

Topic: N171-080

ARiA

High Fidelity Acoustic Scattering Models for Large Objects

This technology combines edge-diffraction modeling, boundary-element methods, and parallel processing to create a model of acoustic scattering of midfrequency active sonar from underwater targets that are larger than mines and smaller than conventional submarines. ARiA's approach offers an accurate and efficient method for calculating acoustic scattering of midfrequency threats that is 10 times faster than current state-of-the-art target-scattering models and scales well at high frequencies. This method has been validated against third party BEM software and analytical solutions. ARiA provides research and development in interdisciplinary acoustics, signal processing, modeling & simulation, machine learning, and artificial intelligence. The goal is to transition this technology as a tool for ONR, NAVAIR, and NAVSEA to use in creating midfrequency synthetic target signatures for developing signal-processing algorithms.

Technology Category Alignment:

Machine Perception, Reasoning and Intelligence

Synthesis/Analytics/Decision Tools

Acoustic, Seismic and Magnetic

Modeling, Simulation & Test Infrastructure

Undersea Weapons

Contact:

Jason E. Summers

jason.e.summers@ariacoustics.com

(202) 841-7451

<https://www.ariacoustics.com/>

SYSCOM: ONR

Contract: N68335-18-C-0533

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0533

WHO

SYSCOM: ONR

Sponsoring Program: ONR 321 Ocean Sensing and Systems Applications Division

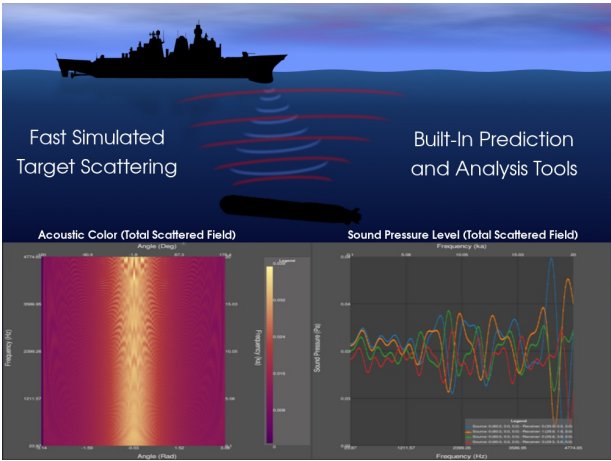
Transition Target: The goal is to transition this technology as a tool for ONR, NAVAIR, and NAVSEA to use in creating midfrequency synthetic target signatures for developing signal- and information- processing algorithms.

TPOC:

Mr. Michael Vaccaro
michael.vaccaro@navy.mil

Other transition opportunities:

ARiA's initial focus is on NAVAIR and the ASPECT/MPACT tactical decision aid (TDA) and acoustic-processor weapons tactics trainers (WTTs) using the Common Acoustic Simulation Environment (CASE). ARiA's second focus is on NAVSEA and the Surface Anti-submarine Warfare Synthetic (SAST) trainer and Sonar Performance Prediction Functional Segment (SPPFS) TDA of the AN/SQQ-89A(V)15 tactical system used aboard DDG-51 and CG-47, the Littoral Combat Ship (LCS) anti-submarine warfare (ASW) mission package (MP) NAVSEA IWS 5. Longer range targets for technology transition will be related to the export of tactical systems in use by foreign navies.



Copyright ARiA, 2019

WHAT

Operational Need and Improvement: Accurate and computationally efficient modeling of acoustic target scattering is critical to multiple components of modern sonar systems. Such systems use target models for integrated/embedded simulation-based training and model-based tactical decision aids (TDAs) and as integral components of the signal-and-information processing chain in such components as model-based classifiers and model-based trackers. Moreover, simulated data are increasingly used for development and testing of signal- and information-processing algorithms. While many target-scattering models have been developed, there is a current gap in the availability of models that are both fast and accurate for wave number characteristics associated with midfrequency active sonar and models of the size of interest in this project.

Specifications Required: The Navy requires a target scattering that can be run on a desktop work station that can compute scattering for specified targets similar in scale to a prolate spheroid and incident signals in the midfrequency band.

Technology Developed: ARiA's method combines edge-diffraction modeling using the edge-source-integral equation (ESIE) and boundary-element methods (BEM) along with parallel processing to create a model of acoustic scattering of midfrequency active sonar from underwater targets that are larger than mines and smaller than conventional submarines. ARiA's approach scales efficiently to higher frequencies while still representing the wave phenomena correctly at lower frequencies, and calculates acoustic scattering of midfrequency threats up to ten times faster than current state-of-the-art target scattering models.

Warfighter Value: The resulting model will provide the Navy with the capability to simulate target response for TDAs, simulation-based training applications, model-based active-sonar classification, and tracking algorithms, generating synthetic data to aid in development of signal and information processing for active sonar and related applications.

WHEN

Contract Number: N68335-18-C-0533 Ending on: July 10, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Verification and validation results of structural- and internal-mode target-scattering model evaluated	Low	Results compare favorably with benchmark models for ka range of interest	5	4th QTR FY19
Delivery of stand-alone software build	Low	Software successfully deployed on ONR end-user systems	6	4th QTR FY20
Integration with ONR development tools	Med	Software successfully integrated and deployed in ONR development tools	7	4th QTR FY21

HOW

Projected Business Model: ARiA plans to retain the SBIR data rights for the developed target-scattering model. ARiA will deliver a software tool for use by ONR to support development of signal- and information-processing algorithms for active sonar systems. Working with the Navy and large primes ARiA will integrate the target-scattering model with TDAs and training tools for NAVAIR and NAVSEA ASW programs.

Company Objectives: For TDAs and training, ARiA plans to first integrate the target-scattering model in the ESAIL Cloud product we are developing for PMA-264 for the P-8A maritime patrol and reconnaissance aircraft (MPRA) under support from the Naval Air Warfare Center Training Systems Division (NAWCTSD). ARiA is looking to work with other developers of ASW and tactical oceanography training systems including Boeing, General Dynamics and others.

Potential Commercial Applications: ARiA's primary commercialization target beyond ONR is integration of ESIEBEM in simulation-based training products and TDAs of Navy MFA sonar systems. ARiA's initial focus is on NAVAIR and the ASPECT/MPACT TDA and acoustic-processor WTTs using the CASE. ARiA's second focus is on NAVSEA and the SAST trainer and SPPFS TDA of the AN/SQQ-89A(V)15 tactical system used aboard DDG-51 and CG-47 (Meg Stout and Robert McNeal at NAVSEA IWS 5, the LCS ASW MP NAVSEA IWS 5 (Meg Stout for LCS ASW MP). Longer range targets for technology transition will be related to the export of tactical systems in use by foreign navies.