Efficient Correlation-Free Many-States Lattice Monte Carlo on GPUs

Jeffrey Kelling[1]

[1]Helmholtz-Zentrum Dresden-Rossendorf, Department of Information Services and Computing, Dresden, Germany

In this talk, we present a method for highly efficient lattice Monte Carlo simulations with correlation-free updates. Achieving freedom from erroneous correlations requires random selection of lattice sites for updates, which must be restricted by suitable domain decomposition to create parallelism. While approaches based on caching limit the number of allowed states, the multisurface-type approach presented here allows arbitrarily complex states. The effectiveness of the method is illustrated in the fact that it allowed solving a long standing dispute around surface growth under random kinetic deposition in the KPZ-universality class. The method has also been applied to Potts models and is suitable for spin-glass simulations, such as those required to test quantum annealers, like D-Wave.