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13. Exercises for the Course „Logic-based Knowledge Representation“

Exercise 49:

(a) Let $D := \left\{ \frac{\text{Italian}(x) : \text{lovesWine}(x)}{\text{lovesWine}(x)}, \ \frac{\text{French}(x) : \text{lovesWine}(x)}{\text{lovesWine}(x)} \right\}$

$W := \{\text{Italian(Tom)} \vee \text{French(Tom)}\}$.

Compute the extensions of D and W and decide whether Tom loves wine.

(b) Let $D := \left\{ \frac{\text{true} : \text{usable}(x) \wedge \neg\text{broken}(x)}{\text{usable}(x)} \right\}$

$W := \{\text{broken(leftArm)} \vee \text{broken(rightArm)}\}$.

Compute the extensions of D and W and decide whether both arms are usable.

Exercise 50:

Consider the default theory (D, W) from Example 8.5 of the lecture: for closed atomic formulae a, b, c of first order predicate logic, we define

$$D := \left\{ \frac{a : b}{c}, \ \frac{c : \neg b}{\neg b} \right\}$$

$$W := \{a\}.$$

Prove that (D, W) has no extension.

Exercise 51:

Let (D, W) be a default theory.

- Let $\mathcal{E}_{(D,W)}$ be the set of all extensions of (D, W).
- We call $E, E' \in \mathcal{E}_{(D,W)}$ *incomparable*, if neither $E \subseteq E'$ nor $E' \subseteq E$.

Prove of disprove the following claims:

(a) There exists a default theory (D, W) with $|\mathcal{E}_{(D,W)}| \geq 2$ and where all $E, E' \in \mathcal{E}_{(D,W)}$ with $E \neq E'$ are incomparable.

(b) There exists a default theory (D, W) with $|\mathcal{E}_{(D,W)}| \geq 2$ and where, for all $E, E' \in \mathcal{E}_{(D,W)}$, either $E \subseteq E'$ or $E' \subseteq E$.