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Solving Parabolic Equations on a Random Grid Using a Generalized Finite Difference Method[1] MAXIM LAVRENTOVICH, TIMOTHY SULLIVAN, Dept. of Physics, Kenyon College, Gambier, OH, PETER PALFFY-MUHORAY, Liquid Crystal Institute, Kent State University, Kent, OH — A novel, generalized finite differencing scheme for solving parabolic initial value PDEs on a random grid will be described and results from its application to the diffusion equation will be presented. For a given number of points, N, in a computational star, we parameterize the $(N-6)$-dimensional space of all possible approximations to the Laplacian that are accurate to first order. We have generalized von Neumann stability analysis to the random grid and we use simulated annealing to search parameter space to find a Laplacian that gives stable time evolution of the system. The creation of a stable Laplacian is moderately computationally intensive, but using it to evolve the PDE in time is of the same order as standard finite difference schemes on regular grids. We will present simulations using a Gaussian initial profile on a 10,000 point, annealed random grid in 2D. We also show that the same Laplacian also allows stable time evolution of the stiff, nonlinear, Cahn-Hilliard equation on the same grid. .

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