

SEABED TARGET CHARACTERIZATION USING BISTATIC AND MULTISTATIC SCATTERING

Erin Fischell, Woods Hole Oceanographic Institution

Characterization of seabed targets using networks of unmanned marine vehicles (UMVs) is of great interest for the mission of identifying unexploded ordinance. The imaging sensors generally used for target localization and classification are expensive for outfitting multiple unmanned vehicles and produce data that is difficult to use for real-time onboard classification. An alternative approach to this problem uses features of the bistatic (fixed-source, mobile-receiver) or multistatic (mobile-source, mobile-receiver) scattering pattern to characterize target features. In this approach, an acoustic source to insonifies targets while vehicles with inexpensive hydrophone nose arrays are used to sample the resulting scattered fields. The receiver vehicles sense target scattering amplitude at different positions relative to the source and target, to determine information about the target's radiation pattern, and therefore the target geometry and composition. Virtual and real-world experiments have explored the feasibility of using these bistatic and multistatic amplitude features in machine-learning-based classification using simple (spherical and cylindrical) targets, including the impact of bottom composition and self-burial on scattering from these targets. Additional autonomy experiments have looked at practical multi-vehicle formations for collecting acoustic data.

A navigation scheme has also been developed to improve receiver vehicle localization while submerged using the source signal, necessary for the types of low-cost autonomous underwater vehicles targeted by this work.