Principles of Knowledge Representation and Reasoning

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Summer Semester 2008

Exercise Sheet 5
Due: June 3, 2008

Exercise 5.1 (Reasoning in Default Logic, 5 marks)

Translate into default first order logic and check whether the given conclusion follows credulously and/or skeptically.

(a) *Bob is a criminal. Criminals are not innocent, of course. Typically, criminals get accused. But even accused people are innocent, as long as the contrary is not proven.* Conclusion: *Bob gets accused.*

(b) *Bob is a criminal. Typically, criminals are not innocent. People who don't get accused are usually not criminal. But each person is considered innocent as long as the contrary is not proven.* Conclusion: *Bob gets accused.*

(c) *Typically, computer scientists like computers. People who like computers and are female are typically interested in psychology. A typical computer scientist is female, as for example Anne.* Conclusion: *Anne is interested in psychology.*

(d) *By default, students are lazy. Computer science students are typically intelligent. Intelligent students are usually not lazy. Anne, Bob, Jim, and Mary are the only students, Anne and Bob study computer science.* Conclusion: *Computer science students are not lazy.*

(Remark: In (a)–(c) you may assume that Bob/Anne is the only individual, respectively).

Exercise 5.2 (Extensions, 5 marks)

Let S be a set of propositional logic formulae. Consider the set of defaults $D = \{\frac{\top : \phi}{\phi} | \phi \in S\}$. A *maximal consistent* subset of S is a subset C of S such that C is satisfiable, but each proper superset $C \subset C' \subseteq S$ is not. Show the following statements:

(a) If C is a maximal consistent subset of S, then the default theory $\langle D, \emptyset \rangle$ has an extension E such that $C = E \cap S$.

(b) If E is an extension of $\langle D, \emptyset \rangle$, then $E \cap S$ is a maximal consistent subset of S.