

Numerical Methods for Fractional Diffusion

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Fractional diffusion is a non-local diffusion process that accounts for long-range interactions. We review three schemes for the numerical approximation of the fractional Laplacian on bounded domain, which build on different definitions of it. The first method is the integral formulation and deals with singular non-integrable kernels. The second method is a PDE approach that applies to the spectral definition and exploits the extension to one higher dimension. The third method is a discretization of the Dunford-Taylor formula. We discuss pros and cons of each method, error estimates, and document their performance with a few numerical experiments.