

Jointly Organized by

School of Electrical & Electronic Engineering (EEE), Nanyang Technological University (NTU)

IEEE Singapore Section

IEEE Communications Society Singapore Chapter

IEEE Signal Processing Society Singapore Chapter

1. Seminar (tutorial-type)

Title: Optimization-Boosted Beamforming: From Receive and Transmit Methods to Cooperative Relay Techniques
Speaker: **Professor Alex Gershman**, Head of the Department of Communication Systems, TU Darmstadt, Germany
Venue: Executive Seminar Room (S2.2-B2-53) at School EEE, NTU
Time: 2:00 – 3.00 pm
Date: **2 October 2009 (Friday)**

Abstract:

The aim of this talk is to present an overview of recent advances for receive, transmit, and distributed (relay) beamforming based on the theory of convex optimization. Our particular focus will be on robust beamforming techniques for data streaming applications. It will be demonstrated that convex optimization is an indispensable toolbox for advanced beamformer designs.

2. Second Seminar (research-specific)

Title: Filter-And-Forward Distributed Beamforming in Relay Networks with Frequency Selective Fading
Speaker: **Professor Alex Gershman**, Head of the Department of Communication Systems, TU Darmstadt, Germany
Venue: Executive Seminar Room (S2.2-B2-53) at School of EEE, NTU
Time: 2:00 – 3.00 pm
Date: **30 October 2009 (Friday)**

Abstract:

A new approach to distributed cooperative beamforming in relay networks with frequency selective fading is proposed. It is assumed that all the relay nodes are equipped with finite impulse response (FIR) filters and use a filter-and-forward (FF) strategy to compensate for the transmitter-to-relay and relay-to-destination channels. Three relevant half-duplex distributed beamforming problems are considered. The first problem amounts to minimizing the total relay transmitted power subject to the destination quality-of-service (QoS) constraint. In the second and third problems, the destination QoS is maximized subject to the total and individual relay transmitted power constraints, respectively. For the first and second problems, closed-form solutions are obtained, whereas the third problem is solved using convex optimization. The latter convex optimization technique can be also directly extended to the case when the individual and total power constraints should be jointly taken into account. Simulation results demonstrate that in the frequency selective fading case, the proposed FF

approach provides substantial performance improvements as compared to the commonly used amplify-and-forward (AF) relay beamforming strategy.

Speaker's Biography:

Alex B. Gershman received his Diploma and Ph.D. degrees in Radiophysics and Electronics from the Nizhny Novgorod State University, Russia, in 1984 and 1990, respectively.

From 1984 to 1999, he held several full-time and visiting research appointments in Russia, Switzerland, and Germany. In 1999, he joined the Department of Electrical and Computer Engineering, McMaster University, Hamilton, Ontario, Canada, where he became a full professor in 2002. From April 2005, he has been with the Darmstadt University of Technology, Darmstadt, Germany, as a professor and Head of the Department of Communication Systems.

His research interests are in the area of signal processing and communications with the primary emphasis on array processing and beamforming; multi-antenna, multiuser, multi-carrier and cooperative communications; and estimation and detection theory.

Dr. Gershman is a recipient of several awards including the 2004 IEEE Signal Processing Society (SPS) Best Paper Award; the IEEE Aerospace and Electronic Systems Society (AEES) Barry Carlton Award for the best paper published in 2004; the 2002 Young Explorers Prize from the Canadian Institute for Advanced Research (CIAR); the 2001 Wolfgang Paul Award from the Alexander von Humboldt Foundation, Germany; and the 2000 Premier's Research Excellence Award, Ontario, Canada. He has also co-authored the paper that received both the 2005 IEEE SPS Young Author Best Paper Award and the 2003 Best Paper Award of the Information Technology Society (ITG) of the German Institute of Electrical Engineering, Electronics, and Information Technology (VDE).

He is a Fellow of the IEEE.

Dr. Gershman is currently a member of five editorial boards including the IEEE Signal Processing Magazine and the IEEE Transactions on Signal Processing. He is a Member-at-Large of the IEEE SPS. He was Editor-in-Chief for the IEEE Signal Processing Letters (2006-2008) and Chair of the Sensor Array and Multichannel (SAM) Technical Committee (TC) of the IEEE SPS (2007-2008). He is currently a "Past-Chair" member of the latter TC and also a member of the IEEE Signal Processing Theory and Methods (SPTM) TC of the IEEE SPS. He was Associate Editor of the IEEE Transactions on Signal Processing (1999-2005); General Co-Chair of the 5th IEEE Sensor Array and Multichannel Signal Processing Workshop, Darmstadt, Germany, July 2008; General Co-Chair of the 1st IEEE Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP), Puerto Vallarta, Mexico, December 2005; Technical Co-Chair of the 4th IEEE Sensor Array and Multichannel Signal Processing Workshop, Waltham, MA, USA, June 2006; Technical Co-Chair of the IEEE International Symposium on Signal Processing and Information Technology (ISSPIT), Darmstadt, Germany, December 2003; General Co-Chair of two IEEE/ITG Int. Workshops on Smart Antennas (in Duisburg, 2005, and in Darmstadt, 2008), and Tutorial Chair of EUSIPCO, Florence, September 2006.