

## Nonlinear “Wavelet Transforms” Based on Median-Interpolation

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Abstract:

We introduce a nonlinear refinement subdivision scheme based on *median-interpolation*. The scheme constructs a polynomial interpolating adjacent block medians of an underlying object. The interpolating polynomial is then used to impute block medians at the next finer triadic scale. Perhaps surprisingly, expressions for the refinement operator can be obtained in closed-form for the scheme interpolating by polynomials of degree  $D = 2$ . Despite the nonlinearity of this scheme, convergence and regularity can be established using techniques reminiscent of those developed in analysis of linear refinement schemes.

The refinement scheme can be deployed in multiresolution fashion to construct a nonlinear pyramid and an associated forward and inverse transform. In this paper we discuss the basic properties of these transforms and their possible use in removing badly non-Gaussian noise. Analytic and computational results are presented to show that in the presence of highly non-Gaussian noise, the coefficients of the nonlinear transform have much better properties than traditional wavelet coefficients.