A Fast Exponential Analysis and Variable Projection Based Method for Linear Antenna Array Synthesis

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Modern wireless communication systems frequently employ antenna arrays because of their high gain and beamforming capabilities. With increasing complexity, sparse arrays that utilize fewer antenna elements are becoming increasingly popular. In this context, exponential analysis has been explored as a tool for synthesizing linear antenna arrays with reduced element counts. However, many of these synthesis methods overlook the scan performance of the resulting arrays. Achieving a wide scan range remains particularly challenging, especially since the synthesized arrays are typically aperiodic.

In this talk, we explore some possible solutions to improve the scan performance of aperiodic arrays, using exponential analysis and variable projection. Numerical experiments demonstrate that with the given techniques it is possible to reduce the elements in an array, while maintaining a wide scan range for the synthesized array, and with directivity that is comparable to an array with more elements.