



Introduction to nonmonotonic reasoning

Winter Semester 2019/20

Exercise Sheet 5

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Exercise 5.1 Default logics does not support reasoning by cases. For example, consider the default theory $T = (W, D)$ with $W = \{emu \vee ostrich\}$ and

$$D = \left\{ \frac{emu : runs}{runs}, \frac{ostrich : runs}{runs} \right\}.$$

Then *runs* is not contained in any extension of T because none of the defaults can be applied. Now let's reformulate the default theory, and consider $T' = (W, D')$ with

$$D' = \left\{ \frac{true : emu \longrightarrow runs}{emu \longrightarrow runs}, \frac{true : ostrich \longrightarrow runs}{ostrich \longrightarrow runs} \right\}.$$

- Compute the extensions for T' . Compare the result with that of T and explain the difference.
- Given a normal default $\delta = \frac{\varphi:\psi}{\psi}$, define

$$\lambda(\delta) = \frac{true : \varphi \longrightarrow \psi}{\varphi \longrightarrow \psi}.$$

For a normal default theory $T = (W, D)$ let $\lambda(T) = (W, \{\lambda(\delta) \mid \delta \in D\})$. Show that every extension of T is contained in an extension of $\lambda(T)$.

Exercise 5.2 Devise a default theory with three extensions and compute all brave and all cautious consequences (modulo equivalence) of it.

Exercise 5.3 Express some of the examples from Default logic in the language of Autoepistemic logic.

Exercise 5.4 Give an inductive definition of *degree*.