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Algorithm 6.14: Label Correcting Algorithm

(Input) $G = (V, E)$ digraph with costs $c(e) \gtrless 0 \quad (\forall\, e \in E)$,

$E = \{e_1, \ldots, e_m\}$ list of edges (arbitrarily sorted).

(1) (Initialization)

Set $\pi_s^1 := 0$,

$$\pi_i^1 := \begin{cases} c_{si} & \text{if } (s,i) \in E \\ \infty & \text{otherwise,} \end{cases} \qquad \forall\, s \neq i \in \{1, \ldots, n\},$$

$\text{pred}(i) := s \quad (\forall\, i = 1, \ldots, n)$,

$p := 1$.

(2) Set $\pi_j^{p+1} := \pi_j^p \; \forall j = 1, \ldots, n$.

For $l = 1$ to m do

If $e_l = (i, j)$ and $\pi_j^{p+1} > \pi_i^p + c_{ij}$,

set $\pi_j^{p+1} := \pi_i^p + c_{ij}$ and $\text{pred}(j) := i$.

(3) If $\underline{\pi}^p = \underline{\pi}^{p+1}$ (STOP), $d_i = \pi_i^p$; the dipaths P_{si} can be determined using the labels pred(i) backwards.
If $\underline{\pi}^p \neq \underline{\pi}^{p+1}$ and $p < n - 1$, set $p := p + 1$ and goto Step (2).
If $\underline{\pi}^p \neq \underline{\pi}^{p+1}$ and $p = n - 1$ (STOP), choose i with $\pi_i^p \neq \pi_i^{p+1}$. Using the labels pred(i), a negative dicycle C can be obtained.