Correction of Project 4 - FYS3150

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Continuation of the results for extracting the critical temperature from section 7 in the report

The suspicion that we had in the last section in the report of Project4 seemed to be slightly correct. We thought that we had used too few Monte Carlo cycles in the original report, which was 10^6 due to the erroneous maximums of the heat capacity. We started a recalculation of the simulation using 10^7 cycles to see if we got any improvement.

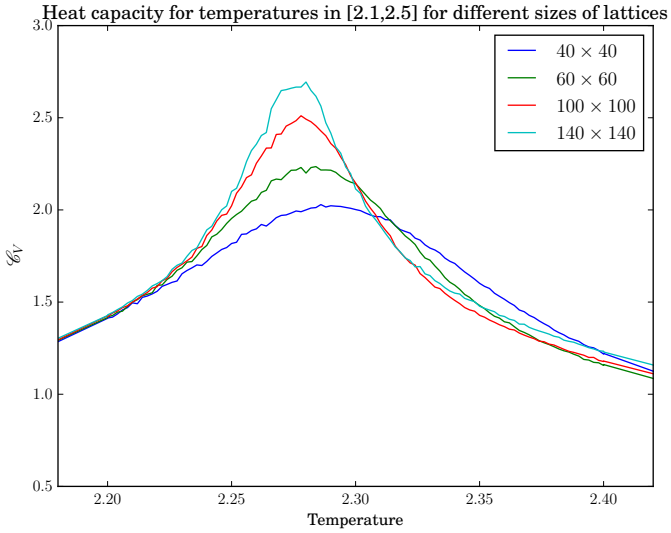

Figure 1: Plot of the heat capacity when the simulation has used 10^7 cycles in total.

When we try to extract the critical temperatures for the lattices, we get

L	40	60	100	140
	2.28600	2.28400	2.27800	2.28000

Table 1: The found estimates of the critical temperature.

Using the described equation in section 7 in the report to find an estimate of the critical temperature, we get the average value of a to be 0.28822, which gives us an estimate of the critical temperature of infinite lattice

$$T_C = 2.27776$$

This is a huge improvement compared to what we presented in the report, as it is closer to the temperature Lars Onsager found. However, if we instead use the susceptibility to extract the critical temperature, we get the following found temperatures

L	40	60	100	140
	2.32200	2.30000	2.29600	2.28600

Table 2: The found values of the critical temperature when looking at the susceptibility.

which gives us a average value of a to be 1.99322 and which gives us an estimate to the analytical critical temperature of an infinite lattice

$$T_C \approx 2.27169$$

which is certainly better. However, we notice the difference between the average values of the as. It should really not matter that much whether we looked at the heat capacity or the susceptibility. We have therefore found that the error does not necessarily lie in the number of cycles.

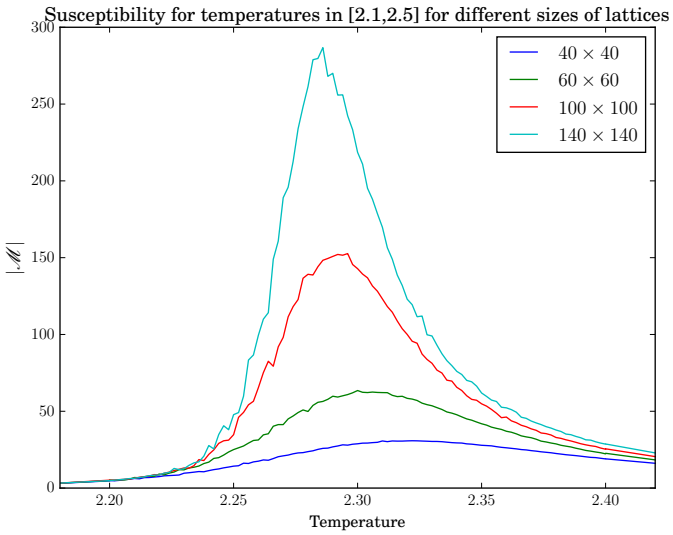

Figure 2: Plot of the susceptibility under the same run for 10^7 total number of cycles.