7TH EXERCISE SESSION

Evolutionary Algorithms (EAs)

1. Genetic Algorithm

Study the slides of Lecture 11 and implement a simple genetic algorithm (GA) that uses binary encoding of variables, random initialization, parent selection, crossover & mutation, and survival selection. Solve the problem of minimizing function $f(\vec{x}) = \sum_{i=1}^{50} x_i - \sum_{j=51}^{100} x_j + 50$, where variables can have only binary values {0,1}. Visualize the development of the fitness of the population through the generations. Return a report and program code(s).

2. Differential Evolution

Differential Evolution (DE) (http://en.wikipedia.org/wiki/Differential_evolution) is a simple floating point encoded EA that was introduced in mid-90's. It is still a good method, for example, for optimizing hard engineering optimization problems or complicated neural networks.

Implement the DE algorithm and apply it for minimizing the Schwefel's function with two variables $f(\vec{x}) = 837.9658 - \sum_{i=1}^{2} x_i * \sin(\sqrt{|x_i|}),\ x_i \in [-500, 500]$. Visualize the fitness landscape and development of population through the generations. You can also test the method with the more general form of the Schwefel's function $f(\vec{x}) = 418.9829 * d - \sum_{i=1}^{d} x_i * \sin(\sqrt{|x_i|}),\ x_i \in [-500, 500]$. Return a report and program code(s).