Homework Project 2

Given 10/21/2015, Due 11/04/2015

Implement the randomized incremental algorithm to compute the maximum of a linear objective function of four variables under a set of linear inequalities.

You should write a function

- `int rand_lp(int n, double *A, double *b, double *c, double *result)`

  which has as parameters the number of inequalities `n`, the coefficient matrix `A` and right-hand side `b`, the coefficients of the objective function `c`, as well as the result vector `result`, which contains the optimum values for the four variables $x_0, \ldots, x_3$. It returns an integer, which is the number of recomputations at the top level taken by the algorithm to reach the optimum.

  Your function should solve the LP problem

$$\max \mathtt{c}[0]x_0 + \mathtt{c}[1]x_1 + \mathtt{c}[2]x_2 + \mathtt{c}[3]x_3$$

$$\begin{aligned}
\mathtt{A}[0][0]x_0 + \cdots + \mathtt{A}[0][3]x_3 &\leq \mathtt{b}[0] \\
\mathtt{A}[1][0]x_0 + \cdots + \mathtt{A}[1][3]x_3 &\leq \mathtt{b}[1] \\
&\vdots \\
\mathtt{A}[\mathtt{n}-1][0]x_0 + \cdots + \mathtt{A}[\mathtt{n}-1][3]x_3 &\leq \mathtt{b}[\mathtt{n}-1] \\
x_0 \geq 0, x_1 \geq 0, \cdots, x_3 &\geq 0
\end{aligned}$$

The matrix is a 4 by n matrix with n fairly large, so do not make any assumptions on the size of the matrix; any additional storage you need should be allocated dynamically. The programming language is C or C++; test your code before submission using the `gcc` or `g++` compiler. Submit your source code (the function) by mail to `peter@cs.ccny.cuny.edu`.