Slave control by using progressive hotspot selection and allocation over television white space

[1]Jaspreet Kaur, [2]Amandeep Kaur

[1]M. Tech. Student , [2]Professor
Electronics and Communication Department, UCoE
Punjabi University, Patiala, Patiala, India.

E-mail: [1]jaspreetdeol19@gmail.com, [2]aman_dhaliwal3333@yahoo.com

Abstract. Air dense wireless phone spectrum resources are insufficient, the traditional approach is to deploy additional ships (Bs), or offload some of the traffic onto Wi-Fi unlicensed band. A study to be run by a management algorithm for Tethering as a white -out.The iterative algorithm bunch of the hotspots of the slaves and their resources to maximize spectrum utility. It is estimated that the algorithm can effectively take advantage of TVWS spectrum, and receives a fixed amount of network resources, which increase the number of users.

Keywords: White-space , Spectrum, User, Channel allocation.

Introduction

The proliferation of smartphones has led to the demand for wireless data transfer uitousubiq access anywhere and anytime. This is a clear demand, especially in crowded places such as conference rooms and shopping malls, where there is a large number of mobile devices confirms spectrum is limited. These facilities are filled with people who want to share their experiences with friends through e-mail, and text messages, and upload images on their websites and social networks, or just surfing the Internet. Conventional methods for the deployment of small cells (femtocells or relays) and dump traffic over Wi-Fi can improve congestion spectrum, but requires a fixed post.[1] More transfer or add infrastructure necessary can be based on the distribution of current users. In addition, without resorting to the use of white space resources, and high levels of interference in the Wi-Fi networks and the lack of licensed gangs enough to femto cells and relays limit the ability of the network.[4] On the other hand, restraint is an attractive method for delivering data to the destination node through the intermediate node. Cellular access make the mobile hotspot broadband near users (slaves) as shown in Figure 1. As such, tethering offers highly mobile station for broadband access. Tethering mechanism is the basis of the proposed coordinated - tethering algorithm that seeks to provide full connectivity coordinating users, manage interference and selecting hot systematically. This method brings into play the sources of problems, densely packed nodes, to solve the problem without the additional infrastructure costs.

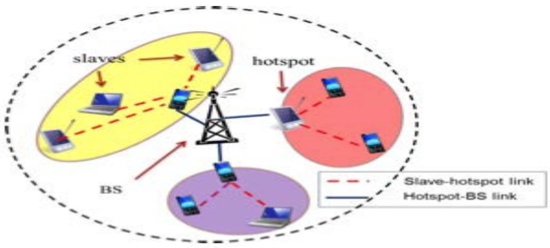

Fig 1 : Hotspot – slave configuration. [6]

To make use of all possible resources, the proposed algorithm systematic use of unused spectrum or available White space (WS). His radio and television unused TV spectrum called white space (TVWS) its frequency 50-700 MHz and have in comparison ISM band better propagation characteristics. Out-of-band, Wi-Fi on the basis of the ad hoc relay was first introduced in 2003 by the Todd. [7]It is assumed that a mobile act as a hot spot, only when user is inactive then only one slave relay data in any time. Authors allow each hotspot to connect multiple slaves and allow any node to act as hot (not just inactive), obtained in achieving near-optimal structure for greater flexibility.[8]

ALGORITHM USED

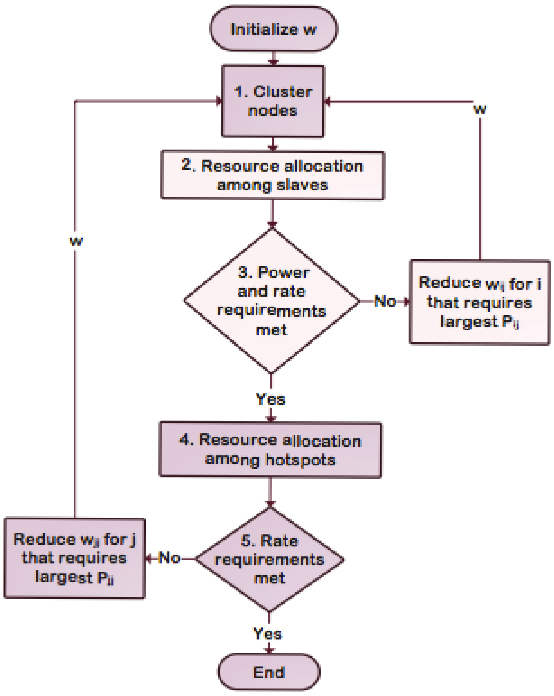

Fig 2: iterative clustering and resource allocation algorithm[1]

