Mathematics > Numerical Analysis

The fast Fourier Transform and fast Wavelet Transform for Patterns on the Torus

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We introduce a fast Fourier transform on regular d-dimensional lattices. We investigate properties of congruence class representants, i.e. their ordering, to classify directions and derive a Cooley-Tukey-Algorithm. Despite the fast Fourier techniques itself, there is also the advantage of this transform to be parallelized efficiently, yielding faster versions than the one-dimensional Fourier transform. These properties of the lattice can further be used to perform a fast multivariate wavelet decomposition, where the wavelets are given as trigonometric polynomials. Furthermore the preferred directions of the decomposition itself can be characterised.

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