Computational Physics II

Homework 2

Submission: November 11 (Monday), 2019

Binary mixture: Conserved Ising model (6 points)

1. Write a program to solve the two-dimensional Ising model (for $h = 0$) for conserved kinetics with periodic bounday conditions. Use spin exchange Metropolis algorithm for sampling. *(You can consider a system size, say, $L = 64$. Prepare the system at $T > T_c$ with randomly distributed up and down spins and then quench at $T(< T_c)$, say, $T = 0.6T_c$. Take $T_c = 2.27$ assuming $J = 1$ and $k_B = 1$.)*

   (a) Plot the snapshots at least for 4 different times.

   (b) Plot energy E as a function of time.

   (c) Calculate the local magnetization distributions $P(m, t)$ vs m for 5 different times. The last one should be the equilibrium or the complete phase separating one. *(You can consider many smaller subsystems with 2×2 boxes or 4 lattice points to calculate local magnetizations.)*

Non-conserved Ising model (4 points)

From the previous program of HW1, by generating "uncorrelated" configurations at equilibrium plot the temperature dependence (as a function of reduced temperature) of susceptibility for $L = 128$. Use the following formula to calculate susceptibility:

$$\chi = \beta(\langle m^2 \rangle - \langle m \rangle^2) \tag{1}$$

where $\beta = 1/k_B T$ and m is the magnetization.