The clustering refers to a group of nodes and defines a hotspot (and therefore the slaves) in each cluster. Generally, clusters, and resource distribution across the network can also be prepared from the global nuclear non-convex (Combinatorial) problem, which increase the complexity in nodes. Instead, simplistic, repetitive clusters, and resource allocation (Icara) algorithm proposed, which consists of five main steps, which are summarized in the flowchart in Figure 2. The darker the color and design of steps BS milder forms of steps that can be taken either BS or each hotspot.[2] The The first step is the destination node or a cluster configuration, which results in a more feasible and effective use of resources, and the network is a major step in the algorithm Icara. This step determines the network connects Y, and then steps 2-5, in order to determine whether the configuration of the nodes is possible as regards the allocation of resources and preservation of the user service requirements. Therefore, the feedback parameters wij∈[0, 1], and determining the mass of the link i - j. When the steps of the feasibility of this algorithm to determine the nodes i and j can be connected to the slave – the hotspot way, the shorter wij

Step-1: Clustering Nodes into Hotspots and Slaves

The first step make a group of nodes by selecting the nodes and their slaves. There are various methods of making such a grouping, which differ in the immediate purpose and complexity. clustering technique that tries to minimize the overall power grid based on linear programming. For clusters, the base station uses a statistically higher level of the channel, i.e., Average profit channel between nodes labeled with gij (without channel superscript), which is assumed constant throughout the clusters. The base station then communicates the results of cluster and identifies each node work as slave or hotspot. The problem with clustering to minimize the transmission network Power is formulated in the following way.

$$\underset{Y}{\text{minimize}} \sum_{j=1}^{U} \left\{ \frac{y_{jj}}{w_{jj}g_{jj}} + \frac{\sum_{i\neq j} y_{ij}}{w_{jj}g_{jj}} + \sum_{i\neq j} \frac{y_{ij}}{w_{ij}g_{ij}} \right\} \quad \text{.........................(1)}$$

$$\text{subject to} \sum_{j=1}^{U} y_{ij} = 1,\ \forall i \quad \text{.........................(2)}$$

$$y_{ij} \leq y_{jj},\ \forall i,j \quad \text{.........................(3)}$$

$$y_{ij} = \{0,1\},\ \forall i,j \quad \text{.........................(4)}$$

The aim is not correspond to the actual transmission power of the network. The basic assumption of this goal is that each connection is assigned traffic directly proportional to the number of destination nodes. In other words, for each node of the destination link that carries data, there is bandwidth available to b. Wij are initialized at 1 and can be reduced based on the results of checks restrictions imposed on the way the algorithm. Wij reduce the fair means clustering gain assuming the bottom line between nodes i and j and hence try to separate the two nodes when clustering. [3]Prohibition (2) suggests that each node can I have only one transmitter j. Prohibition (3) connected to the node i Hotspot j j only if these hotspots. If j is a hotspot (yjj = 1), then yij be equal to 1, as well, but if yjj is equal to zero (not a portable j), yijcan not ban 1. (4) enforcesyij to take on the binary values.This as integer linear programming problems. Convert this problem into linear programming problems in general, the ban (4) to cool it yij ≥ 0, ∀i, j.Thus, the problem can be solve by using internal - point method, which is a polynomial time complexity. Note that the fair value of the optimal steady problem is less than or equal to the fair value of the original issue of the optimal.

Step-2: Resource Allocation Among Slaves

Provide a set of slaves in relation to the hotspot j Sj obtained when clustering algorithm is a step, which means that the Legal Service = {i | Y ij = 1}.[4] In the second stage of the algorithm, each hotspot points on the basis of his slaves OFDMA CUS - type approach speed and capacity constraints. In this approach, each CU can be only one slave. This step is similar to the optimal resource allocation of resources through the optimization of OFDMA systems.

Determining the Maximum Allowed Transmission Power:

To prevent interference from neighbouring clusters, each cluster determines the maximum power that they transmit every CU. This ensures that no clusters that create significant interference with others. Let Tjn the maximum transmission power of the cluster j (ie, the cluster whose hotspot node j) shall be sent to CU n. Intervention is considered negligible if it is on the order of the noise N0.

$$\begin{cases} l = j \text{ and } \mathcal{K} = \mathcal{S} - \mathcal{S}_j, & \text{downlink} \\ l \in \mathcal{S}_j \text{ and } \mathcal{K} = \mathcal{H} - \{j\}, & \text{uplink} \end{cases}$$

If Downlink communications (platform slaves), which is considered to be l = J is measured based on the channel gain and interference between the hotspot and the slave j all the other clusters. If the uplink communication (captive hotspot), which is considered to l ∈Sj calculated based on the customs union and interference with each channel gain between the j cluster of slaves, SJ, and all the other hotspots.

