PH-M31 Assignments Question 7

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1. Question 7 - Write an OpenMP code for the Ising model, run it on two cores and show that it reproduces the correct results. Comment on performance and how one could improve it at fixed number of cores.

(See isingopenmp.C file for OpenMP code)

The OpenMP Ising model code was attempted, however the results between serial and OpenMP code do not agree. However, the code still produces the correct results if the OpenMP library is not included when compiling, this points towards an error within the parallelization.

The error appears to be with the communication of interactions between threads as when the OpenMP code is ran it produces roughly the same values for Energy and Magnetisation independent on the value of β so in my OpenMP code there doesn't appear to be any phase transition observed.

In general, to improve my OpenMP code, the jackknifing could be parallelized by using a #pragma omp for schedule(static, binchunk) type loop, this would allow each thread to perform the statistical analysis independently on each bin. Also in general, the efficiency of the code could be increased by using nowait on some of the for loops, but this would most likely require redesign of some of the code. Also, there is currently the use of #pragma omp atomic write clauses, these will effect efficiency, the code could be redesigned to remove these and ensure they are not needed. Also my code currently uses #pragma omp critical and #pragma omp barrier regions, these effect efficiency and should be minimized. however, the barrier is required to ensure that the threads have initialised and allocated the lattice memory before operations can be performed on that memory space.