

Introduction to CUDA Parallel Programming Homework Assignment 9
Due 2020/05/26

1. GPU accelerated Monte Carlo simulation of 2D Ising model on a torus

Write a CUDA code to accelerate the simulation of 2D Ising model on the torus with multi-GPUs. Test your code with one and two GPUs, by comparing GPU and CPU results. You may start by writing your CUDA code for one GPU.

For the 200 x 200 lattice, determine the optimal block sizes for one and two GPUs respectively. Then use your CUDA code (with optimal block sizes) to perform MC simulations at $B=0$, and $T=2.0, 2.1, 2.2, 2.3, 2.4$, and 2.5 , and measure $\langle E \rangle$ and $\langle M \rangle$, and estimate the errors, with one and two GPUs respectively. Summarize your results of $\langle E \rangle$, $\delta \langle E \rangle$, $\langle M \rangle$, and $\delta \langle M \rangle$, with tables and figures, together with the timings.

As usual, your homework report should include your source codes, results, and discussions. The discussion file should be prepared with a typesetting system, e.g., LaTeX, Word, etc., and it is converted to a PDF file. All files should be zipped into one gzipped tar file, with a file name containing your student number and the problem set number (e.g., r05202043_ps9.tar.gz). Please send your homework from your NTU email account to twchiu@phys.ntu.edu.tw before 24:00 of the due date.