Geometrically Weighted Direction of Arrival Estimation Method for Small Scale Square Array

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Abstract

In this work, a combined direction-of-arrival (DoA) estimation method for a four element square array is presented. A four element array is a very small planar array and estimation performance with ordinary DoA estimation techniques is considerably low. Main goal in this work is to improve the estimation performance of such an array by estimating the DoA with different geometrical configurations of the array elements and combine the results to evaluate the resulting DoA estimation. The geometrical structures employed are based on the circular, L shaped and linear configurations of the array elements. Performances of the geometries are evaluated and a combining filter based on the weighted results of the geometries is generated. The weighted results evaluated at the output of the filter are superior when compared with individual results of each of the geometries.

Full Text

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Figures

Figure 1

Basic geometrical structure of the small scale square array

Figure 2

Different array geometries based on the physical array structure. I-circular array, II-L shaped array, III-linear array.

Figure 3

Uniform Linear Array structure

Figure 4

Structure of a uniform L shaped array

Figure 5

Structure of the Uniform Circular Array

Figure 6

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Figure 7

Angular error performance comparison of array geometries

Figure 8

Angular error performance comparison of array geometries

Figure 9

Weighting function based on the error performance of the preferred geometries

Figure 10

Weighting function based on the error performance of the preferred geometries

Figure 11

Angular error performance of the weighted output

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