

Stochastic Simulation at Your Service

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IN recent years it has become increasingly clear that stochasticity plays an important role in many biological processes. Notable examples include bistable genetic switches, noise enhanced robustness of oscillations, and fluctuation enhanced sensitivity or “stochastic focusing”. Moreover, numerous cellular systems harness stochastic noise for robust performance. At the same time, algorithms and software for discrete stochastic simulation have advanced to the point where not only simulation of well-mixed systems, but spatial stochastic simulation on 3D complex geometries, parameter estimation for stochastic systems, and efficient computation of the probability of rare events, can be performed with accuracy and reliability. A few years ago we embarked on a quest to build a unified software environment to enable biologists to easily harness the power of these tools. We envisioned that users might build an ODE model or discrete stochastic model on a laptop, and scale it up to increasing levels of complexity, accessing tools such as those mentioned above, and deploying computing resources from the cloud with the push of a button when they are needed. StochSS: Stochastic Simulation as-a-Service, is available for download at www.stochss.org. As the capabilities of StochSS have grown, so has our vision of the roles that computing can play in the advancement of science.