

Evolutionary Computing - Fall 2019

Assignment #3

Shiraz University

Due Date: 26/Dec

Synopsis

The goal of this assignment is for you to become familiarized with

- I. Implementing an Evolutionary Algorithm (EA) with adaptive mutation step control to solve a classic multi-dimensional function optimization problem
- II. Conducting scientific experiments involving EAs
- III. Statistically analyzing experimental results from stochastic algorithms
- IV. Writing proper technical reports

Problem

The generalized Griewank function is defined as follows:

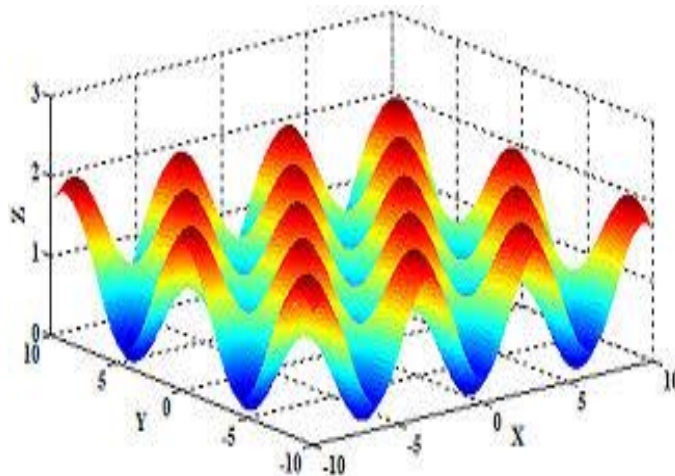
$$f(\mathbf{x}) = \sum_{i=1}^d \frac{x_i^2}{4000} - \prod_{i=1}^d \cos\left(\frac{x_i}{\sqrt{i}}\right) + 1$$

$$x_i \in [-600, 600], i = 1, \dots, d$$

The Griewank function has many widespread local minima, which are regularly distributed. Its dimensionality is controlled by the parameter d .

The global minimum: $f(x^*) = 0$, at $x^* = (0, \dots, 0)$

The following plot illustrates the generalized Griewank function for $d = 2$:



The problem you are attempting to solve is using an EA with adaptive mutation step control for each dimension to find the global minimum of the Griewank objective function.

Implementation

Implement an EA solution for the generalized Griewank function employing a real-valued representation with adaptive mutation step control for each dimension and appropriate reproduction operators. The adaptive mutation step control must be implemented as d real values corresponding to the mutation rates of the d elements in x .

Instead of hard coding all the EA parameters you are to employ a separate configuration file. The EA strategy parameters in your configuration file include, but are not limited to, parameters for initialization, parent selection, reproduction, competition and termination. It must be possible to enable or disable the adaptive mutation step control in your configuration file. Furthermore, your configuration file should also include experiment parameters including, but not limited to, number of runs, dimensionality of generalized Griewank function (d) and logging parameters.

Notes:

- Your implementation should be functional.
- You should write a complete report for the results you get.
- Allowed programming languages: MATLAB - python.
- Feel free to change the model parameters.
- Any sign of cheating would be result in the zero grade for the assignment.
- Your codes should be self-commented.
- Send you codes in a ZIP file named "LASTNAME - FIRSTNAME.zip"