A Course on Meta-Heuristic Search Methods for Combinatorial Optimization Problems Assignment-I

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January 13, 2014

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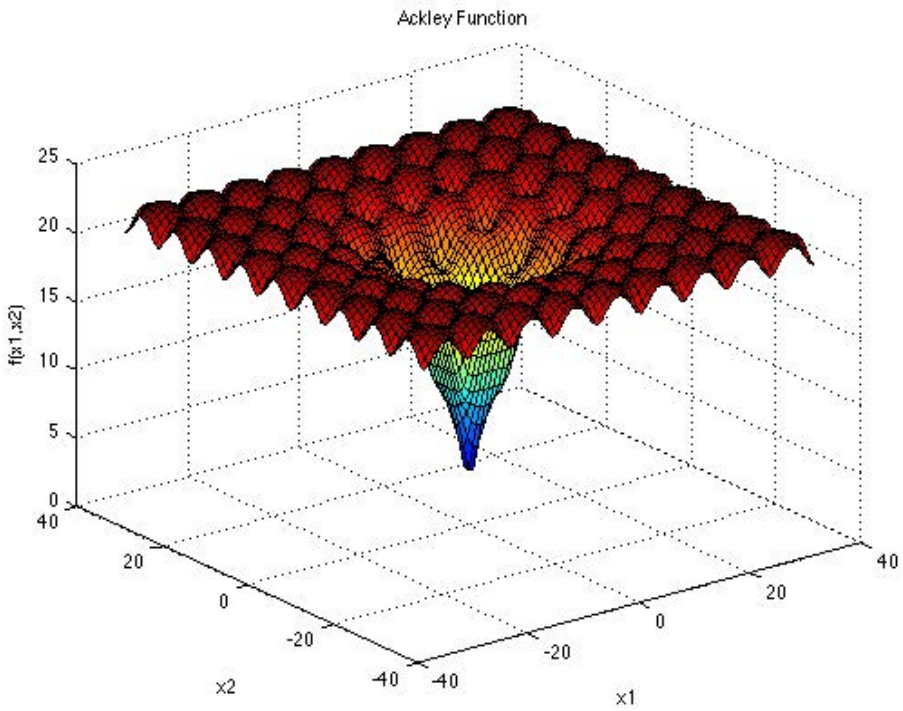
Ackley function

$a = 20,\ b = 0.2,\ c = 2\pi$ & $x_i \in [-32.768, 32.768]$

$$f(\mathbf{x}) = -a \exp\left(-b\sqrt{\frac{1}{d}\sum_{i=1}^{d} x_i^2}\right) - \exp\left(\frac{1}{d}\sum_{i=1}^{d}\cos(cx_i)\right) + a + \exp(1)$$



Global minimum $f(x^*) = 0$ at $x^* = (0, \ldots, 0)$

Assignment

- Implement *Simulated Annealing* algorithm on the single-variable Ackley function using C++/MATLAB/Java.
- Check performance on different values of algorithmic parameters.
- Prepare a report of 3-5 pages:
  - State about the problem.
  - Write about the Simulated Annealing algorithm.
  - Write in detail your computational observations (why and how ?).
  - Support your claims by:
    - Providing tables showing results on different values of algorithmic parameters.
    - Providing graphs showing convergence of algorithm (w.r.t. number of iterations/computational time).
- Use binary string.
- Use flip mutation.

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Binary string to real value

$$x = x_{min} + decimal(substring_x)\frac{x_{max} - x_{min}}{2^{l_x} - 1}$$

l_x: length of binary string (number of bits)
$decimal(substring_x)$: decimal value of binary string

$$l_x = \lfloor \frac{\log\left(\frac{x_{max} - x_{min}}{\delta}\right)}{log2} \rfloor + 1$$

$\delta = 10^{-4}$
Small δ: large string