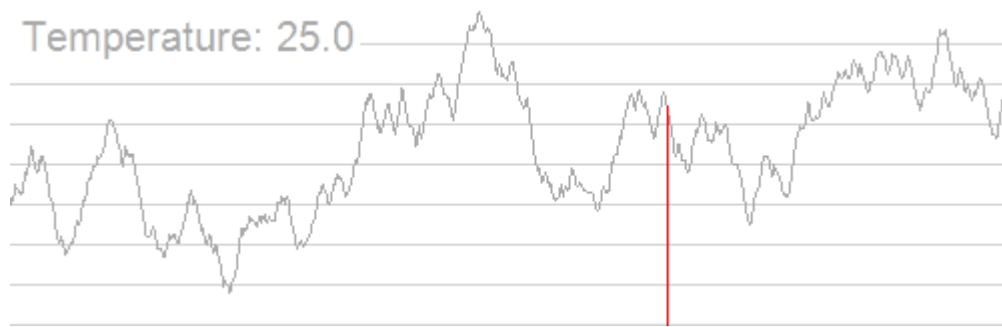


Simulated annealing



Simulated annealing is an heuristic aiming to find the minimum of a non-convex function $f(x)$ by mimicking the physical annealing process. The annealing is the process by which a metal is slowly cooled so that the internal structure may find the minimum of its internal energy.

It belongs to the class of sampling algorithms. From one (or more) random location x a sample of nearby location is drawn and accepted if $f(x_{sample}) \leq f(x)$, while if $f(x_{sample}) > f(x)$ the sample is accepted with a probability that depends on a variable T (the temperature), and which goes to zero when T reaches a minimal value. The algorithm starts with an high value of temperature, so that it will accept also moves that increase the objective function, while eventually it only accepts samples giving lower values.

in [1], [3] you have a general description, while in [4] a description of possible parallel implementation. You need to use random numbers, so I have added some slides on random numbers and statistical distributions in C++.

Objectives;

- Write first a scalar version of the basic algorithm and try it on some of the functions proposed in [2]
- Write the parallel version (MPI or openMP) following one of the strategies suggested in [4]

More advanced stuff (may lead to an exam project)

- Extend to multidimensional case
- Implement other sample based optimization algorithms.

[1]https://en.wikipedia.org/wiki/Simulated_annealing

[2] <http://www.sfu.ca/~ssurjano/optimization.html>

[3] Introduction SA.pdf

[4] parallelSA.pdf

[5] RandomNumbersAndDistributions.pdf