Computational Physics II

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1 Kinetic Monte Carlo

Simulate the $d = 2$ Ising model with periodic boundary conditions on the square lattice using kinetic Monte Carlo (also called BKL-algorithm/N-fold/continous time Monte Carlo/rejection free Monte Carlo). Use roughly 10 temperature points in the range $\beta = 0$ to $\beta = 3$ and simulate for linear system-size 4, 8, and 16. While measuring both energy and magnetization make sure to appropriately weight the observables by the time the system would have spend in this microstate. As an update probability make use of the Metropolis criterion.

1. Compare to the exact solution.
2. What happens, if you do not weight your observables by the correct time?
3. Compare the runtime of your program with your implementation of Metropolis Monte Carlo. Can you detect a cross-over temperature at which kinetic Monte Carlo becomes faster than simple Metropolis Monte Carlo? Please note that this of course depends on your processor/compiler options/... and your programming capabilities.