Allocating Channels and Transmission Powers:

Each CU determines the maximum transmission power, and the knowledge required in each of the slave, the following optimization solves the problem hotspots:

$$\underset{\mathbf{P},\mathbf{X}}{\text{minimize}} \quad \sum_{i\in S_j}\sum_{n=1}^{N}\{p_{ij}^n\} \qquad \text{.........................(1)}$$

$$\text{subject to} \quad \sum_{n=1}^{N} x_{ij}^n b \log(1+\frac{p_{ij}^n g_{ij}^n}{x_{ij}^n}) \geq R_i,\ \forall i \in S_j \qquad \text{.........................(2)}$$

$$p_{ij}^n \leq T_j^n,\ \forall n, \forall i \in S_j \qquad \text{.........................(3)}$$

$$\sum_{i\in S_j} x_{ij}^n \leq 1, \forall n \qquad \text{.........................(4)}$$

$$p_{ij}^n \geq 0,\ \forall n, \forall i \in S_j \qquad \text{.........................(5)}$$

$$x_{ij}^n = \{0,1\}\ \forall n, \forall i \in S_j \qquad \text{.........................(6)}$$

The objective of the algorithm is to minimize the total transmission power over all the available CUs subject to minimum rate requirements and the maximum transmission powers over each CU. Constraints (2) and (3) determine the rate and power constraints, respectively. Constraint (5) enforces power to be positive and constraint (6) forces the channel selection variables x^n_{ij} to take on binary values. This is a mixed integer programming problem with a combinatorial solution, hence, the integer constraint is relaxed and solved via dual decomposition.

Step-3: Cluster Rate and Power Constraint Check

This step performs a check on the feasibility of resource allocation within each cluster. In other words, it is checked to see if each cluster has satisfied the rate requirement of each of its slaves based on the maximum allowed transmission powers. If at least one cluster has not satisfied its constraints, all the nodes have to be re-clustered.

In order to re-cluster the nodes with the hope of the new clusters satisfying their constraints, the problematic clusters have to reduce the number of their slaves. This is performed by reducing the weights w_{ij} of the i − j links that need too much power, in the clustering . The hotspots j whose constraints are not met, select the slave i that requires the highest transmission power and reduces its weight w_{ij}. It then notifies the BS with its new decision. The BS, collects the updated weights, and solves the clustering again by returning to step 1 of the algorithm.

Step-4: Resource Allocation Among Hotspots

When the constraints at all clusters are met, the BS allocates its resources among the selected hotspots j ∈ H.[5] The resource allocation in this step is similar to step 3 resource allocation, with a slight difference in the rate requirements.

$$\begin{aligned} \underset{\mathbf{P},\mathbf{X}}{\text{minimize}} \quad & \sum_{j\in\mathcal{H}} \sum_{m=1}^{M} \{p_{jj}^m\} \\ \text{subject to} \quad & \sum_{m=1}^{M} x_{jj}^m b \log(1 + \frac{p_{jj}^m g_{jj}^m}{x_{jj}^m}) \geq R_j + \sum_{i\in\mathcal{S}_j} R_i \\ & \forall j \in \mathcal{H} \end{aligned}$$

$$\begin{aligned} & p_{jj}^m \leq Z^m, \ \forall m, \forall j \in \mathcal{H} \\ & \sum_{j\in\mathcal{H}} x_{jj}^m \leq 1, \forall m \\ & p_{jj}^m \geq 0, \ \forall m, \forall j \in \mathcal{H} \\ & x_{jj}^m = \{0,1\} \ \forall m, \forall j \in \mathcal{H}, \end{aligned}$$

Constrain denotes that the rate hotspot j obtains has to be greater than the sum of its own rate requirement and its slaves' rates. The parameter Z^m in constraint indicates the maximum power that can be transmitted on CU m.

Step-5: BS Rate and Power Constraint Check

In this step the feasibility of resource allocation performed in step 4 is checked to make sure that all hotspots receive the required resources to satisfy their cluster rate requirements. If the problem in step 4 is not feasible, that is, there are not enough resources available, [6]the BS has to re-cluster the nodes. The BS selects the hotspot j' that requires the largest power and reduces its weight $w_{j'j'}$ returning to step 1.Step 5 failure can be the reason for re-clustering for a predetermined maximum number of times. If the maximum number is reached, the node i' that requires the maximum amount of transmission power will be removed from the system and the algorithm re-initialized with $w_{ij}=0, \forall i, j=i'$.Such situation indicates that the total licensed and TVWS resources are not sufficient to satisfy the requirements of all nodes and hence some nodes need to be dismissed.

Conclusion

The proposed algorithm is a promising approach to meet the demands of users with low cost by (1) the composition of some contract to serve as hot spots, (2) take advantage of the gangs WS is used for data emptied, (3) Re-use of resources between the blocks and (4) the expansion process cellular to the other bands that can be done in software. The simulation results show that the fixed network resources proposed method could double the number of users admitted

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