Matlab Algorithm: Revised Simplex Method

INPUT : A, $\vec{b}$, $\vec{c}$, number of basic variables.

[m, k] = size(A)

~~B = A(:, (end-m+1):end)~~

$\vec{X}_B = \vec{b}$

z = 0

$\vec{C}_B = \vec{c}$(end-m+1 : end);

STEP 1 : Determine entering variable:

$$\text{Obj Row} = [1 \quad \vec{C}_B^T B^{-1}] * \begin{bmatrix} -\vec{c}^T \\ A \end{bmatrix}$$

If Obj Row $\geq \vec{0}$ STOP.

Otherwise

p = index of the most negative entry in the obj. Row.

~~X_B End~~ Entering variable = $\vec{X}(p)$

STEP 2: Determine the departing variable.

Need: Pivotal column and $\vec{X}_B = [X_{1B} \; X_{2B}, \ldots \; X_{mB}]^T$

Pivotal column: $\vec{t}_p = B^{-1} A_p$

θ-ratios: $\underset{\substack{\text{entries} \\ \text{in } t_p \\ \text{positive}}}{\text{Min}} \{ X_{jB}/t_{jp} : t_{jp} > 0 \}$

q = index of element in $\vec{X}_B$ s.t. X_{jB}/t_{jp} is the minimum θ-ratio

$\vec{X}_B(q)$ = Departing variable.

3.- Update valve of $\vec{C}_B$:

$$\vec{C}_B(q) = \vec{c}(p)$$

4.- Update B^{-1} by $(B^{-1})_{New} = E B^{-1}$

→ Define the η-vector (Need pivotal column $\vec{t}_p$ and pivot t_{qp})

$$\Rightarrow \quad \eta = -\vec{t}_p / t_{qp}$$

$$\eta(q) = 1/t_{qp}$$

→ Define matrix E:

$E = \text{Identity}(m)$

$E(:, q) = \eta\text{-vector}$

$(B^{-1})_{new} = E * B^{-1}$

Update $\begin{bmatrix} z \\ \vec{x}_B \end{bmatrix}$ with the formula $\begin{bmatrix} z \\ \vec{x}_B \end{bmatrix} = \begin{bmatrix} 1 & \vec{C}_B^T B^{-1} \\ \vec{0} & B^{-1} \end{bmatrix} \begin{bmatrix} 0 \\ \vec{b} \end{bmatrix}$

Go to step 1.