Principles of Knowledge Representation and Reasoning

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Exercise Sheet 14
Due: February 10th, 2016

Exercise 14.1 (BELIEF REVISION)

Consider the following description:

> Bob is organizing a party for Xmas. Mary and Tom said they will come together. Peter said he won't come if Mary is here and Judea said he will come only if Peter is here.

> At the last minute, Mary learns that she is unable to come because her mother is ill.

Propose a formalization of this description within propositional logic and perform a full-meet revision.

Exercise 14.2 (BELIEF REVISION AND NON-MONOTONIC REASONING)

Let $\dot{+}$ be a revision operator that satisfies the six basic AGM postulates as well as the following:

$(\dot{+}7)$ $K \dot{+} (\varphi \wedge \psi) \subseteq (K \dot{+} \varphi) + \psi$;

$(\dot{+}8)$ If $\neg\psi \notin K \dot{+} \varphi$, then $(K \dot{+} \varphi) + \psi \subseteq K \dot{+} (\varphi \wedge \psi)$.

Given a theory K (i.e., K is a deductively closed set of propositional logic formulae), define a consequence relation $\vdash\!\!\!\sim_K$ by:

$$\varphi \vdash\!\!\!\sim_K \psi \text{ iff } \psi \in K \dot{+} \varphi.$$

Check for each of the rules *Reflexivity, LLE, RW, Cautious Monotonicity, Cut, Loop, Or,* and *Rational Monotonicity* whether $\vdash\!\!\!\sim_K$ is closed under the rule. Provide proofs or counter-examples.

Exercise 14.3 (PATH CONSISTENCY)

Consider the following constraint network over the point algebra. The constraints are $x \geq v, x \geq w, x \neq z, z \geq w, w > v$. Apply the path-consistency algorithm to the network.