Seminar Talk

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Friday, September 25, 2015
3:00 p.m. KH 224

Title: Ambient Noise Forecasting with a Large Aperture Acoustic Array

Abstract:
Forecasting ambient noise levels in the ocean can be a useful way of characterizing the detection performance of sonar systems and projecting bounds on performance into the near future. This, how- ever, requires a priori knowledge of source positions as well as the ability to resolve closely separated sources in bearing. One example of such a system is the large aperture research array located at the South Florida Test Facility. Given local radar and Automatic Identification System (AIS) defined source positions as well as accurate environmental information, transmission loss is computed from known source positions to the array. Source levels of individual ships are then estimated from computed TL and the pre-determined beam response of the array using a hybrid non-linear and non-negative least squares technique. Once source levels are estimated, ambient noise forecasts are formed by projecting the estimated SL along known ship tracks into the near future. Ambient noise forecast estimates are compared to measured beam level data and mean-squared error is computed. Upon preliminary analysis, the acoustic data suggest that radar and AIS have a number of untracked ships. These are accounted for by projecting a mean source level, based on ship class, onto extrapolated ship tracks. Once unknown ships are accounted for, we demonstrate mean squared error as low as 3 dB in 30 minute forecast estimates when compared to ground truth.
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Bio:
Dr. Jeffrey S. Rogers has over 10 years of experience in underwater acoustic signal processing. In his Ph.D. dissertation at Duke University, he developed novel array signal processing methods to exploit towed array dynamics for improved passive target detection. Since joining NRL in 2010, he has played an integral role in the base funded Ambient Noise Forecasting project; developing signal processing algorithms for estimating shipping source levels from ambient noise measurements. More recently, he is PI on a base funded effort focused on developing compressive sensing based algorithms for vector sensor arrays to provide a software mitigation/reduction to mechanical array noise and improve detection and localization performance on towed arrays. He is also interested in developing novel signal processing algorithms to handle high degree of freedom arrays.