Abstract— In this paper, we address the problem of channel assignment considering partially overlapping channels (POCs) for interference avoidance in 802.11-based wireless mesh networks. A novel interference model is proposed which provides a systematic approach of measuring the interference caused by links operating on POCs by taking into account both the adjacent channel interference and the corresponding physical distance between mesh nodes. Based on this model, we design a centralized and a distributed interference-aware channel assignment algorithm called i-POCA which enables the use of smart ants for assigning orthogonal and non-orthogonal channels to radios in order to minimize total network interference. We evaluate our algorithms through extensive simulations and demonstrate that our proposed algorithms improve network throughput by efficient utilization of the available spectrum.

Index Terms—Channel assignment, Interference, Partially overlapping channels, Wireless mesh networks

I. INTRODUCTION

Most of the existing research on channel assignment (CA) has been focused on assigning orthogonal (non-overlapping) channels [2-5] to links belonging to neighboring nodes in order to minimize the interference in the network. However, the number of non-overlapping channels in commodity wireless platforms such as 802.11b/g is very small (only 3 orthogonal channels out of total 11 channels) while nodal density in a typical multi radio multi channel wireless mesh network (MRMC-WMN) is high. This realization has recently drawn attention to the study of partially overlapped channels (POC) for channel assignment in such networks [1]. The basic idea is to make the whole wireless spectrum available to nodes for channel selection as a result of which, partially overlapped channels may realize. This enables multiple concurrent transmissions on radios configured on POCs and therefore increases network capacity in terms of throughput by efficient spectrum utilization.

Previously, an algorithm for channel assignment based solely on orthogonal channels had to deal with only co-channel interference. However, one of the major issues in designing efficient channel assignment schemes using POCs is the adjacent channel interference, which is the interference between two neighbors configured on adjacent channels. The effect of such adjacent channel interference has a direct relationship with the geographical location of these two nodes, i.e., the farther two nodes are apart, the less interference is experienced on adjacent channels. Nonetheless, the assignment of orthogonal and non-orthogonal channels in high density mesh networks needs to be carefully coordinated; the key issue lies in the fact that the interference between adjacent channels has to be considered. This needs to be done intelligently so that channel capacity is maximized, otherwise the shared nature of wireless medium can lead to serious performance degradation of the whole mesh network.

This paper focuses on the problem of channel assignment using partially overlapping channels for interference avoidance in the context of 802.11-based MRMC-WMNs. The salient features of our work are as follows:

- We propose a partially overlapped interference graph (POIG) model to capture the interference caused by links operating on non-overlapping and overlapping channels.
- Based on this model, we design i-POCA; a channel assignment algorithm which enables the use of smart ants for assigning POCs to radios.
- i-POCA utilizes all the available channels effectively and achieves a significant improvement in network throughput by reducing various interference effects (e.g., self, co-channel, and adjacent channel interference) that are typically common in a MRMC-WMN.
- Simulation results demonstrate that our proposed i-POCA algorithm outperforms other existing schemes by as much as 36.3% when the network is saturated.

The rest of the paper is organized as follows. We start by describing the different types of interferences that may exist in a typical MRMC-WMN in Section II. Section III explains our interference model where we will propose our novel partially overlapped interference graph. Our interference-aware channel assignment algorithm i-POCA is presented in Section IV with its centralized and distributed version. Section V evaluates the performance of i-POCA algorithms followed by the related work in Section VI. Finally we conclude our paper and present the future work in Section VII.

II. MESH NETWORK INTERFERENCE TYPES

A wireless mesh network utilizing both orthogonal and non-orthogonal channels may suffer from interferences which can be characterized as follows.

- Co-channel Interference: This is the most common type of interference that exists in almost all wireless networks. It refers to the fact that radios belonging to two nodes, operating on the same channel would interfere with each other, if they are within the interference range of each other. This effectively means that parallel communication from two separate in-range nodes is not possible if such type of interference exist in a mesh network.
• **Adjacent Channel Interference:** This happens mostly when radios on two separate nodes are configured to partially overlapping channels. For example, in 802.11, a radio on node A is configured on channel-4 while another radio at neighboring node C is configured on channel-1; then the transmission from either node would experience some sort of partial interference. This type of interference also restricts parallel communication depending upon the channel separation and the physical distance between the two nodes.

• **Self Interference:** This is defined as transmission from a node interfering with one of its own transmissions. This is typically related to situations when nodes are equipped with multiple radios in a mesh network. Therefore, parallel communication cannot be achieved among multiple radios installed on a node, unless they are configured on completely orthogonal channels.

