

$$\llbracket p_i \rrbracket_{NodeSet}(n) = \bigcup_{n' \in \mathbf{Node}} \bigcup_{\substack{(n', n_1) \in R_{\text{child}}, \\ n_1 \in \mathbf{Lab}_b}} \bigcup_{(n_1, n'_1) \in R_{\text{parent}}} \bigcup_{(n'_1, n_2) \in R_{\text{child}}} \cdots \bigcup_{(n_i, n'_i) \in R_{\text{parent}}} \{n_{i+1} \mid (n'_i, n_{i+1}) \in R_{\text{child}}\},$$

Figure 1: Naive evaluation of queries  $p_0 = //b$ ,  $p_{i+1} = p_i/./*$ .

$$\begin{aligned} \llbracket p_i \rrbracket_{NodeSet}(n) &= \bigcup_{n'_i \in S_i} \{n_{i+1} \mid (n'_i, n_{i+1}) \in R_{\text{child}}\} &&= F_{\text{child}}(S_i) \\ S_i &= \bigcup_{n_i \in S'_i} \{n'_i \mid (n_i, n'_i) \in R_{\text{parent}}\} &&= F_{\text{parent}}(S'_i) \\ S'_i &= \bigcup_{n'_{i-1} \in S_{i-1}} \{n_i \mid (n'_{i-1}, n_i) \in R_{\text{child}}\} &&= F_{\text{child}}(S_{i-1}) \\ &&&\vdots \\ S_1 &= \bigcup_{n_1 \in S'_1} \{n'_1 \mid (n_1, n'_1) \in R_{\text{parent}}\} &&= F_{\text{parent}}(S'_1) \\ S'_1 &= \bigcup_{n' \in \mathbf{Node}} \{n_1 \in \mathbf{Lab}_b \mid (n', n_1) \in R_{\text{child}}\} &&= F_{\text{child}}(\mathbf{Node}) \cap \mathbf{Lab}_b \end{aligned}$$

where

$$F_{axis}(N) = \{n' \in \mathbf{Node} \mid \exists n \in N. (n, n') \in R_{axis}\}$$

Figure 2: Improved evaluation of queries  $p_0 = //b$ ,  $p_{i+1} = p_i/./*$ .