the performance at the cell-edge but degrades the overall cell throughput, a coordinated system was proposed to overcome the weakness of the FFR scheme. Also, the techniques for ICI mitigation and performance enhancement by sharing the full channel state information (CSI) and transmit data were studied in. [2]However, the techniques are difficult to implement in a practical communication system because of the large amount of information to be shared between BSs. Instead of the impractical scenario that requires full CSI and transmit data sharing among the whole network, a clustering algorithm has been applied to practical communication systems by configuring the cluster for sharing full CSI between a limited number of cells. The clustering algorithms are classified into two types: static clustering algorithm and dynamic clustering algorithm. A dynamic clustering algorithm to avoid the ICI was developed , whose objective is that the overall network has the minimum performance degradation while also improving the performance of the cell-edge user.




A clustering algorithm for sum rate maximization by using the greedy search was proposed to improve the sum rate without guaranteeing the cell-edge user's data rate. However, when the size of the whole network is large, the complexity of the algorithm is increased rapidly. If the complexity of the algorithm is large.the processing speed cannot adopt the change of the channels. [3]The purpose of coordinated communication is to minimize the inter-cell interference to the cell-edge user and to improve their performance. When the clusters are not properly configured, the performance of the cell-edge users will be further degraded. Even though the existing algorithm improves the overall data rate, it does not consider the goal of the coordinated communication: the improvement of the performance of cell-edge users.

## II. EXISTING SYSTEM

In the uplink communication system, the base station (BS) receives low Intensity signals from cell-edge users and signals from users to the edge of adjacent cells simultaneously. In the downlink communication system, the user receives signals from the BS on its own cell and signals from the BSs at the adjacent cells in similar power. In the past, the fractional frequency reuse (FFR) scheme, which is a simple ICI reduction technique, has been used to achieve required performance in interference-limited environment. In the static clustering algorithm, the construction of clusters is fixed, so that clusters are composed of a limited number of adjacent cells . The advantage of the static clustering algorithm is that BSs share the CSI and received data with other BSs belonging to the same cluster without the central controller[4]. So, the complexity is low and there is no CSI sharing between clusters caused by the clustering algorithm.

## III. PROPOSED SYSTEM

The dynamic clustering algorithms to improve the cell-edge user data rate and to reduce the complexity the same time. The proposed clustering algorithms have lower complexity than the existing algorithms. Moreover, improve the cell-edge user's performance without increase the complexity. First, maximization of coordination gain MAX-CG) clustering algorithm is proposed. The MAX-CG clustering algorithm maximizes the coordination gain between he coordinated communication system and the single-cell communication system. Its performance is close to the optimal clustering algorithm - the full search clustering algorithm. This effect mainly comes from the usage of the coordination gain which highlights the benefit of coordinated communication[5]. The coordination gain is increased only if the benefit of the BS coordination is large. Second, we develop interference weight (IW) clustering algorithm which reduces complexity and improves both the average user rate and the 5% edge user rate.

