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Simulation and channel assignment by Simulated Annealing of a wireless mesh network using Dynamic Spectrum Access

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Abstract:

This work tackles a new angle to the Channel Assignment (CA) problem, which has otherwise been fairly widely studied for allocating channels optimally to access points and ad-hoc network nodes. Wireless Mesh Networks (WMNs) using Dynamic Spectrum Access (DSA), such as Television White Spaces (TVWS), create new avenues for research due to the additional constraints and complexity. For the production of controlled and repeatable experiments and design of CA algorithms without the drawbacks and difficulties of real hardware, we use Network Simulator 3 (ns3). In this paper we address the construction of an experimental setup in ns3 for evaluating CA algorithms in a DSA WMN environment. Additionally, we propose a solution to the CA problem in this scenario using Simulated Annealing. We simulate TVWS device operation by adding TVWS channels (this can be extended to include any new DSA bands), provide a framework for multi-radio multi-channel WMN experiments, and present and analyse the performance of a CA algorithm. Results show that the proposed algorithm provides channel assignments with much improved performance (120%-755% better) over random channel assignments.