Principles of Knowledge Representation and Reasoning

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Exercise Sheet 12

Due: January 27th, 2016

Exercise 12.1 (Cumulative and Preferential Consequences, 4)

For each of the following statements (a)–(d), provide a (different!) example of a set of conditionals K and a plausible consequence $\varphi \mathrel{|\!\sim} \psi$ satisfying the given property (prove that your answer is correct by giving derivations and/or counterexamples as appropriate). If the property cannot hold for any set K and formulae φ and ψ, prove this.

(a) K implies $\varphi \mathrel{|\!\sim} \psi$ in system **C** and in system **P**.

(b) K implies $\varphi \mathrel{|\!\sim} \psi$ in system **C**, but not in system **P**.

(c) K implies $\varphi \mathrel{|\!\sim} \psi$ in system **P**, but not in system **C**.

(d) K does not imply $\varphi \mathrel{|\!\sim} \psi$ in either system **C** or system **P**.

Exercise 12.2 (Answer Sets, 2)

Find an answer set for the program Π_n consisting of the following n rules

$$p_i \leftarrow not\ p_{i+1}. \qquad (1 \leq i < n)$$

where n is a natural number.

Exercise 12.3 (Answer Set Programming and Defaults, 6)

Reconsider the following knowledge base from exercise 9.3 (slightly condensed): *By default, students are not lazy. But computer science students are typically intelligent, and intelligent students are usually lazy. Anne and Bob study computer science.* Using Default Reasoning, the conclusion *Anne and Bob are lazy* follows credulously. Your task:

- Model the knowledge base as an Answer Set Program. Make use of the two versions of negation provided by the ASP language. Use clingo[1] to output all answer sets of your program.[2]
- Choose one of the answer sets and check that it is indeed an answer set according to the definition from the lecture.
- Show that the answer sets correspond to the extensions of the default theoretical formalization.

[1] http://potassco.sourceforge.net/
[2] Run `./clingo 0 <yourfile>`