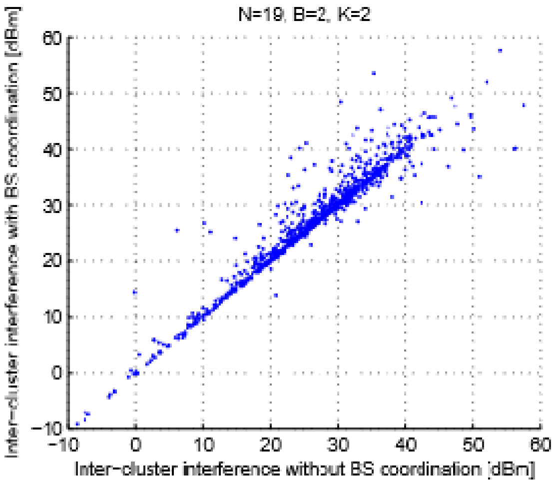
## IV. MAX-CG ALGORITHM

We define a new parameter called as the coordination gain of data rate, which is the rate difference between the coordinated communication and the single cell communication. The most important objective of the BS coordination is to improve the cell-edge users' performance As we explained in Section III, the static clustering algorithm. and the GSCA do not guarantee the cell-edge users' performance. The former does not reflect the change of the channel environment, while the latter considers only the sum rate maximization. Since the GSCA tries to maximize the sum rate, the cluster is composed of the cells with many cell-center users. Thus, the cluster which is made last has low coordination gain. To combat these problems, we use the coordination gain to make clusters maximize the performance gain[6]. The coordination gain is the rate difference between C(C) and C(NC). C(C) is the sum rate of users in cluster G, and C(NC) is the sum rate of users in cluster G on the basis that those users do not coordinate.

## V. IW CLUSTERING ALGORITHM

In this section, we propose an algorithm to supplement the MAX-CG clustering algorithm. In comparison with the GSCA, the MAX-CG clustering 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 combinations. Therefore, we propose the interference weight (IW) clustering algorithm to reduce the complexity of clustering without performance loss. We consider the pair wise relationship between two cells for clustering.

$C^{(C)}-C^{(NC)} = \sum \sum \{\log_2(1+1/I_b{}^{C}{}_{(i)})-\log_2(1+1/I_b{}^{NC}{}_{(i)})$



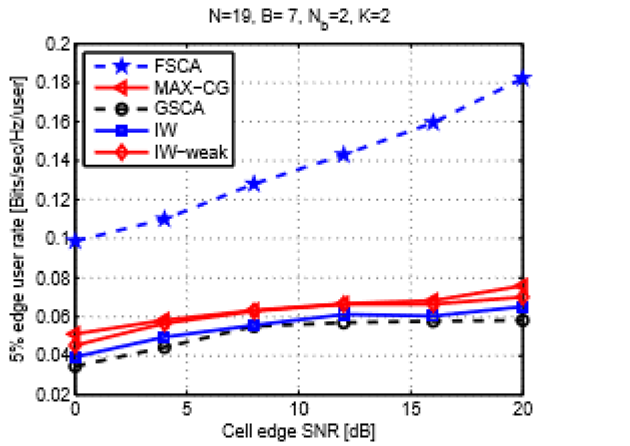

. 2. The relationship between the $I^{NC,b(i)}_{\text{intercluster}}$ and $I^{C,b(i)}_{\text{intercluster}}$ for $N = 19$, $= 2$ and $K = 2$.

In this approach, we don't need to make all combinations of BS, so that we can reduce the complexity of the clustering algorithm**.** Even though we narrow down the scope to 2 cells case for the coordination gain, is difficult to solve without making any further simplification. In the high SINR regime, we can simplify the optimization problem fortunately[7]. Note that the high SINR regime for user b in the cell i assumes SINR ≫ 1, which implies that the transmit power of the user is larger than 0 (turning off the transmit power never leads to the high SINR regime) . Since we assume that the user uses same transmit power P, the assumption for the high SINR regime is available in this system for practical coordinated systems.

