

Physics-Based Signal Processing Approaches for Underwater Acoustic Sensing

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The undersea world is an important and fascinating domain, but it is also a very challenging environment for sensing and interpretation of the sensor data. Because of potentially long propagation ranges, acoustics has emerged as one of most utilized modalities for sensing in the ocean, but the design of signal processing algorithms to process the complex acoustic signatures is very challenging. One of the most successful approaches has been to utilize a physics-based understanding of the wave propagation and scattering to extract meaningful information and improve sonar system performance. This talk will discuss application of wave propagation physics to the following three areas: 1) identification of deep ocean channel passive acoustic signatures based on multipath propagation; 2) harmonic/spectral processing for active acoustic signatures that is realizable in an environmentally/computationally robust fashion; and 3) exploitation of acoustic noise generated by surface waves to probe seabed sediment layers. The talk will discuss the connection between these problems, and illustrate approaches to exploit our understanding of the spectral/spatial/temporal structure of the undersea acoustic signal.



Lisa Zurk is currently a Program Manager in the Strategic Technologies Office (STO) at the Defense Advanced Projects Research Agency (DARPA). She is also a Professor of Electrical and Computer Engineering at Portland State University (PSU, Portland, Oregon), where she also founded and currently co-directs the Northwest Electromagnetics and Acoustics Research Laboratory (NEAR-Lab). In addition to representing the faculty as a senator (two terms), she served as the Associate Vice President for Research. Prior to joining PSU, Professor Zurk spent 10 years at MIT Lincoln Laboratory working on national security programs in the areas of radar signal processing and underwater acoustics for advanced sonar systems. She is the author of over 50 technical papers, and has received multiple recognitions and honors, including the Presidential Early Career Award for Scientists and Engineers (PECASE), the NSF CAREER award, and the ONR Early Faculty Award. She was

selected as a recipient for a Murdock grant, an NSF MRI grant, and as a Fulbright scholar. Professor Zurk received her BS/CS at University of Massachusetts at Amherst, her MS/ECE at Northeastern University, and her PhD/EE at the University of Washington, where she also was part of the Applied Physics Laboratory as a graduate student.