Documentation (Group 15)

Reading input file:

First, we write input file name as a parameter of file reading function 'open()'. Then, we read first line of file, split words of the line and assign words as integer variables m and n. m is assigned for constraint line and n is assigned for . Then we assign list c which is for objection function. Then, we assign an matrix A for constraint functions. First m column of A represents coefficients of slack variables, from mth column to m+nth columns represent coefficients of variables and last column of A represent constrains.

m : number of constrain functions
n : number of variables
c : coefficients of objection function
A : matrix for coefficients of constrains function and constrain which is m by (m + n +1) matrix

Calculation LP:

We create a list basic_variables for indexes of basic variables. We iterate in a loop while one of the coefficients of objection function smaller than 0 (each element in c smaller than 0 except last element). In each iteration we assign *min_index* for index of minimum element in c(pivoting the column with a smallest c_j term). Then, we iterate over rows of A matrix and decide the index of row with smallest ratio of b_r/a_r and $a_r > 0$ and $b_r > 0$. We assign this index to *basic_line_index* variable.Then we assign *min_index* (j) to *basic_line_index*th cell of *basic_variables*. If we can't find proper ratio, we do same operations with next smallest index of minimum element in c. If we can't find any feasible variable, we exit from loop and print "there is no feasible solution". Then we assign *multiplier* variable for pivoting operations. Then we pivot the rth row and jth variable. Then we do same operation for c.

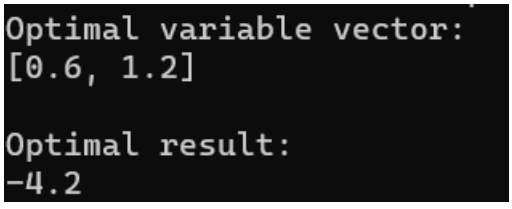
basic_variables : indexes of basic variables
min_index *:* index *of* minimum objection coefficient (column index of A which will be pivoted)
basic_line_index : row index of A which will be pivoted
multiplier : multiplier which is multiply the row of A which will be pivoted.

Output:

After iterations are done, we print all basic variables and objection.

Here are the output images of three data.

Data1:



Data2:

Because there are infinite numbers of solutions.

Data3:

```
Optimal variable vector:
[0, 4.846, 2.231, 0, 5.808, 0.577, 0, 0]

Optimal result:
-28.5
```

In Question 2 we print all iterations. Output is here.

```
Inıtial
[1.0, 0.0, 0.0, 0.25, -8.0, -1.0, 9.0, 0.0]
[0.0, 1.0, 0.0, 0.5, -12.0, -0.5, 3.0, 0.0]
[0.0, 0.0, 1.0, 0.0, 0.0, 6.0, 0.0, 1.0]
-------------------------------------------------
[0.0, 0.0, 0.0, -0.75, 20.0, -0.5, 6.0, 0]



Iteration :  1
[1.0, 0.0, 0.167, 0.25, -8.0, 0.0, 9.0, 0.167]
[0.0, 1.0, 0.083, 0.5, -12.0, 0.0, 3.0, 0.083]
[0.0, 0.0, 0.167, 0.0, 0.0, 1.0, 0.0, 0.167]
-------------------------------------------------
[0.0, 0.0, 0.083, -0.75, 20.0, 0.0, 6.0, 0.083]



Iteration :  2
[1.0, -0.5, 0.125, 0.0, -2.0, 0.0, 7.5, 0.125]
[0.0, 2.0, 0.167, 1.0, -24.0, 0.0, 6.0, 0.167]
[0.0, 0.0, 0.167, 0.0, 0.0, 1.0, 0.0, 0.167]
-------------------------------------------------
[0.0, 1.5, 0.208, 0.0, 2.0, 0.0, 10.5, 0.208]



Optimal variable vector:
[0.167, 0, 0.167, 0]
Optimal result:
-0.208
```