

**MULTICAST IN MULTIHOP CRNS UNDER UNCERTAIN  
SPECTRUM AVAILABILITY: A NETWORK  
CODING APPROACH**

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# ABSTRACT

- The benefits of network coding on multicast in traditional multihop wireless networks have already been extensively demonstrated in previous works. However, most existing approaches cannot be directly applied to multihop cognitive radio networks (CRNs), given the unpredictable primary user occupancy on licensed channels. Specifically, due to the unpredictable occupancy, the channel's available bandwidth is time-varying and uncertain.
- Accordingly, the capacity of the link using that channel is also uncertain, which can significantly affect the network coding subgraph optimization and may result in severe throughput loss if not properly handled. In this paper, we study the problem of network coding-based multicast in multihop CRNs while considering the uncertain spectrum availability.



## CONT...

- To capture the uncertainty of spectrum availability, we first formulate our problem as a chance-constrained program. Given the computational intractability of the above-mentioned program, we then transform the original problem into a tractable convex optimization problem, through appropriate Bernstein approximation with relaxation on link scheduling.
- We further leverage Lagrangian relaxation-based optimization techniques to propose an efficient distributed algorithm for the original problem. Extensive simulation results show that the proposed algorithm achieves higher multicast rates, compared with a state-of-the-art non-network coding algorithm in multihop CRNs, and a conservative robust network coding algorithm that treats the link capacity as a constant value in the optimization.



## EXISTING SYSTEM

- Indeed, most existing works on network coding-based multicast cannot handle new challenges arising from CRNs, e.g., the uncertainty of spectrum availability. Particularly, in the optimization of traditional wireless networks, the link capacity is usually assumed as a fixed value.
- However, in CRNs, due to unpredictable primary occupancy on licensed channels, the availability of the channel (i.e., on/off) follows some probability distribution in the time domain, while the unoccupied bandwidth of an available channel is uncertain in the frequency domain, in the sense that it is a random variable satisfying some certain distribution. That is to say, the capacity of a link using that channel is also a random variable.



# PROPOSED SYSTEM

- The proposed system decompose the overall problem into two relatively independent subproblems, i.e., a multiple-shortest-paths problem with channel availabilities constraints and a maximum-weighted-stable-set problem on the TDCG, respectively.
- Then, we propose an efficient distributed algorithm for network coding-based multicast in multi-hop CRNs, to simultaneously optimize the flow rate and coding subgraph with channel selection.

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# HARDWARE REQUIREMENTS

- Processor - Pentium-IV
- Speed - 1.1 Ghz
- RAM - 256MB(min)
- Hard Disk - 20 GB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

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## SOFTWARE REQUIREMENTS

- Tool - Network Simulator-2
- Operating system - LINUX
- Front end - OTCL (Object Oriented Tool Command Language)

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# REFERENCES

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