02/03/15 - 17/03/15

1 Dissertation

2 Code

3 Data and Results

3.1 Metropolis Thermodynamic Quantities

The Specific Heat Capacity was calculated using

$$C_V = \frac{1}{T^2}\left[< E^2 > - < E >^2\right] \tag{1}$$

The Magnetic Susceptibility was calculated using

$$\chi = \frac{1}{T}\left[< M^2 > - < M >^2\right] \tag{2}$$

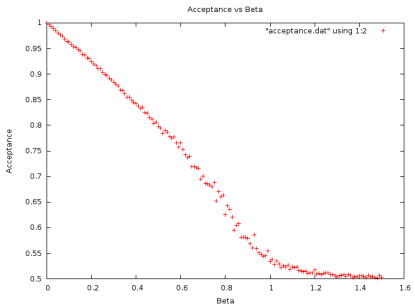
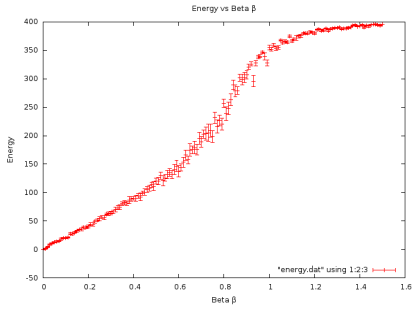
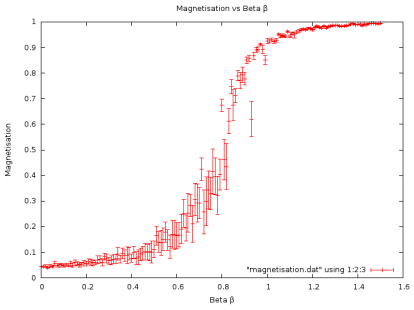


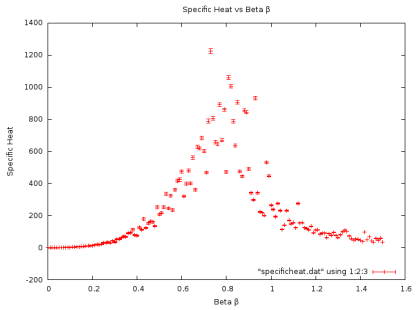
Figure 1: Acceptance for $q = 2$ on a $20 * 20$ grid



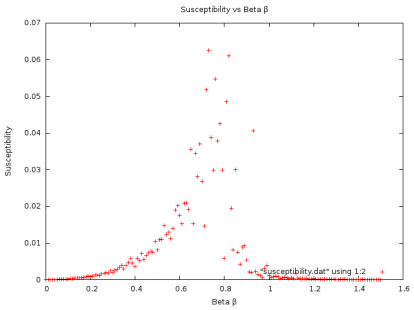
(a) Energy per Lattice Site with Errors



(b) Magnetisation per Lattice Site with Errors



(a) Specific Heat of the System with Errors

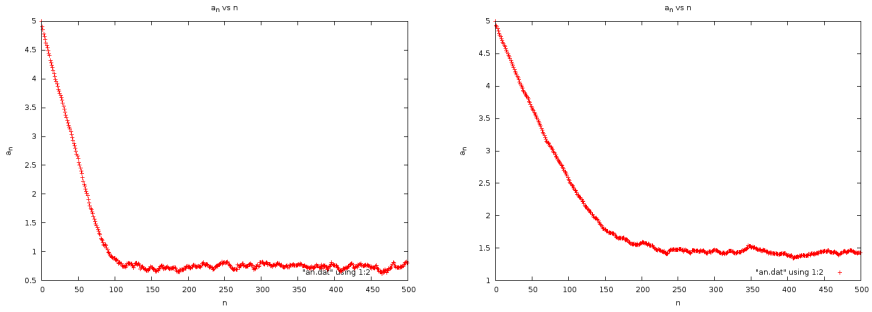


(b) Magnetic Susceptibility without errors

Figure 3: The magnitude of the error bars in susceptibility around the critical point β_c become significantly larger than the data

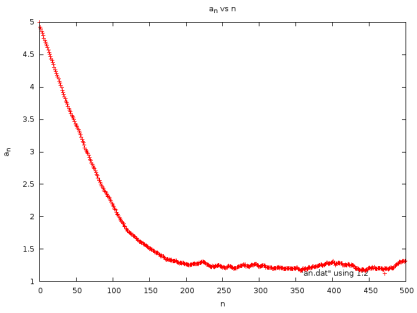
Behaviour as expected when coupling is $J = 1/2$ to match the Ising Model. However when changing to the Antiferromagnetic case $J = -0.5$ the simulation becomes erratic. Further investigation will be required to identify the source of the problem.

3.2 an Convergence



(a) $q = 2$

(b) $q = 4$



(c) $q = 10$

Figure 4: Target Energy: -100.0, Energy Band Width: 15.0