

## 基于部分重叠信道的 WMNs 多播信道分配方法研究

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## 摘 要

无线 Mesh 网络(Wireless Mesh Networks, WMNs)作为下一代无线网络的发展方向之一,具有多跳、自组织、高宽带、健壮性和兼容性等特点,相比其他无线网络,其优势在于覆盖范围更广、接入更可靠、服务更全面,因此得到广泛的关注。多播通信可以节省网络带宽,为许多实时应用提供服务,最大化 WMNs 服务的用户数。多接口多信道(Multi-Radio Multi-Channel, MRMC)技术可以增加整个网络可用带宽、提升网络容量,但由于 IEEE 802.11b/g 最多只提供 3 条正交信道,导致网络同信道干扰增大,网络质量严重下降。只有在干扰允许的范围内合理的利用部分重叠信道,才能降低干扰、增加并行传输数、提升网络容量。目前信道分配的研究主要集中在干扰感知上而忽略负载感知方面的影响。本毕业设计研究基于部分重叠信道的 MRMC-WMNs 中给定多播树的负载感知多播信道分配。在给定的多播树下,通过求解带约束的整数线性规划得到最大服务用户数,从而得到最优的信道分配决策。所考虑的约束条件包括节点有效载荷、信道容量约束和同级链路约束。为降低问题求解的难度,提出一种启发式负载感知多播信道分配算法。所提算法引入有效载荷概念,计算以节点为根的子树覆盖的用户总数,根据有效载荷降序排列,为有效载荷最大的链路分配干扰最小的信道,且采用最大信道号信道分配方法。仿真结果表明,该启发式算法在显著降低计算复杂度的同时,可以达到接近最优的性能。

**关键词:** 无线 Mesh 网络; 多播; 信道分配; 负载感知; 部分重叠信道

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## ABSTRACT

Wireless mesh networks(WMNs), as one of the development directions of the next generation wireless network, have the characteristics of multi hop, self-organization, high broadband, robustness and compatibility. Compared with other wireless networks, WMNs has the advantages of wider coverage, more reliable access and more comprehensive services, so they have been widely concerned by scholars and industries. Multicast communication can save network bandwidth, provide services for many real-time applications, and maximize the number of users of WMNs services. Multi-Radio multi-channel(WRMC) technology can improve the available bandwidth of the whole network and the capacity of the network, but as IEEE 802.11b/g can only provide three orthogonal channels at most, which may cause co-channel interference, and the network quality declines seriously. Only when partially overlapped channels are used reasonably within the allowable range of interference, can the interference be reduced, the number of parallel transmissions be increased, and the network capacity be increased. At present, research on channel allocation mainly focuses on interference perception and ignores the influence of load perception. This thesis studies the load-aware multicast channel allocation for given multicast tree in MRMC-WMNs based on partially overlapped channels. Under the given multicast tree, the maximum number of served users is obtained by solving constrained integer linear programming, and the optimal channel allocation decision is obtained. The node payload, channel capacity and peer link constraints are considered. A heuristic load aware multicast channel allocation algorithm is proposed. In this paper, the concept of payload is introduced to calculate the total number of users covered by the sub-tree rooted at the node. According to the descending order of the payload, the channel with the least interference is allocated to the link with the largest payload, and the channel allocation method with the largest channel number first is adopted. Simulation results show that the heuristic algorithm can achieve near optimal performance while significantly reducing the computational complexity.

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**Keywords:** wireless mesh networks; multicast; channel assignment; load-aware;

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