Errata for Hochbaum MOR 1994.

The paper points out an error in the scaling algorithm *greedy*(s) of Hochbaum which is part of a proximity-scaling algorithm for solving the general resource allocation problem.

The general resource allocation problem is stated as follows:

$$\begin{array}{lll} \text{(General RA)} & \max & \sum_{j=1}^{n} f_j(x_j) \\ \text{subject to} & & \sum_{j=1}^{n} x_j \leq B \\ & & \sum_{j\in A} x_j \leq r(A) \\ & & \ell_i \leq x_i \qquad i = 1, \ldots, n. \end{array}$$

Where $r(A)$ is a submodular rank function. The first constraint can be stated either as inequality or as an equality constraint.

Hochbaum's scaling algorithm *greedy*(s) increments, if feasible, a variable x_i, that has the largest per unit increment to the objective function, by s. When variable x_i can be incremented by a positive amount, but strictly lesser than s, *greedy*(s) increments it by one unit.

Moriguchi and Shioura [MS04] pointed out that the increment by one unit could lead to an error. For the algorithm to work correctly when variable x_i can be incremented by a positive amount, but strictly lesser than s, *greedy*(s) must increment it to the *maximum* feasible increment $\delta_i \in [1, s)$.

The correction is as follows:

greedy(s) has in Step 2,

If $\mathbf{x} + \mathbf{e}^i$ is feasible, but $\mathbf{x} + s\mathbf{e}^i$ is infeasible then,

"$E \leftarrow E - \{i\}$, $x_i \leftarrow x_i + 1$, and $\delta_i = 1$."

This step should be substituted by, Step 2',

If $\mathbf{x} + \mathbf{e}^i$ is feasible, but $\mathbf{x} + s\mathbf{e}^i$ is infeasible then find the most violated constraint by $\mathbf{x} + s\mathbf{e}^i$ and let this violation be β,"

"$E \leftarrow E - \{i\}$, $\delta_i = s - \beta$ and $x_i \leftarrow x_i + \delta_i$."

This change does not affect the complexity of the algorithms for the special classes of the allocation problem.

Reference

[MS04] Satoko Moriguchi and Akiyoshi Shioura. On Hochbaum's Proximity-Scaling Algorithm for the General Resource Allocation Problem. *Mathematics of Operations Research*, 29:2 (May 2004), 394-397.