

Computational Logic

Mock exam

1. Consider the following programs.

$$P_1 : \text{halts}(a).$$
$$P_2 : \text{halts}(a). \\ \text{halts}(b) \leftarrow \text{halts}(b).$$

- Are P_1 and P_2 logically equivalent?
 - Write their completions $Comp(P_1)$ and $Comp(P_2)$
 - Are $Comp(P_1)$ and $Comp(P_2)$ equivalent? Check whether $\neg \text{halts}(b)$ is a logical consequence.
 - Can $\neg \text{halts}(b)$ be concluded by using the closed world assumption on P_1 ? and on P_2 ?
2. What are the main sources of unsoundness and incompleteness in Prolog?
- Give examples for each of them.
 - Show that SLDNF-resolution is incomplete with respect to the completion of normal logic programs.
3. Consider the general program:

$$\begin{aligned} \text{flies}(X) &\leftarrow \text{bird}(X), \text{notabnormal}(X). \\ \text{bird}(\text{tom}). \\ \text{bird}(\text{sam}). \\ \text{bird}(\text{donald}). \\ \text{abnormal}(\text{donald}). \\ \text{abnormal}(X) &\leftarrow \text{isa}(X, \text{penguin}). \\ \text{isa}(\text{sam}, \text{eagle}). \\ \text{isa}(\text{tom}, \text{penguin}). \\ \text{isa}(\text{donald}, \text{duck}). \end{aligned}$$

Construct the SLDNF-forest for the goal $\leftarrow \text{flies}(X)$.

4. What are the mgu's of the following pairs of atoms:

$$\begin{array}{ll} p(X, f(X)) & p(Y, f(a)) \\ p(f(X), Y, g(Y)) & p(Y, f(a), g(a)) \\ p(X, Y, X) & p(f(Y), a, f(Z)) \\ p(a, X) & p(X, f(X)) \end{array}$$

5. Give an inductive definition of term in first-order-logic