

Spectral Features and Asymptotic Properties for g -Circulants and g -Toeplitz Sequences

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For a given nonnegative integer g , a matrix A_n of size n is called g -Toeplitz if its entries obey the rule $A_n = [a_{r-gs}]_{r,s=0}^{n-1}$. Analogously, a matrix A_n again of size n is called g -circulant if $A_n = [a_{(r-gs) \bmod n}]_{r,s=0}^{n-1}$. Such kind of matrices arise in wavelet analysis, subdivision algorithms and more generally when dealing with multigrid/multilevel methods for structured matrices and approximations of boundary value problems. In this paper we study the singular values of g -circulants and we provide an asymptotic analysis of the distribution results for the singular values of g -Toeplitz sequences in the case where $\{a_k\}$ can be interpreted as the sequence of Fourier coefficients of an integrable function f over the domain $(-\pi, \pi)$. Generalizations to the block and multilevel case are also considered.

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