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Analysis and determination of effective parameters on direction-finding performance in infrasound sensing arrays

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Abstract

Recently, infrasound arrays have been greatly considered by researchers because of their unique ability in long-range monitoring of natural and anthropogenic events. Since different geometric configuration have different performance in terms of detection probability and direction-finding accuracy, it has always been the question of what the optimal arrangement for an infrasound array is. In this paper, three methods for performance evaluation of infrasound microphone arrays are introduced and in each case, associated analytical equations are derived. Firstly, the so-called frequency-wavenumber power spectral density is described as a well-known array-based detection performance evaluation criterion. As the second method, direction-dependency of array-averaged coherence coefficient is proposed for measurement of detection accuracy. Finally, the degree of uncertainty in estimation of parameters of incoming wave over the array is proposed as a performance criterion. Then, by using the proposed methods, performance of different array geometries are studies through several computer simulations. The results of this paper show the required characteristics of an optimum configuration strategy for the deployment of infrasound arrays.

Keywords: Array geometry, Microphone array, Optimum configuration, Infrasound.

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