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Representations of Toeplitz-plus-Hankel matrices using trigonometric transformations with application to fast matrix-vector multiplication

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Abstract

Representations of real Toeplitz and Toeplitz-plus-Hankel matrices are presented that involve real trigonometric transformations (DCT, DST, DHT) and diagonal matrices. These representations can be used for fast matrix-vector multiplication. In particular, it is shown that the multiplication of an $n \times n$ Toeplitz-plus-

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Hankel matrix by a vector requires only 4 transformations of length n plus $O(n)$ operations.

Keywords

Toeplitz matrix; Hankel matrix; Fast algorithm; Cosine transform

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