M. Troyer
ETH Zürich, HIT G 31.8
CH-8093 Zürich

Set 7 - Hybrid MPI+OpenMP and Autocorrelations

Issued: April 27, 2015
Hand in: May 4, 2015

Question 1: Hybrid MPI+OpenMP

In previous exercises we parallelized the 2D diffusion code for distributed memory machines and for shared memory machines. In this exercise we will parallelize the same code using hybrid parallelism.

a) Include shared memory parallelism in the 2D diffusion code parallelized with MPI (you can start from `skeleton/diffusion2d_mpi.cpp`). You can use any of the shared memory programming models learned in the lecture.

b) Compare the performances of the pure MPI code and the hybrid code, Use different configurations to run the hybrid code, but use always a total of 48 cores (two nodes on Euler). Comment on the results.

Question 2: Dogs and Fleas

The dogs and fleas model[1] is a nice toy model to show the problems of autocorrelations in Markov-Chain Monte Carlo simulations.

a) Implement the dogs and fleas as described in section III B) of the paper using naive error estimates.

b) Implement the binning analysis method to obtain more reliable error estimates and compare the results.

Note: For simplicity, you may assume that the total number of measurements is a power of two.

Summary

Summarize your answers, results and plots into a short PDF document. Furthermore, elucidate the main structure of the code and report possible code details that are relevant in terms of accuracy or performance. Send the PDF document and source code to your assigned teaching assistant.

[1] `http://dx.doi.org/10.1119/1.3247985` (accessible from within the ETH network)