

# Programming Techniques

## II

### Exercise 13

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#### Problem 13.1 Parallel Monte Carlo Simulation

This week's exercise is a larger project, incorporating solutions of some previous exercises. The goal is to write a parallel Monte Carlo simulation for the Ising model and calculate the absolute value of the magnetization as a function of temperature. Work on it in teams, synchronizing your work via a subversion repository. (You may use any version control system, but do not expect any help for others.)

- Form teams of 3-4 people.
- Set up an svn repository, e.g. on one of the D-PHYS Linux machines and grant everyone access:

```
$ svnadmin create svnrep  
$ chmod -R ugo+rwX svnrep
```

Now all members of your group should be able to check the repository out:

```
$ svn co svn+ssh://username@plimpy.ethz.ch/path/to/svnrep
```

You add new files to the version control, commit your local changes and retrieve all committed changes with the commands

```
$ svn add [file]  
$ svn ci  
$ svn up
```

For more information use

```
$ svn help
```

- Split the project into subtasks, done by individual people:
  1. test the graph creation for a chain and square lattice, which was this week's exercise,
  2. write a MC simulation using that graph and local Metropolis type updates,
  3. write a framework to launch multiple clones and collect the results and
  4. extend the accumulators to calculate the error, using some fixed binning strategy (e.g. average 100 numbers before storing  $x$  and  $x^2$ ). For this an accumulator needs to store four different numbers: The sum of complete bin values, the sum of the squares of complete bin values, the number of samples collected, and the sum of values in the last, partially filled bin.
- Test the components separately.
- Then finally merge them using svn and build the full program.