CSCI 5654-Fall15 Programming Assignment .
Assigned date: Saturday 10/03/2015,
Due date: Saturday 10/10/2015 (midnight).

Goal

The goal of the assignment is to:

1. Understand how "pivot.m" works.
2. Use it in a loop in order to solve LP problems with initial feasible dictionary.
3. Extend it (with and without the initialization phase) to handle the general LPs.

Problem

We consider the following LP transformation (as in "pivot.m"):

$$\begin{array}{ll} \text{maximize} & c \cdot x \\ \text{s.t.} & Ax = b \\ & x \geq 0. \end{array} \tag{1}$$

The starting implementation is the matlab function "pivot.m' (that can be found on moodle) and the inputs are (A,b,c,bas,nonbas) defined in "pivot.m"".

1. Exploit the "pivot.m""function :
   (a) What are the variables name for the step direction Δx_B, length step t and solution ${x_B}^*$.
   (b) How is the matrix inversion operation performed.
   (c) Write the variable p_{II}, *chat* and the current object value *objval* using c_N, c_B, B and b.
2. Case of initial feasible dictionary
   (a) Write a matlab function "pivotF.m" performing pivoting steps until reaching final dictionary.
   (b) Does this function always terminate? If no, write a function "pivotT.m" to fix this issue.
3. Infeasible initial dictionary without the initialization phase:
   (a) Write a matlab function "dual.m" that maps primal inputs to dual inputs.
   (b) Write a matlab function "pivotF1.m" extending "pivotF" to the case where initial dictionary is feasible or c_i are all negative.
   (c) Write a matlab function "pivotG.m" extending "pivotF1" to the general case.
4. Infeasible initial dictionary using the initialization phase:
   (a) Write a matlab function "Auxiliary" that maps the initial dictionary to the dictionary associated with the auxiliary problem.
   (b) Write a matlab function "pivotF2.m" extending "pivotF.m" to the general case using the initialization phase.

5. Perform tests using three LPs (that you report) such that:
    - LP with feasible initial dictionary.
    - LP that cycles (you can use the example from the previous assignment).
    - LP with infeasible initial dictionary.