

Special Lecture

on March 2 (13:00~16:10) and March 3 (8:50~12:00)

No. 106, 1F, Research Building 2

Lecture Title: Cognitive and Cooperative Wireless Communications

Time Duration: 6 hours for two days

Lecturer: Dr Ying-Chang Liang,

Senior Scientist, Institute for Infocomm Research, Singapore

Abstract: Access to radio spectrum today is largely based on fixed spectrum management and allocation. With the proliferation of wireless applications/services in the last couple of decades, in many countries, most of the available spectrum has been allocated. This results in the radio spectrum scarcity which poses a serious problem for the future development of the wireless communications industry. On the other hand, careful studies of the usage pattern reveal that most of the allocated spectrum experiences low utilization. This motivates the concept of opportunistic spectrum access using cognitive radio technology, which allows secondary users to reuse the unused radio spectrum from primary users.

In this lecture, we will provide a state-of-art overview on cognitive radio networks and dynamic spectrum access, covering the theoretical aspects, enabling techniques, practical applications as well as technical challenges. In particular, the following topics will be covered in details.

- (1) Cognitive radio basics
- (2) Spectrum sensing techniques
- (3) Sensing-through tradeoff for dynamic spectrum access
- (4) Signal processing for dynamic spectrum access schemes
- (5) Exploiting multiple antennas for spectrum sharing
- (6) Cooperative wireless communications
- (7) Cognitive radio applications

Dr Ying-Chang Liang is now Senior Scientist in the Institute for Infocomm Research (I²R), Singapore, where he has been leading the research activities in the area of cognitive radio and cooperative communications. He also holds adjunct associate professorship positions in Nanyang Technological University (NTU) and National University of Singapore (NUS), both in Singapore, and adjunct professorship position with University of Electronic Science & Technology of China (UESTC). He has been teaching graduate courses in NUS since 2004. From Dec 2002 to Dec 2003, Dr Liang was a visiting scholar with the Department of Electrical Engineering, Stanford University. His research interest includes cognitive radio, dynamic spectrum access, reconfigurable signal processing for broadband communications, space-time wireless communications, wireless networking, information theory and statistical signal processing.

Dr Liang is now an Associate Editor of *IEEE Transactions on Vehicular Technology*. He was an Associate Editor of *IEEE Transactions on Wireless Communications* from 2002 to 2005, Lead Guest-Editor of *IEEE Journal on Selected Areas in Communications*, Special Issue on Cognitive Radio: Theory and Applications, and Guest-Editor of *COMPUTER NETWORKS Journal (Elsevier)* Special Issue on Cognitive Wireless Networks. He received the Best Paper Awards from IEEE VTC-Fall'1999 and IEEE PIMRC'2005, and 2007 Institute of Engineers Singapore (IES) Prestigious Engineering Achievement Award. Dr Liang has served for various IEEE conferences as technical program committee (TPC) member. He was TPC Co-Chair of 2006 IEEE International Conference on Communication Systems (ICCS'2006), and 3rd International Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom'2008), Deputy Chair of 2008 IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks (DySPAN'2008), and Co-Chair, Thematic Program on Random matrix theory and its applications in statistics and wireless communications, Institute for Mathematical Sciences, National University of Singapore, 2006. Dr Liang is a Senior Member of IEEE.