Multiscale Simulation Algorithms for Biochemical Systems

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Abstract

Discrete stochastic methods are in widespread use for the simulation of biochemical processes, where small populations of key reactant molecules can result in dynamical behavior that is discrete and stochastic rather than continuous and deterministic.

Much of our recent work has focused on the development of algorithms and software for spatial stochastic simulation. We outline our recent results, including a fast, parallelizable algorithm called Diffusive Finite State Projection and our contributions to the URDME software package for spatial stochastic simulation with unstructured mesh on complex geometries. We conclude with a spatial stochastic model of cell polarization in yeast mating, which reveals how the cell exploits intrinsic noise to achieve both punctate polarization and signal tracking.