We believe that all of the above interference issues have to be considered when designing channel assignment algorithms to exploit the full potential of the available wireless spectrum.

### III. INTERFERENCE MODEL

It has been observed that the interference range of two node pairs communicating using POCs is much less than that of two node pairs communicating on same channel [1]. This is because; only a part of signal’s power from the sender is picked up by the receiver. The decrease in interference range is related to the amount of channel separation that exists between two neighboring POCs. To introduce our interference model for POCs, let us take a simple case where a sender node $s$ is transmitting at channel $i$ and a receiver node $u$ is receiving at channel $j$. We define $Th$ as the threshold that specifies the tolerance level of interference for successful communication. Let $P_t$ be the transmitted power of the signal and $D_{s,u}$ the physical distance between the sender and receiver, then under the two-ray ground propagation model of [12] for $s > 0.5$

$$Th < \frac{o(i,j)P_t K}{N D_{s,u}^2}$$  \hspace{1cm} (1)

where $K$ is a constant reflecting the effect of antenna gain and channel attenuation, $N$ is the ambient noise experienced by receiver $u$ and $o(i,j)$ is the path loss exponent. $o(i,j)$ is simply the convolution of power spectrum densities (PSDs) of the sending and receiving channels and thus the extent of overlap between channels $i$ and $j$. Therefore, equation 1 indicates the possibility of correctly receiving a transmission on a partially overlapping channel $j$ that was sent from channel $i$ as long as the received power is above the threshold.

Now we can define the POC interference range (adjacent channel interference range - ACIR) between two nodes that are configured on two adjacent channels $i$ and $j$ as:

$$ACIR(i,j) = \delta \left( \frac{o(i,j)P_t K}{N Th} \right)^{\frac{1}{n}} \hspace{1cm} (2)$$

where $\left( \frac{o(i,j)P_t K}{N Th} \right)^{\frac{1}{n}}$ is effectively the transmission range between two node’s channels and $\delta$ defines the coefficient that characterizes the impact of channel separation and the physical distance on the interference range. (The authors of [6] have conducted an experimental study to calculate the values of $\delta$ under different channel separations and variable transmission bit rates on multiple physical distances in 802.11b networks.)

Similarly, the co-channel interference range (CCIR) between two nodes configured on same channel can be defined as:

$$CCIR(i,j) = \left( \frac{P_t K}{N Th} \right)^{\frac{1}{n}} \text{ when } i = j \hspace{1cm} (3)$$

Note that $CCIR(i,j)$ is the interference range of a transmitting node which is typically taken as twice its transmission range.

#### A. Partially Overlapped Interference Graph (POIG) Model

The first step in developing mechanisms which take advantage of the partial overlap is to build a model that captures this overlap in a quantitative fashion. We introduce the partially overlapped interference graph (POIG) model which is a weighted undirected interference graph modeling an 802.11-based MRMC-WMN. The basic idea is to assign weights to the edges of our interference graph in such a way that they represent the amount of adjacent or co-channel interference that exists between two radios configured on POCs belonging to neighboring nodes. The edge weights measure the adjacent channel interference by taking into account the amount of channel overlap between two radios on adjacent nodes together with the physical distance between the corresponding nodes.

Let us consider a wireless mesh network with stationary wireless routers (nodes), where each node is equipped with a certain number of transceivers that can work on any channel provided by the IEEE 802.11 standard. For the sake of simplicity, we assume that all nodes transmit with the same transmission power. Given an initial channel assignment, an interference graph $G(V,E)$ can be constructed, such that the nodes are represented by the vertices $V$ in the graph and two nodes $s$ and $d$ are connected by a link $e \in E$ in the graph if they are within the interference range of each other and the link weight $w(l)$ is defined as:

$$w(l) = \frac{ACIR(i,j)}{CCIR(i,j)} \hspace{1cm} (4)$$

where $ACIR(i,j)$ is the interference range of a POC whose value will always be less than $CCIR(i,j)$ which is the co-channel interference range. Note that equation 4 is always mapped to a real number between $[0,1]$. The link weight is the ratio of the adjacent channel interference range to the co-channel interference when both the channels are same. Hence, our weight function in equation 4 quantifies the co-channel interference among the radios along with the physical distance separation between nodes in the form of measuring $ACIR(i,j)$ in a mesh network.

