Illinois Institute of Technology
Department of Computer Science

Homework Assignment 3—Addendum

CS 535 Design and Analysis of Algorithms
Fall Semester, 2015

Corrections

1. In the last line of the relabeling procedure, the new label of $\text{succ}^{(k)}(x)$ should be

$$\text{label}(\text{succ}^{(k)}(x)) = (\lfloor w_j k/j \rfloor + \text{label}(x)) \bmod M.$$

2. The potential function should be:

$$\Phi = \sum_{0 \le k < n} -c \log(g_k/M),$$

which is non-negative; you will choose the constant c later on (CLRS3 calls this "scaling the units of potential").

Clarification

In case it was not obvious, $\text{succ}^{(-1)}(x)) = \text{pred}(x)$ so that in the RELABEL operation $w_0 = 0$ and $w_1 = 1$.

A Hint on Analyzing the Relabeling Operation

Although the RELABEL operation is described in a direct fashion, for purposes of analysis consider it to happen in three phases: the first phase relabels so that all the gaps g_k, $0 \le k < i$, are multiplied by $w_j/(2w_i)$, and gaps g_k, $i \le k < j$, are multiplied by $w_j/(2(w_j - w_i))$. (What effect does this have?) The second phase sets all gaps g_k, $0 \le k < j$, to be equal, but not necessarily integer. The third phase adjusts the gaps to be integers that are all u or $u + 1$ for some integer u. Now, consider the changes in potential caused by the three phases.