Simulating spin models on GPU

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Over the last couple of years it has been realized that the vast computational power of graphics processing units (GPUs) could be harvested for purposes other than the video game industry. This power, which at least nominally exceeds that of current CPUs by large factors, results from the relative simplicity of the GPU architectures as compared to CPUs, combined with a large number of parallel processing units on a single chip. To benefit from this setup for general computing purposes, the problems at hand need to be prepared in a way to profit from the inherent parallelism and hierarchical structure of memory accesses.

In this presentation I discuss the performance potential for simulating spin models, such as the Ising or Heisenberg models as well as the Edwards-Anderson spin glass, on GPU as compared to conventional simulations on CPU. Different algorithms, including Metropolis [1] and cluster updates [2], as well as computional tricks such as multi-spin coding are taken into account.

References

[1] M. Weigel, *Performance potential for simulating spin models on GPU*, Mainz preprint (2010).

[2] M. Weigel, *Cluster update simulations of spin models on GPU*, Mainz preprint (2010).

[3] M. Weigel, *Simulating spin models on GPU*, Preprint arXiv:1006.3865.