We illustrate the concept of our POIG model in Figure 1. The wireless network has three nodes $A$, $B$, and $C$, as shown in the communication graph (see Figure 1a). Node $A$ has two radios indicated by the rectangular shapes on top of that node and node $B$ and $C$ has only one radio each. Figure 1b shows the partially overlapped interference graph $G(V,E)$; each node’s radio in the communication graph is represented by a vertex $v \in V$ and an edge $ee \in E$ between two nodes exist in $G$ if and only if $w(e)$ > 0. In other words, if there is any interference between two radios in a network, it will be represented by a weighted edge $e$ in our interference graph with the weight showing the amount of interference experienced by these two radios based on the channel separation. If the two radios are on the same channel, then the edge weight would be 1, resulting in complete channel overlap and therefore maximum interference.

**Channel assignment (CA) problem.** Based on our POIG
model, the CA problem can be restated: To assign a POC to each node’s radio in the graph such that the channel separation between two adjacent node’s radio are maximized by choosing light weight links in the graph which would eventually results in reducing the overall network interference. The objective of our problem is therefore to minimize the overall network interference which results in improving the overall network capacity.

However, in our POIG model, since an edge weight represents the ratio of POC to co-channel interference, we can define a channel separation mapping function which derives the channel separation $C_{s,u}$ between two vertices $s$ and $u$ from the weight function in equation 4 as follows:

$$C_{s,u} = \begin{cases} 
2 & 0 < w(l) \leq 0.5 \\
5 & 0.5 < w(l) \leq 1 
\end{cases} \quad (5)$$

It was shown in [1] that two nodes configured on POC with channel separation larger than 2 provide the same throughput as two orthogonal channels in 802.11b networks. Similarly a channel separation of 5 means that the adjacent vertices should be assigned orthogonal channels. This channel separation mapping function is applied to the POIG graph (Figure 1b) and the corresponding link weights are mapped to the channel numbers as shown in Figure 1c. These channel numbers define the minimum separation that is required for a conflict free communication between two adjacent nodes. Note that the channel set on top of the nodes avoids self-interference issue by implementing the constraint that no two radios on a single node can have partially overlapped channels.

IV. i-POCA - CHANNEL ASSIGNMENT ALGORITHM

In this section, we propose i-POCA: which utilizes POCs for our channel assignment problem. We present two versions of i-POCA; the first is a centralized algorithm for interference avoidance exploiting partially overlapped channels. The second algorithm is a distributed interference-aware partially overlapping channel assignment algorithm based on smart ants inspired by the Ant Colony Optimization (ACO) framework [13].

A. Centralized Algorithm (i-POCA-C)

Centralized algorithms are (arguably) realistic in infrastructure WMNs where they are normally controlled by a single entity. Our proposed centralized i-POCA algorithm consists of three components, namely interference graph (POIG) construction, link ordering and channel assignment.

POIG construction. The first step of our centralized algorithm involves the construction of the partially overlapped interference graph (POIG). The interference graph of the whole network is constructed by a designated node (server) in the mesh network and each node measures the interference values for all channels supported by its radios and periodically sends this information to the server. The server first constructs the interference graph with the help of neighbor information that was sent by all the nodes and then uses the interference estimates and associates with each link a weight by plugging the corresponding values into the link weight equation 4.

Link ordering. After the construction of the interference graph, the server arranges the communication links based on their weights. The main purpose of this component is to describe in which priority the links should be assigned channels. The links are arranged in the descending order of link weight values.

Channel assignment. Finally, the last component of our centralized CA algorithm assigns channels to the links of the interference graph (POIG). We have used a greedy strategy of selecting the channels based on the link weights in the graph. The server assigns a particular channel to a link using the channel separation mapping function described in equation 5. Note that with this type of channel assignment, if the link weight is high (since they are already ordered in descending order), orthogonal channels are being assigned first and when they are exhausted then partial overlap channels are assigned by the algorithm. This would eventually result in less interference and increased channel utilization.

The pseudo-code for the centralized CA algorithm using POCs is shown in Algorithm 1. Line 3 orders the edges according to the edge weights in descending fashion. Line 5-9 assign channels to the edges based on their weight by first trying to assign any free orthogonal channel to the link, if it succeeds then it moves to the next edge (iteration) otherwise pick a POC.

B. Distributed Algorithm (i-POCA-D)

i-POCA-D performs the channel assignment with the help of smart ants, the idea of which is derived from the framework of Ant Colony Optimization (ACO) [13]. A brief overview of ACO framework is provided below.

