On full spark frames via Cauchy matrices

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Abstract

Full spark frames have been widely applied in sparse signal processing, signal reconstruction with erasures and phase retrieval. Since testing whether a given frame is full spark is hard for NP under randomized polynomial-time reductions, hence the deterministic full spark (DFS) frames are particularly significant. However, the degree of freedom of choices of DFS frames is not enough in practical applications because the DFS frames are well known as Vandermonde frames and harmonic frames. In this paper, we focus on the deterministic constructions of full spark frames. We present a new and effective method to construct DFS frames by using Cauchy matrices. We also construct the DFS frames by using Cauchy-Vandermonde matrices. Finally, we show that full spark tight frames can be constructed from generalized Cauchy matrices.

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