IMPROVED BEARING ESTIMATION IN OCEAN BY NONLINEAR WAVELET DENOISING UNDER NON−GAUSSIAN NOISE CONDITIONS (TueAmPO2)

Author(s) :

N. C. Pramod (Indian Institute of Science, India)
G. V. Anand (Indian Institute of Science, India)

Abstract :

Bearing estimation of underwater acoustic sources is an important aspect of passive localization in the ocean. The performance of all bearing estimation techniques degrades under conditions of low signal−to−noise ratio (SNR) at the sensor array. The degradation may be arrested by denoising the array data before performing the task of bearing estimation. In the last few years, there has been considerable progress in the use of the wavelet transform for denoising signals. It is known that the traditional wavelet transform, which is a linear transformation, can be used for denoising signals in Gaussian noise; but this method is not suitable if the noise is strongly non−Gaussian. Statistical measurements of ocean acoustic ambient noise data indicate that the noise may have a significantly non−Gaussian heavy−tailed distribution in some environments. In this work, we have explored the possibility of employing nonlinear wavelet denoising, a robust technique based on median interpolation, to improve the performance of bearing estimation techniques in ocean in a strongly non−Gaussian noise environment. We propose the application of nonlinear wavelet denoising to the noisy signal at each sensor in the array to boost the SNR before performing bearing estimation by known techniques such as MUSIC and Subspace Intersection Method.
[continued on the next page]

IMPROVED BEARING ESTIMATION IN OCEAN BY NONLINEAR WAVELET DENOISING UNDER NON−GAUSSIAN NOISE CONDITIONS (TueAmPO2)

Author(s) :

N. C. Pramod (Indian Institute of Science, India)
G. V. Anand (Indian Institute of Science, India)

Abstract : (cont.)

Simulation results are presented to show that denoising leads to a significant reduction in the mean square errors (MSE) of the estimators, and enhancement of resolution of closely spaced sources.