

/ ★ The Mapper is to invert the input ★ /

Mapper :

$\forall page_j \in (page_1, page_2, \dots, page_k)$

output $page_j \rightarrow \langle page_1, \frac{rank_1}{d_1} \rangle$ // d_1 is degree of node i.

output $page_i \rightarrow page_1, page_2, \dots, page_k$

/ ★ The Reducer is to update the ranking using the in-links ★ /

Reducer :

Input is in a format of Δ . The key: $page_k$

\forall in-link $page_i \in (page_1, page_2, \dots, page_n)$

$rank_k + = \frac{rank_i}{d_i} * \beta$

output $\langle page_k, rank_k \rangle \rightarrow \langle page_1, page_2, \dots, page_n \rangle$

// $page_1, page_2, \dots, page_n$ are out-links of $page_k$.

After map function, we have temporary files in the following structure (Δ):

$page_k \rightarrow \langle page_1, rank_1 \rangle,$

$\langle page_2, rank_2 \rangle,$

.....,

$\langle page_n, rank_n \rangle,$

$\langle page_{k1}, page_{k2}, \dots, page_{kn} \rangle$

where $page_1, page_2, \dots, page_n$ are the in-links of $page_k$.

and $page_{k1}, page_{k2}, \dots, page_{kn}$ are the out-links.