

Department of Electrical, Computer and Biomedical Engineering

Fall 2009 Seminar Announcement

Speaker: *Richard Hartnett, Professor*
U.S. Coast Guard Academy

Location: *Kelley 102*

Date/Time: *Wednesday, November 4, 2009*

Title: *“Phase Trellis Overlay Modulation for a Secondary*
Communications Channel”

Abstract:

During times of national or regional emergencies, dependable dissemination of relevant information is critical. Major incidents such as 9/11 and Hurricane Katrina can cause disruptions in radio and television coverage, and “short message service” (SMS) text message systems can saturate or exhibit sparse coverage in urban canyons or inside buildings. In those cases, critical Emergency Alert System (EAS) notices of severe weather or regional/national threat may not be received in time for evasive action. Our proposed solution for such information dissemination is the overlay of a robust secondary communications link onto a legacy communications signal that is currently being used for nationwide GPS augmentation. This augmentation system, called the Nationwide Differential GPS (NDGPS) service, consists of over 85 broadcast sites operating in the MF band. This system broadcasts GPS correction information to improve the accuracy and integrity of GPS. The existing system provides differential correction data using minimum shift keying (MSK). Our view is that the NDGPS has significant capability for use beyond that of its current mandate, and that this capability can be exploited at minimum cost to the taxpayer by employing a method we have proposed called a “phase trellis overlay.” Here we discuss the phase trellis overlay optimization problem in the context of a more interesting general problem formulation: How can one modify a legacy signal set so that (1) such modification is essentially “transparent” to legacy users, yet (2) new receiver technology is able to demodulate these new signals? Here we present several examples of trellis overlays, performance analyses, and preliminary results from on-air tests. Examples are provided that show several possible signal set optimizations.

Bio:

Dr. Richard Hartnett is a Professor in Electrical and Computer Engineering at the U.S. Coast Guard Academy in New London, CT, and taught last summer at the University of Rhode Island (ELE314). He received his BSEE degree from the U.S. Coast Guard Academy in 1977, the MSEE degree from Purdue University in 1980, and his Ph.D. in EE from the University of Rhode Island in 1992. His research interests include: efficient digital filtering methods, improved receiver signal processing techniques for electronic navigation systems, and autonomous ground vehicle (AGV) design. Dr. Hartnett is a member of the IEEE Signal Processing Society, the IEEE Education Society, and serves as the Marine Representative on the national Institute of Navigation (ION) Council.

