Principles of Knowledge Representation and Reasoning

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Summer Semester 2008

Exercise Sheet 6

Due: June 10, 2008

Exercise 6.1 (Minimal Model Reasoning, 4 marks)

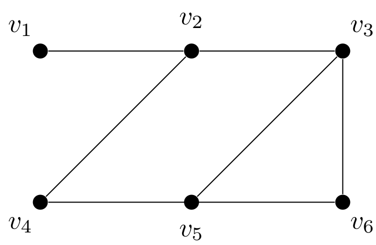
Prove the theorem on embedding B-minimal model reasoning into propositional default logic (chap. 7, slide 6):

Let A be a set of atomic propositions. Let Φ be a set of propositional formulae on A, and $B \subseteq A$.
Then $\Phi \models_B \psi$ if and only if ψ follows from $\langle D, W \rangle$ skeptically, where

$$D = \left\{ \frac{:\neg b}{\neg b} \,\middle|\, b \in B \right\} \text{ and } W = \Phi.$$

Exercise 6.2 (Nonmonotonic Logic Programs, 4 marks)

Consider the following undirected graph:



(a) State a logic program whose answer sets are the maximal independent sets of the graph. Is your program stratified?

(b) Add an additional rule to your program that enforces vertex v_3 to be in the answer set. Is your new program stratified? If not, reformulate it as a (non-trivial) stratified program. A possible partition is for example:

$P_1 = \{$`in(v3).`$\}$
$P_2 = \{$`in(v2) :- not in(v3).`, `in(v5) :- not in(v3).`,
`in(v6) :- not in(v3).`$\}$
$P_3 = \{$`in(v1) :- not in(v2).`,
`in(v4) :- not in(v2), not in(v5).`$\}$

Exercise 6.3 (Cumulative Logic, 2 marks)

Prove that system **C** implies the *Modus Ponens in the Consequence* (MPC) rule:

$$\frac{\alpha \mid\!\sim \beta \to \gamma \quad \alpha \mid\!\sim \beta}{\alpha \mid\!\sim \gamma}$$

In your proof, you may use the defined derivation rules of system **C** as well as the derived rules *Supraclassicality*, *Equivalence*, and *And*.