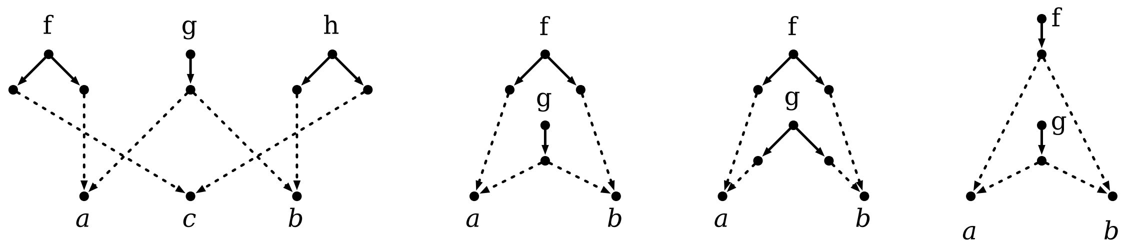
Computational Linguistics, Summer 2014, Exercise "Underspecification"

1. Consider the following dominance graphs:



(a) (b) (c) (d)

Which of the graphs are hypernormally connected?

2. Optional / Bonus: Consider the following tree automaton

$A = \langle Q = \{q\}, \Sigma = \{\neg_{|1}, \exists x_{|2}, \exists y_{|2}, \text{stud}_{x|0}, \text{book}_{y|0}, \text{read}_{x,y|0}\}, Q_f = \{q\}, \Delta\rangle$

where Δ contains the following transition rules:

$$\neg(q(x_1)) \rightarrow q(\neg(x_1))$$
$$\exists x(q(x_1), q(x_2)) \rightarrow q(\exists x(x_1, x_2))$$
$$\exists y(q(x_1), q(x_2)) \rightarrow q(\exists y(x_1, x_2))$$
$$\text{stud}_x \rightarrow q(\text{stud}_x)$$
$$\text{book}_y \rightarrow q(\text{book}_y)$$
$$\text{read}_{x,y} \rightarrow q(\text{read}_{x,y})$$

This automaton simply accepts *all* trees over Σ.

(a) Modify (extend) the automaton so that it accepts all trees over Σ *except* those trees that contain ∃x(_, ∃y(_, _)) as a subtree (trees where ∃y occurs as the right child of ∃x).

(b) Intersect the automaton from (a) with the automaton on slide 24 from the lecture.

Appendix: Intersection (see Comon &al. 2007, page 29)

Let $A_1 = \langle Q_1, \Sigma, Q_{f1}, \Delta_1\rangle$ and $A_2 = \langle Q_2, \Sigma, Q_{f2}, \Delta_2\rangle$ be two tree automata. An automaton that accepts $L(A_1) \cap L(A_2)$ can be defined as follows:

$A = \langle Q_1 \times Q_2, \Sigma, Q_{f1} \times Q_{f2}, \Delta\rangle$

$$\Delta = \{ f(\langle p_1,q_1\rangle(x1), \dots, \langle p_n,q_n\rangle(xn)) \rightarrow \langle p,q\rangle(f(x_1, \dots, x_n)) \mid$$
$$f(p_1(x_1), \dots, p_n(x_n)) \rightarrow p(f(x_1, \dots, x_n)) \in \Delta_1 \text{ and}$$
$$f(q_1(x_1), \dots, q_n(x_n)) \rightarrow q(f(x_1, \dots, x_n)) \in \Delta_2\}$$

To be turned in Tuesday, 2012-06-11