ACOUSTICS2008/1806
A numerical method for array sensor noise field calculation in detection performance optimization

Chao Sun, Bo Yang and Yixin Yang
Institute of Acoustic Engineering, Northwestern Polytechnical University, 710072 Xi'an, China

Different from the generally adopted criteria of minimizing the sidelobe level and maximizing the array gain in the weighting design of a sonar array, an approach was proposed recently to optimize the shading weights with the aim of maximizing the deflection coefficient in the square-law detector, which in essence suppresses the self-noise by including the noise information at array sensors in the optimization procedure. When several noise sources are present and/or an analytical expression of the noise transfer function is not available, the sensor noise needs to be measured in forming the sensor noise response cross correlation matrix required in the optimization which is very demanding when an array with large number of sensors is considered. To avoid the tedious work of noise measurement, a numerical method is developed in this paper. In this method, the main self-noise sources are assigned with different positions and strengths and the noise field at the array sensors is calculated via either the finite element method or the boundary element method. Tank experiment validated the effectiveness of this method. By using this method, the detection performance of a sensor array can be predicted before it is physically built and tested in under practical conditions.