Homework No. 4

Simulated Annealing

CUTTING Stock Problem is the problem of cutting standard-sized pieces of stock material, such as paper rolls or sheet metal, into pieces of specified (requested) sizes whilst minimizing material wasted. It is an optimization problem in mathematics that arises from applications in industry. In terms of computational complexity, the problem is an NP-hard problem.

What to do?

Assume a paper machine can produce an unlimited number of master rolls, each c meters wide. We also have a number of cut requests. We should cut these rolls in a way to satisfy all of the requests and use the minimum number of rolls, simultaneously.
For instance, let's say we have ten meter paper rolls and we get requests of 3, 5 and 7 meters. Following is one of the optimal solutions to this example – two rolls are used.

5	3	waste
7		waste

You can use the "Debugger" test cases to make sure that your code is working properly. In order to maximize your score, your code must accomplish the following tasks:

- Input 1: finding a way to use less than 56 rolls.
- Input 2: finding a way to use less than 80 rolls.
- Input 3: finding a way to use less than 115 rolls.

Prepare a summary of what your code does and how did you enhance the performance of your code. How important is the temperature function? Is it possible to use a linear function as the temperature function? How did you define the neighborhood of a point?

Upload a zip file containing your source code along with the summary.

Extras

Your homework will receive extra points for each of the following parts:
Extra $\aleph_0$. using at most 235 rolls for input 4.
Extra $\aleph_1$. using the minimum number of rolls among the students for test 5.

Test Cases

Download the test cases here.

Prof. BabaAli