

Worksheet 6: Finite-Size Scaling and the Ising Model

April Cooper, Patrick Kreissl und Sebastian Weber

February 5, 2013
University of Stuttgart

Contents

1	Finite Size Scaling	2
1.1	Determinig T_C	2
1.2	Estimating β_m	2

1 Finite Size Scaling

1.1 Determining T_C

In this task the Binder parameter $U = 1 - \frac{1}{3} \langle \mu^4 \rangle / \langle \mu^2 \rangle^2$ was implemented. The resulting plot of the Binder parameter over the Temperature for different L can be seen below:

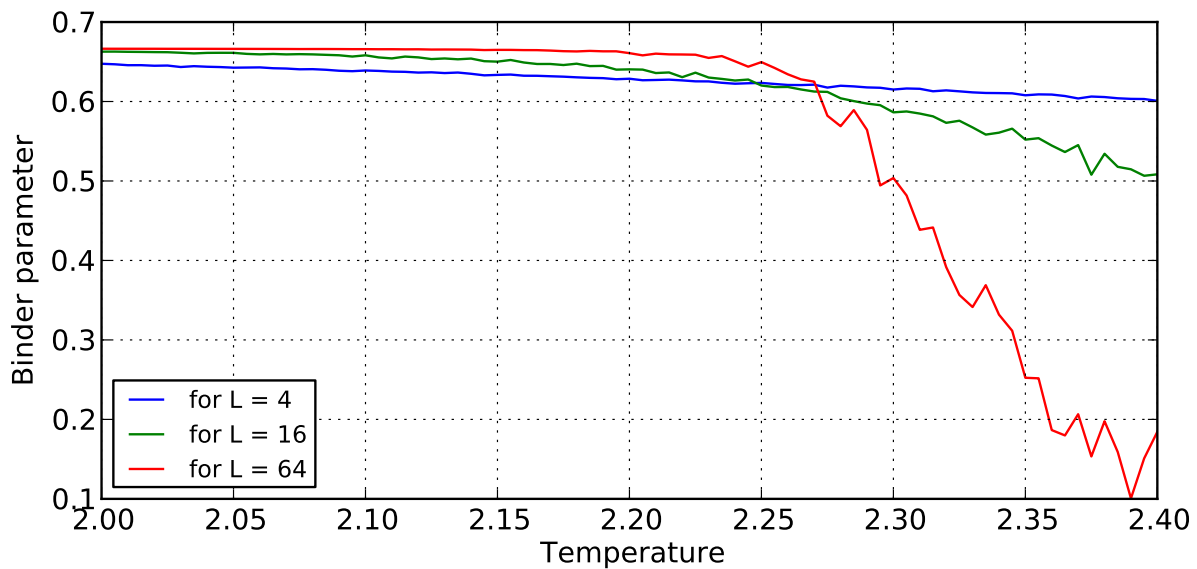


Figure 1: Plot of the Binder parameter for different lattice sizes L . From the intersection point of the different curves the critical Temperature can be determined as $T_C = 2.27K$. In order to get a good result a 100000 sweeps and a temperature step size of $\Delta t = 0.005$ K were used.

1.2 Estimating β_m

Here we performed different simulations at $T_C = 2.27K$ were performed for $L \in \{8, 16, 32, 64, 128\}$. The resulting plot of the magnetization M over L is as follows:

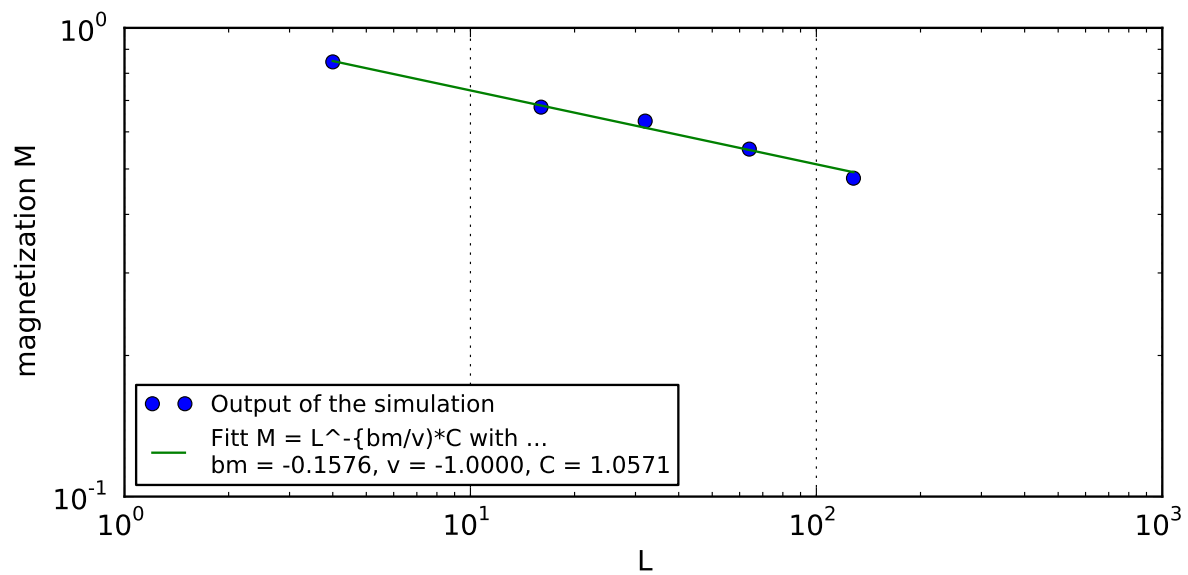


Figure 2: Plot of the magnetization M over L with double logarithmic scale. From the linear fit through the computed magnetizations β_m can be determined as -0.1576.

The formula which connects the magnetization M , lattice size L and β_m is the following:

$$M = L^{-\beta_m/\nu} \quad (1)$$

It was also used in order to get a value for β_m from the plot.