The basic flow of simulated annealing algorithm is as follows:

(1) Initialization: initial temperature T, initial solution state s, number of iterations L;
(2) for each temperature state, repeat l cycles to generate and probabilistic accept new solutions:
(3) generate a new solution s' from the current solution s through the transformation operation;
(4) calculate the energy difference Δ e, that is, the difference between the objective function of the new solution and the objective function of the original solution;
(5) if Δ e < 0, accept s' as the new current solution, otherwise accept s' as the new current solution with probability exp (- Δ E / T);
(6) after completing l cycles in each temperature state, reduce the temperature T until the termination temperature is reached.

Multivariable function optimization problem

The classical function optimization problem and combinatorial optimization problem are selected as test cases.

Problem 1: schwefel test function is a complex multimodal function with a large number of local extremum regions. $F(X)=418.9829\times n-\sum_{i=1}^{n} \left[x_i * \sin\left(\sqrt{|x_i|}\right) \right]$
In this paper, we take d = 10, x = [– 500,500], and the function is the global minimum f (x) = 0.0 at x = (420.9687, … 420.9687).

The basic scheme of using simulated annealing algorithm: control the temperature to decay exponentially according to t (k) = a * t (k–1), and the attenuation coefficient is a; As shown in equation (1), accept the new solution according to metropolis criteria. For problem 1 (schwefel function), a new solution is generated by applying a random disturbance of normal distribution to an independent variable of the current solution.