T3. Resource Allocation in Wireless Physical Layer Security

Abstract:

Wireless physical layer security is an emerging security concept that achieves perfect secrecy data transmission between the intended network nodes, while the malicious nodes obtain zero information. It serves an alternative to cyber encryption, and attracts great attentions recently. Most of research for physical layer security is from the information theory perspectives. However, less study is investigated from the resource allocation point of view. This tutorial will take a comprehensive and coordinated approach in presenting the ways of physical layer security enhancement with the use of resource allocation tools (such as game theory). There are four main objectives of this tutorial. First, we intend to provide a general introduction to physical-layer security from information, signal processing, and radio resource allocation points of view. Second, we discuss how the source nodes can improve the performance by jointly cooperate using collaborative beamforming and relaying techniques. Third, we intend to present the use of game theory along with resource optimization for security improvement, and topics such as non-cooperative game, auction game, coalition game etc. will be provided. Finally, we summarize and categorize the working scenarios of unsecure networks, including OFDMA based cellular networks, relay networks, and jammer aided networks, etc. Some cross-layer issues by jointly considering signal processing and resource allocation will be also provided.

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Lingyang Song received his PhD from the University of York, UK, in 2007, where he received the K. M. Stott Prize for excellent research. He worked as a postdoctoral research fellow at the University of Oslo, Norway, until joining Philips Research UK in March 2008. In May 2009, he joined the School of Electronics Engineering and Computer Science, Peking University, China, as a full professor. His main research interests include MIMO, cooperative communications, physical layer security, and game theory. He is currently on the Editorial Boards of Journal of Network and Computer Applications, and IET Communications. He was a guest editor of Wireless Communications and Mobile Computing (Wiley Publication), special issue on "Emerging Techniques for Wireless Vehicular Communications", and a guest editor of Elsevier Computer Communications, special issue on "Adaptive Multicarrier Communications and Networks", a guest editor of EURASIP Journal on Wireless Communications and Networking, special issue on "OFDMA Architectures, Protocols, and Application". He is co-inventor of a number of patents (standard contributions), and author or co-author of over 100 journal and conference papers. He received the best paper award in IEEE International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM 2007), the best paper award in the First IEEE

International Conference on Communications in China (ICCC 2012), and the best paper award in IEEE Wireless Communication and Networking Conference (WCNC 2012).

Zhu Han received the B.S. degree in electronic engineering from Tsinghua University, in 1997, and the M.S. and Ph.D. degrees in electrical engineering from the University of Maryland, College Park, in 1999 and 2003, respectively. From 2000 to 2002, he was an R&D Engineer of JDSU, Germantown, Maryland. From 2003 to 2006, he was a Research Associate at the University of Maryland. From 2006 to 2008, he was an assistant professor in Boise State University, Idaho. Currently, he is an Assistant Professor in Electrical and Computer Engineering Department at University of Houston, Texas. His research interests include wireless resource allocation and management, wireless communications and networking, game theory, wireless multimedia, and security. Dr. Han is an NSF CAREER award recipient 2010. Dr. Han is an Associate Editor of IEEE Transactions on Wireless Communications since 2010. Dr. Han was the MAC Symposium vice chair of IEEE Wireless Communications and Networking Conference, 2008. Dr. Han was the Guest Editor for Special Issue on Cooperative Networking Challenges and Applications (IEEE Journal on Selected Areas in Communications) Fairness of Radio Resource Management Techniques in Wireless Networks (EURASIP Journal on Wireless Communications and Networking), and Special Issue on Game Theory (EURASIP Journal on Advances in Signal Processing). Dr. Han is the winner of the 2011 IEEE Communications Society Fred W. Ellersick Prize. Dr. Han is the coauthor for the papers that won the best paper awards in IEEE International Conference on Communications 2009, 7th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt09), IEEE Wireless Communication and Networking Conference 2012, and IEEE Smartgrid Communication Conference 2012. Dr. Han is an IEEE Senior Member.