

SPECIAL SEMINAR

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Storrs, CT

SIGNAL PROCESSING FOR MULTICARRIER MODULATION IN UNDERWATER ACOUSTIC COMMUNICATION AND PASSIVE RADAR

Abstract

This talk focuses on advanced signal processing techniques for multicarrier modulation in two application scenarios: underwater acoustic (UWA) communication and passive radar. In UWA communication, multicarrier transmission promises a substantial increase in data rate, following the path of the recent success of broadband wireless radio communications. However, UWA channels are much more challenging than their radio counterparts, due to strong multipath and significant Doppler effects. Advanced signal processing dedicated to the UWA environment is indispensable to realize successful multicarrier modulation in underwater environments. In this talk, I will present a receiver design where the channel estimator exploits the sparse nature of the UWA channel and the demodulator can effectively suppress the inter-carrier interference (ICI). The channel estimators include subspace algorithms from the array processing literature, namely root-MUSIC and ESPRIT, and recent compressed sensing algorithms in the form of Orthogonal Matching Pursuit (OMP) and Basis Pursuit (BP). Results from a recent experiment organized by the Office of Naval Research (ONR) will be presented for performance demonstration.

In passive radar, multicarrier waveforms in the form of Digital Audio Broadcast (DAB) are used as illuminators of opportunity to detect and locate airborne targets. As signal reflections off the targets compose additional time-varying multipath components, target detection and localization are feasible through advanced channel estimation algorithms that detect path variations. In this scenario, super-resolution subspace methods like MUSIC, or BP from the field of compressed sensing are proposed. These advanced methods can improve clutter suppression and target resolution in the passive radar application.

Speaker's Biographical Sketch

Christian R. Berger received the Dipl.-Ing. degree in electrical engineering from the Universitaet Karlsruhe (TH), Germany in 2005. During this degree he also spent a semester at the National University of Singapore, where he took both undergraduate and graduate courses in electrical engineering. He is currently working towards his Ph.D. degree in electrical engineering at the University of Connecticut, Storrs.

His research interests lie in the areas of wireless communications and signal processing, including distributed estimation in wireless sensor networks, wireless positioning and synchronization, underwater acoustic communications and networking. Mr. Berger has served as a reviewer for the IEEE Transactions on Signal Processing, Wireless Communications, Vehicular Technology, and Aerospace and Electronic Systems. In the summer of 2006, he was as a visiting scientist at the Sensor Networks and Data Fusion Department of the FGAN Research Institute, Wachtberg, Germany. In 2008 he was member of the technical program committee and session chair for the 11th International Conference on Information Fusion in Cologne, Germany.

DATE: Thursday, April 16, 2009

TIME: 1:30 pm

LOCATION: 360 Benedum Hall