Sixth exercise sheet for the lecture

Syntax Directed Semantics (Part II)

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Exercise 15 (logic programming)
Consider the following logic program:

$$\begin{aligned}
\mathit{cons}(B, N, L1) &\leftarrow \\
\mathit{cons}(A, L1, L2) &\leftarrow \\
\mathit{append}(N, x, x) &\leftarrow \\
\mathit{append}(x, y, z) &\leftarrow \mathit{cons}(u, v, x), \mathit{cons}(u, w, z), \mathit{append}(v, y, w)
\end{aligned}$$

Use SLD-resolution to find all solutions for the goal

$$\leftarrow \mathit{cons}(A, x, y), \mathit{append}(y, z, L2).$$ ◇

Exercise 16 (monadic datalog and MSOL)
Consider the following monadic datalog program:

$$\begin{aligned}
q() &\leftarrow r(x) \\
r(x) &\leftarrow p(y), \mathrm{nextsibling}(y, x), \mathrm{nextsibling}(x, z), s(z) \\
p(x) &\leftarrow \mathrm{firstchild}(y, x) \\
s(x) &\leftarrow \mathrm{lastsibling}(x)
\end{aligned}$$

together with the query predicate q. Translate into an equivalent MSOL formula. ◇

Exercise 17 (semantics of wmd programs)
Consider the following wmd program over the natural numbers semiring:

$$\begin{aligned}
q() &\leftarrow r(x) \\
q() &\leftarrow 0 \\
r(x) &\leftarrow \mathrm{lastsibling}(x), 1 \\
r(x) &\leftarrow \mathrm{nextsibling}(x, y), r(y), 1
\end{aligned}$$

Given the tree $\xi = \alpha(\alpha, \alpha(\alpha, \alpha), \alpha)$, compute the iterations of the immediate consequence operator. ◇

Exercise 18 (ω-cpos)
Generalize the lemma from the lecture about monotonicity implying continuity from finite to (certain) infinite ω-cpos. $\diamond$