



Nonmonotonic Reasoning

Winter Semester 2017/18

Exercise Sheet 1

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Dr. (habil.) Anni-Yasmin Turhan

Exercise 1.1 We consider substitutions. The *composition* of two substitutions $\sigma = [X_1/t_1, \dots, X_n/t_n]$ and $\rho = [Y_1/s_1, \dots, Y_m/s_m]$ is defined as follows

$$\sigma \circ \rho = \{X_i/t_i\rho \mid X_i \neq t_i\rho \text{ for } 1 \leq i \leq n\} \cup \{Y_j/s_j \mid Y_j \notin \{X_1, \dots, X_n\} \text{ for } 1 \leq j \leq m\}.$$

(a) Given the substitutions $\sigma = [V_1/p(), V_2/p'(), V_3/V_4]$ and $\rho = [V_2/V_3, V_4/f_2(V_3), V_1/V_4]$ together with the term

$$t = f(g(V_1), g_2(p(), V_2), f_2(V_4)).$$

Is $\sigma \circ \rho$ a ground substitution?

(b) Show that substitutions are closed under composition.

Exercise 1.2 "For any formula φ and admissible substitution σ , the formula $\forall X\varphi \longrightarrow \varphi\sigma$ is a tautology." Does this claim hold or not? How can one show this?

Exercise 1.3 We are turning to Default logic. Devise a default theory that models the bike shop domain.