Evaluation by Simulation of an Acoustic Array Composed of Multiple Autonomous Vehicles

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Ship-deployable (towed) arrays have been integral to Navy combatant operations for many decades. The continual advancement of towed array technology has been continually driven by the need for high sensitivity, low self-noise, and response across a wide range of frequencies. Robotic autonomy, as applied to acoustic sensors, is currently operationally limited to deployment of traditional arrays from semi-submersible tow vehicles. While such a configuration facilitates flexibility in array placement and a measure of stealth, it is an intermediate step toward fully-submerged, autonomous arrays.

In contrast to a traditional hard-wired acoustic array, a "virtual" array consists of multiple, untethered, hydrophone-equipped autonomous underwater vehicles (AUVs) sharing navigation data over an optical or acoustic connection. Due to the flexibility of its physical configuration, a virtual array can be both steered in angle and tuned (via element spacing) to optimize frequency response.

This research explores the performance of a simple acoustic underwater virtual array (AUVA). Basic software for controlling an AUVA is implemented and evaluated using computer simulation of array navigation. Simulation of a narrowband, beamforming sonar is used to assess AUVA performance under the control scheme. This research provides a basis for expanding the use of autonomous vehicles for acoustic sensing.

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