ACO Overview. ACO algorithms draw their inspiration from the behavior of real ants, which are known to find the shortest path between their nest and a food source by a process where they deposit pheromones along trails. In an ACO framework, artificial ants move stochastically in the solution space therefore they can explore a wider variety of possible solutions of a problem independently and in parallel. A more detailed explanation of the ACO framework can be found in [13]. There are a number of ACO approaches that have been proposed for solving optimization problems but to the best of our knowledge our proposed distributed interference-aware CA algorithm is among the first works that investigates the use of such biological agents (artificial ants) in MRMC-WMNs and demonstrates a possible performance advantage.

Algorithm. The first step in designing a distributed channel assignment algorithm is to build the interference graph which can be constructed only based on local topology information. Each node computes its local interference graph by periodically...
sending small control packets called *smart ants* to its two-hop neighbors. The ants contain the connectivity and all channel interference information that a particular node has measured so far. Based on this information, nodes construct their local view of the partially overlapped interference graph (POIG). After the construction of the POIG, nodes generate special ants called *channel ants* whose role is to iteratively assign POCs to nodes of the interference graph by traversing a path with the objective of minimizing the local network interference at each iteration. At any node \(i\), channel ant \(k\) selects the next node to assign POCs according to a probabilistic decision rule which is a function of a local pheromone value (maintained by node \(i\)) and a heuristic. Equation 6 shows the probability with which ant \(k\) performs the transition from node \(i\) to node \(j\):

\[
P_{Lj}^k = \frac{[\varepsilon_{ij}]^\alpha [w_{ij}]^\beta}{\sum_{i \in N_i} [\varepsilon_{ij}]^\alpha [w_{ij}]^\beta}
\]

where \(\varepsilon_{ij}\) is the value of the pheromone intensity associated with the edges and \(w_{ij}\) is the local heuristic calculated prior; \(w_{ij}\) indeed represents the link weights in the interference graph which models the adjacent channel interference between the two nodes on both ends of the link together with the physical separation of these nodes. \(\alpha\) and \(\beta\) are two parameters which determine the relative influence of the pheromone intensity and the link weight respectively; \(N_i\) is the list of neighbors of node \(i\) that ant \(k\) has not visited yet. *Channel ants* keep record of the POCs that they assigned to the nodes so far in a list (also called a tabu list) which will help in making sure that a channel does not get re-assigned a second time during the ants’ travel.

**Algorithm 1**: Centralized channel assignment algorithm using partially overlapped channel - \(i\)-POCA-C

1. Let \(E=\{e|e \in \text{POIG}\}\)
2. Let \(K= C^e \cup C^p\) List of all available channels where \(C^e=\{c_1, c_2, \ldots, c_n\}\) List of un-assigned orthogonal channels and \(C^p=\{c_1, c_2, \ldots, c_n\}\) List of un-assigned (POCs)
3. Order Link(E)
4. While size(E) > 0 do
5. \(E= \text{removeHead}(E)\)
6. If \(w(e) > 0.5\) then
7. \(c \leftarrow c \in C^a\) assign orthogonal channel \(c\) from the set of free channels to the edge, making the channel separation either one of these \(\delta=\delta_{c,c}\)
8. Else
9. \(c \leftarrow c \in C^p\) assign POC \(c\) to the edge, making the channel separation either one of these \(\delta=\delta_{c,c}\)
10. end while

**Algorithm 2**: Distributed channel assignment algorithm using partially overlapped channel - \(i\)-POCA-D

1. Construct "Local" partially overlapped interference graph (POIG)
2. Initialize the pheromone trails of each edge by a constant
3. Repeat
4. Move to the next node according to probability function (Equation 6)
   Among all the node’s outgoing links \((i,j)\) from the list, choose the one to assign channel that produces largest decrease in local interference.
5. For each edge do
6. Update the pheromone intensity using the pheromone updating rule in Equation 8
7. End for
8. Until a maximum number of iterations in terms of channel ant generation is achieved

how wide the channel separation is. The channel separation can be calculated using equation 5. Now, the pheromone values can be updated as:

\[
\varepsilon_{Lj} = (1 - \rho)\varepsilon_{Lj} + \sum_{k=1}^{N} \varepsilon_{Lj}
\]

The proposed distributed \(i\)-POCA algorithm is summarized in Algorithm 2. Initially, all the nodes are assigned a random channel and from there on the algorithm starts. Each channel ant belonging to a node in a mesh network performs the above mentioned task in Algorithm 2 locally in a cooperative manner to support the global optimal partially overlapped channel problem.