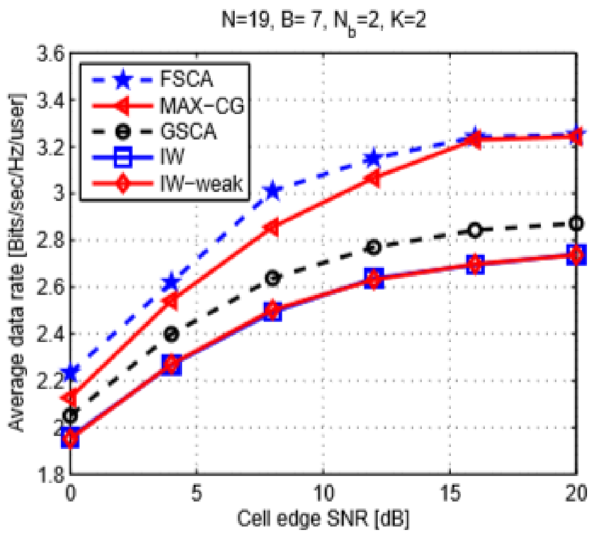
## VI. SEECH PROTOCOL

The energy efficiency is a important for wireless sensor networks in smart space and extreme environments. The cluster is based on a communication protocols and consider a role for energy saving in hierarchical wireless sensor networks. In most of dynamic clustering algorithm is a cluster head simultaneously serves as a relay sensor node to transmit its cluster or clusters data packet to the data sink. As a result, each node would have cluster head role as many relay process during network lifetime. In our view, this is inefficient from an energy efficiency perspective because in most of cases, a node due to its position in the network comparatively is more proper to work as a cluster head and/a relay. The new distributed algorithm named scalable energy efficient We proposed novel dynamic cell clustering algorithms for maximizing the coordination gain in the uplink coordinated system. The MAX-CG clustering algorithm maximizes the coordination gain and improves the average user rate. Simulation and analytical results show that the complexity of the MAX-CG clustering algorithm is much less than that of the FSCA. The IW clustering algorithm reduces the complexity of the MAX-CG clustering algorithm and uses the IW to supplement the disadvantage of the GSCA. Thus, the IW clustering algorithm improves the performance and simplifies the clustering. The IW-weak clustering algorithm improves the 5% edge user rate without the loss of the average user rate. Therefore, the proposed clustering algorithms are simple and efficient such that they are suitable[8].

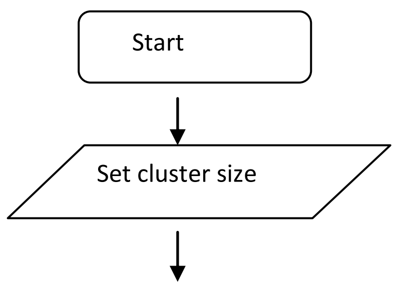
**GRAPH**

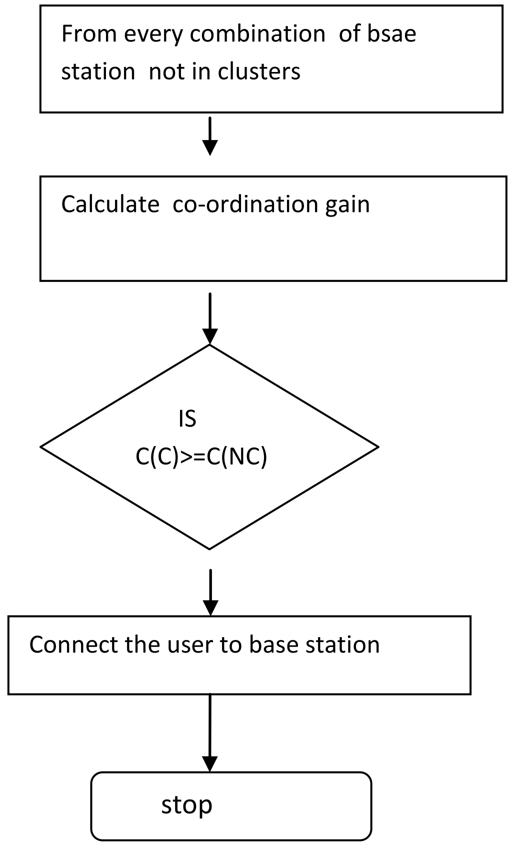



5% edge user rate vs. cell-edge SNR for $N = 19$, $B = 7$, $K = 2$ $N_b = 2$.




## VII. FLOW CHART




## VIII. RESULT

We proposed novel dynamic cell clustering algorithms for maximizing the coordination gain in the uplink coordinated system. The MAX-CG clustering algorithm maximizes the coordination gain and improves the average user rate. Simulation and analytical results show that the complexity of the MAX-CG clustering algorithm is much less than that of the FSCA. The IW clustering algorithm reduces the complexity of the MAX-CG clustering algorithm and uses the IW to supplement the disadvantage of the GSCA. Thus, the IW clustering algorithm improves the performance and simplifies the clustering. The IW-weak clustering algorithm improves the 5% edge user rate without the loss of the average user rate. Therefore, the proposed clustering algorithms are simple and efficient such that they are suitable for practical coordinated systems.

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