Exploiting Multiuser Diversity in Wireless Interference Networks

Interference has always been the bottleneck for performance improvement in many wireless networks. Recent advance in interference alignment (IA) has inspired many solutions to better manage interference in various kinds of wireless interference networks. However, traditional IA techniques either require global channel state information (CSI) or sophisticated iterative algorithms to design the transmit/receive beamforming matrices, which are relatively complicated for realistic implementation. In this talk, some practical and low−complexity solutions are considered, which exploit multiuser diversity gain to improve transmission performance of wireless interference networks. To start with, several novel opportunistic interference alignment (OIA) schemes are proposed to mitigate interference in cellular networks, where OIA for downlink and uplink transmissions are separately studied. It is shown that the proposed OIA schemes significantly outperform the limited−feedback schemes in terms of throughput and implementation complexity. Besides cellular networks, the principle of IA has been tailored to achieve signal space alignment (SSA), by combining physical layer network coding technique, for efficient transmission in multi−way relay systems. For one fundamental multi−way relay channel, the MIMO−Y channel, a simple opportunistic signal space alignment (OSSA) scheme is proposed. The multiuser diversity gain in the MIMO−Y channel is analysed, and some interesting phenomena are observed. Finally, a joint OIA−OSSA scheme is proposed for the multi−pair two−way relay interference channel, and some initial results are presented to inspire future work.

Dr Chau Yuen received the B. Eng and PhD degree from Nanyang Technological University, Singapore in 2000 and 2004 respectively. He is the recipient of Lee Kuan Yew Gold Medal, Institution of Electrical Engineers Book Prize, Institute of Engineering of Singapore Gold Medal, Merck Sharp & Dohme Gold Medal and twice the recipient of Hewlett Packard Prize. Dr Yuen was a Post Doc Fellow in Lucent Technologies Bell Labs, Murray Hill during 2005. He was a Visiting Assistant Professor of Hong Kong Polytechnic University in 2008. During the period of 2006 -2010, he worked at the Institute for Infocomm Research (Singapore) as a Senior Research Engineer, where he was involved in an industrial project on developing an 802.11n Wireless LAN system, and participated actively in 3Gpp Long Term Evolution (LTE) and LTE-Advanced (LTE-A) standardization. He has published over 100 research papers at international journals or conferences. His present research interests include green communications, smart grid, cooperative transmissions, cognitive network, network coding, and distributed storage. He joined Singapore University of Technology and Design as an assistant professor from June 2010. He also serves as an Associate Editor for IEEE Transactions on Vechicular Technology, and awarded as Top Associate Editor from 2009 - 2011. On 2012, he received IBM Smarter Planet Faculty Innovation Award and IEEE Asia-Pacific Outstanding Young Researcher Award. Currently, he is leading a study group for Singapore Information Technology Standards Committee on Sensor Network.

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