**V. PERFORMANCE EVALUATION**

In this section we show simulation results to evaluate both versions of our \(i\)-POCA algorithms, i.e., \(i\)-POCA-C and \(i\)-POCA-D. We compare the performance of our proposed schemes to a centralized channel assignment algorithm (similar to \(i\)-POCA-C) using only orthogonal channels (C-3 channels) and with CAPEO [14] which utilizes both orthogonal and overlapping channels for channel assignment. Briefly, in CAPEO, each node has two radios, one is fixed and the other one can be switched to different channels depending upon the traffic characteristics. Basically, it consists of a metric to calculate interference and that metric is then used to assign channels to the links with the objective of minimizing network interference.

The goals of our evaluations are to quantify i) the effectiveness of the interference-aware partially overlapping channel assignment algorithm in mitigating interference and ii) the benefit of using POCs over orthogonal channels. In particular, we study the impact of \(i\)-POCA in improving throughput in an 802.11b based MRMC-WMN. The algorithms are compared in terms of their performance in network throughput, packet delivery ratio and channel utilization ratio. Our simulations were performed using NS3. Each of our depicted data points is an average over enough simulation runs to claim a 95% confidence that the relative error of them is less than 5%.

Since, most of the traffic in a real WMN is either to or from a wired network (i.e., through Internet gateway points), in our simulations, all flows are destined to multiple gateway nodes. IEEE 802.11b is used as the wireless technology. We randomly generate networks of size 1000m x 1000m each having 20 nodes. All nodes in our studies are equipped with two radios.
We generate a certain number of UDP flows on the network destined to 3 gateway nodes. The packet size in all the flows is fixed to 512 bytes. For our distributed smart ant based channel assignment algorithm (i-POCA-D), the values of parameter $\alpha$ and $\beta$ are set to be 2 and 9 respectively. The evaporation rate $\rho$ is set to $\rho=0.2$, and the algorithm terminates after 20 iterations i.e. smart ant generation rate=20. These parameters are tuned based on extensive experiments which are not shown here due to space limitation.

Figure 2. shows the network throughput of the various schemes as a function of traffic load on the network. We can observe that both the centralized and distributed versions of i-POCA outperform the other schemes. In particular, i-POCA-C achieves 38.9% and 36.3% higher throughput than it’s orthogonal and CAEPO counterpart respectively. The reason for this performance improvement lies in the intelligent interference modeling of our proposed algorithm in the form of partially overlapped interference graph (POIG). Although, i-POCA-D performs better than CAEPO and C-3 using only orthogonal channel (3 channels - 802.11b), note that i-POCA-C provides 11.2% higher throughput than even i-POCA-D. The reason for this relatively poor performance of our smart ant based algorithm is because of its computational complexity in calculating POIG in a distributed manner. For example, the cost of message exchange in terms of smart ant generations, and assignment of POCs to radios by channel ants would naturally eat network resources that could have been used by sending data traffic. In future, we plan to exhaustively measure the control overhead of our distributed scheme and hence its impact on network performance. We will see this pattern of lower i-POCA-D performance over i-POCA-C in our other simulation results also.

We now investigate the packet delivery ratio (PDR) with varying number of nodes in the network. We measure the PDR metric as the number of packets received at the destinations (gateways) to the total number of packets pumped into the network. It can be seen from figure 3, that PDR decreases as the number of nodes in the network increases (so does the flows). When the network size is small, i.e. 20 nodes, all the schemes perform almost equally well, however, as the network size scales, nodal density increases which results in severe contention on the links. This causes the performance degradation in the network. The use of partially overlapping channels in our proposed channel assignment schemes relieves the contention by assigning POCs to links and therefore, PDR of i-POCA-C is around 13.9% higher than CAEPO scheme and consequently 37.3% higher than the channel assignment algorithm using only orthogonal channels (C-3). Although, CAEPO algorithm does exploit both orthogonal and non-orthogonal channels, however, the fact that i-POCA takes into account both the partial interference and the physical distance between the interfering nodes helps to accurately measure the interference thereby resulting in improved performance than CAEPO algorithm.

