



Princeton University
Department of Electrical Engineering
Information Sciences and Systems (ISS)
Seminar ELE 519-Spring 2008

Speaker: Narayan B. Mandayam, Professor of Electrical and Computer Engineering, Rutgers University

Date: Thursday, May 1st

Time: 4:30pm

Room: B205 ~ Equad

Title: Cognitive Radio Networks

Abstract: Recent advances in programmable integrated circuits have created an opportunity to develop a new class of intelligent or “cognitive” radios which can adapt to a wide variety of radio interference conditions and multiple protocol standards for collaboration between otherwise incompatible systems. Such a cognitive radio would be capable of very dynamic physical layer adaptation via scanning of available spectrum, selection from a wide range of operating frequencies (possibly non-contiguous), rapid adjustment of modulation waveforms and adaptive power control. In addition, a suitably designed cognitive radio with a software-defined physical layer would be capable of collaborating with neighboring radios to ameliorate interference using higher-layer protocols. Perhaps for the first time in the short history of networking, cognitive radios offer the potential for organic formation of “infrastructure-less” collaborative network clusters with dynamic adaptation at every layer of the protocol stack including physical, link and network layers. While the development of cognitive radio hardware and software, especially at the physical layer, has received considerable attention, the question of how one transforms a set of cognitive radios into a cognitive network is much less well understood. This talk will present an overview of cognitive radio network research from the points of view of information and coding theory, game theory, collaborative and cooperative communications. The implications of such cognitive radio networks to spectrum policy as well as the design of the future internet will also be highlighted.

Bio: Dr. Mandayam received the B.Tech (Hons.) degree in 1989 from the [Indian Institute of Technology, Kharagpur](#), and the M.S. and Ph.D. degrees in 1991 and 1994 from [Rice University](#), Houston, TX, all in electrical engineering. From 1994 to 1996, he was a Research Associate at the Wireless Information Network Laboratory (WINLAB), Dept. of Electrical & Computer Engineering, Rutgers University. In September 1996, he joined the faculty of the ECE department at Rutgers where he became Associate Professor in 2001 and Professor in 2003. Currently, he also serves as Associate Director at WINLAB. He was a visiting faculty fellow in the Department of Electrical Engineering, [Princeton University](#) in Fall 2002 and a visiting faculty at the [Indian Institute of Science](#) in Spring 2003. His research interests are in various aspects of wireless data transmission including system modeling and performance, signal processing and radio resource management with emphasis on techniques for cognitive radio technologies.

Dr. Mandayam is a recipient of the Institute Silver Medal from the Indian Institute of Technology, Kharagpur in 1989 and the [National Science Foundation](#) CAREER Award in 1998. He is a coauthor with [C. Comaniciu](#) and [H. V. Poor](#) of the book "[Wireless Networks: Multiuser Detection in Cross-Layer Design](#)," Springer, NY. He has served as an Editor for the journals IEEE Communication Letters (1999-2002) and B IEEE Transactions on Wireless Communications (2002-2004). He has served as a guest editor of the IEEE JSAC Special Issue on [Adaptive, Spectrum Agile and Cognitive Radio Networks](#). He is also serving as a guest editor of the upcoming IEEE JSAC Special Issue on [Game Theory in Communication Systems](#).