The University of Alabama
Department of Computer Science
Colloquium Series

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Video over Cognitive Radio Networks

Monday, March 29th

<u>**Presentation at 11:00 a.m. in SEC 3437, refreshments across the hall in SEC 3438 at 10:45 a.m.**</u>

Abstract:
We investigate the problem of scalable video multicast in emerging cognitive radio (CR) networks. Although considerable advances have been made in CR research, such important problems have not been well studied. Naturally, "bandwidth hungry" and rate-adaptive multimedia applications are excellent candidates for fully capitalizing the potential of CRs. We propose a cross-layer optimization approach to multicast video in CR networks. In this talk, we first consider an infrastructure-based CR network collocated with N primary networks. Fine-Granularity-Scalability (FGS) videos are adopted to accommodate the heterogeneity among channel availabilities and dynamic network conditions. We model CR video multicast over the N channels as a mixed integer nonlinear programming (MINLP) problem. The objective is three-fold: to optimize the overall received video quality; to achieve proportional fairness among multicast users; and to keep the interference to primary users below a prescribed threshold. We develop a sequential fixing algorithm and a greedy algorithm to solve the MINLP, while the latter has low complexity and proven optimality gap. We next consider streaming multiple FGS videos over multi-hop cognitive radio (CR) networks. We solve the formulated MINLP problem using a centralized sequential fixing algorithm, which provides upper and lower bounds for the achievable video quality. We then apply dual decomposition to develop a distributed algorithm and prove the optimality and convergence conditions. The proposed algorithms are evaluated with simulations and are shown to be effective in supporting FGS video over CR networks.

Bio:
Shiwen Mao received his Ph.D. degree in electrical and computer engineering from Polytechnic Institute of New York University, Brooklyn, NY (formerly known as Polytechnic University) in 2004. He was a Research Member with IBM China Research Lab, Beijing, P.R. China from 1997 to 1998 and a Research Scientist in the Bradley Department of Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA from 2003 to 2006. Currently, he is an Assistant Professor in the Department of Electrical and Computer Engineering, Auburn University, Auburn, AL.

Dr. Mao's research interests include cross-layer optimization of wireless networks and multimedia communications, with current focus on cognitive radio networks and free space optical networks. He is on the Editorial Board of IEEE Transactions on Wireless Communications, Elsevier Ad Hoc Networks Journal, Wiley International Journal of Communication Systems, and ICST Transactions on Mobile Communications and Applications. He is a coauthor of TCP/IP Essentials: A Lab-Based Approach (Cambridge University Press, 2004). Dr. Mao received the 2004 IEEE Communications Society Leonard G. Abraham Prize in the Field of Communications Systems and the Best Paper Runner-up Award from the Fifth International Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine) 2008. He is a Senior Member of the IEEE.

More details can be found at: http://www.eng.auburn.edu/~szm0001/