Finally, in order to find out how good our proposed channel assignment algorithm is in using partially overlapping channels, we use a metric called channel utilization ratio which is defined as the fraction of the number of radios configured to a particular channel to the total number of radios in the MRMC-WMN. Figure 4. shows the distribution of each individual channel in the network. It is evident that i-POCA-C&D and CAEPO utilize more channels more uniformly than C-3, which only uses three orthogonal channels. The efficient allocation of partially overlapped channels minimizes the interference resulting in more parallel communications than using only orthogonal channels thereby increasing the overall network throughput. Similarly, figure 5. shows us another channel utilization ratio but this time with increasing number of nodes in the network. The formula to calculate channel utilization ratio is also changed to: the number of radios configured to a particular channel to the total number of channels in the network i.e. 11 channels (802.11b) as in our previous definition of channel utilization ratio the number of radios in a network can be larger than the number of channels. It can be seen that when there are less number of nodes in the network, assigning POCs does not give too much performance advantage as compared to when the number of nodes are high. One possible reason for this behavior is that if the nodes are distributed sparsely, they might be out of interference range of each other, and can be assigned orthogonal channels thus resulting in parallel transmission without exploiting overlapping channels. Therefore, the benefit of i-POCA algorithm or any other partially overlapping channel assignment algorithm can truly be appreciated when the nodal density is high in a typical WMN as shown in figure 5 because in that case i-POCA can find much better re-use of space and spectrum.

VI. RELATED WORK

There have been research efforts in using POCs for channel assignment in wireless networks [6-11]. One of the first studies on exploiting partially overlapped channels appears in [1]. The paper shows that a systematic approach to exploit channels with partial spectrum overlap can lead to efficient spectrum utilization and improved network throughput in a wireless LAN environment. They have also provided empirical results showing that two links operating on partially overlapped channels with a separation of three-channels provides the same level of throughput as when they are operating completely on orthogonal channels.

In [6], Ding, et al., proposed a genetic algorithm for POC-based channel assignment in WMNs. In order to model the interference accurately, they have extended the traditional conflict graph model to capture the interference by taking into account both the channel separation and the physical distance of the nodes. They have shown through simulations that POC works better in denser networks.

In [7] a centralized heuristic based channel assignment algorithm for POCs is proposed. The authors develop an interference model called I-Matrix that measures the co-channel and adjacent channel interference among the nodes in order to assign channels to radios efficiently. Given the network topology their heuristic algorithm arranges the links according to their nodal degree. One of the drawbacks of this scheme is that it does not take into account the self-interference issue typically common in a MRMC-WMN, in which a node having multiple radios cannot transmit packets simultaneously on all of its radios unless they are configured on orthogonal channels. To overcome these issues the authors of [10] have extended the work of [7].

Recently, Cui, et al., [9] have proposed an approximation algorithm to get the channel assignment solution in 802.11 based wireless networks. The objective of their approximation algorithm is to minimize total network interference for throughput maximization. The authors introduced the notion of node orthogonality to capture the fact that two nodes on adjacent channels are orthogonal if they are physically
sufficiently apart. They have demonstrated that the network throughput can be increased by using overlapping channels. However, their proposed solution addresses single radio WMNs. Our proposed algorithm is designed for multi radio multi channel WMNs and uses a more accurate partially overlapping interference graph model to capture all types of interferences that exists in WMNs.

Figure 2. Network throughput

![Figure 2. Network throughput](image)

Figure 3. Packet delivery ratio

![Figure 3. Packet delivery ratio](image)

Figure 4. Channel utilization vs. channel number

![Figure 4. Channel utilization vs. channel number](image)

Figure 5. Channel utilization vs. number of nodes

![Figure 5. Channel utilization vs. number of nodes](image)

VII. CONCLUSION

We proposed a POC based channel assignment algorithm called $i$-POCA for interference avoidance in IEEE 802.11-based MRMC-WMNs. A novel partially overlapped interference graph (POIG) model is presented which tries to capture all types of interference typically exist in a MRMC-WMN. Based on this model, we designed a centralized and a distributed version of $i$-POCA employing smart ants for assigning POCs to radios with the objective of minimizing overall network interference. Our simulation results show that $i$-POCA using POCs reaches better throughputs than existing channel assignment schemes.

The evaluations shown in this paper serve only as a proof of concept for $i$-POCA. In the near future, we plan to investigate our $i$-POCA scheme on a real wireless mesh network test bed consisting of 802.11n mesh nodes (which are more common nowadays and provide many orthogonal channels) in our information technology building and compare the performance of $i$-POCA with other existing POC based channel assignment algorithms like [7] and [10].

REFERENCES