Lab Assignment 8

Stochastic Techniques in Global Optimization

ACS II

Fall 2016

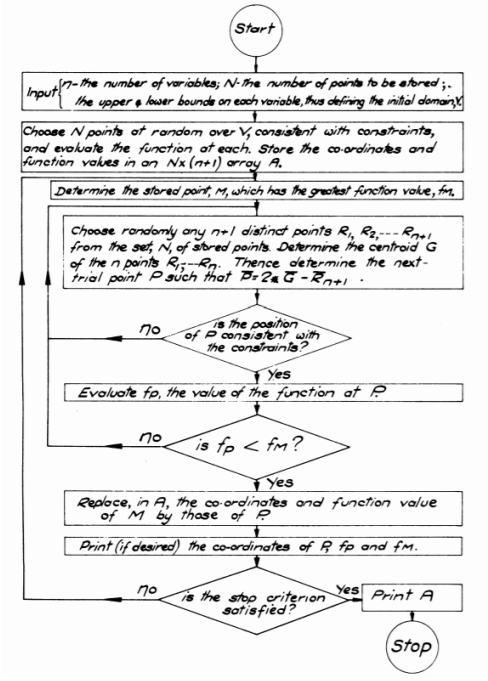
Due 11/1/16

Background

When considering the global optimization problems, it's general agreed that there is no gold-standard algorithmic technique, with different algorithm types (line search, stochastic) performing variably better or worse than the other depending on the specific problem considered; it is thus useful to have first-hand experience implementing multiple families of globall optimization techniques.

In the previous lab assignment, you implemented a variety of line-search techniques to optimize a global function. In this lab, you will implement the Controlled random search algorithm as developed by Price et al (1977) and compare it's performance to that of the line searches.

Having read Price's paper already as a reading assignment, you should already be familiar with the structure of the CRS algorithm. Nevertheless, for ease of implementation, the flowchart for the CRS algorithm from Price's paper is given below.



Problem

In Fortran, C, or C++, implement prices CRS algorithm as outlined above. Then, apply it to example 4 form Price's paper, specifically the problem:

$$f(x,y) = 100(y - x^2)^2 + [6.4(y - 0.5)^2 - x - 0.6]^2$$

Let you initial search domain be $-5 < x, y < 5$, and your initial number of cloud points $N = 50$. Compare your results for this optimization problem to those given in the paper. Plot the evolution of the minimum, average, and maximum function value stored in the cloud as the function of iteration. Show distribution of trial points in the "cloud" at the initial time, at 1/3rdand 2/3rdsof iterations, and at the final time. Adjust limits of your plots as needed.

Then, apply the BFGS algorithm you developed for Lab 6 to this algorithm, with the initial conditions$x, y = 0$. Compare the convergence of the BFGS algorithm to that of your CRS algorithm and explain any discrepancies between the two results.