Tentamen Intelligent Agents, Universiteit Utrecht, ICS, 7.11.2011, 17-20 uur.

LIMITED OPEN BOOK: only clean (non-annotated) versions of the study material (slides, copies of articles) may be used, and no elaborations of exercises. Write legibly and clearly! Success!

Assignment 1 (General)

(a) Why do you think that logic has played such an important role in the theory and development of the field of intelligent agents?

(b) What is the importance of the choice of logics used for describing agents' attitudes? Can you explain the choices made in the literature that we have studied during the course?

Assignment 2 (Rao & Georgeff)

Prove Theorem 1(a) in the article by Rao & Georgeff (as precisely as you can). Hint: use, besides property A19a, also property A18.

Assignment 3 (KARO)

(a) Prove that under the condition

$$\alpha_1; \alpha_2 \in C(M, w) \text{ iff } [\alpha_1 \in C(M, w) \text{ and } \alpha_2 \in C(R_{\alpha_1}(M, w))]$$

it holds that $\models A(\alpha_1; \alpha_2) \leftrightarrow (A\alpha_1 \wedge [\alpha_1]A\alpha_2)$.

(b) Show that under the same condition as in (a) augmented with the condition that α_1 is deterministic and non-failing (i.e. execution leads to exactly one successor model/state pair) it holds that $\models A(\alpha_1; \alpha_2) \leftrightarrow (A\alpha_1 \wedge <\alpha_1>A\alpha_2)$.

(c) Discuss why the validity under (a) is strange (or even undesired) for failing action α_1 (i.e. α_1 has no successor models/state pairs). Provide an example to illustrate your argument.

(d) Why could the property as expressed by the formula mentioned in (b) be considered as undesired for *non*deterministic α_1?

Assignment 4 (situation calculus)

(a) What is the frame problem?

(b) What is Reiter's solution to the frame problem? Describe the essence of this solution.

(c) To what extent is Reiter's solution really a solution to the frame problem?

Assignment 5 (agent-oriented programming languages)

What elements of the formal logics of Cohen & Levesque, Rao & Georgeff's BDI logic and KARO can you recognize in the agent language 3APL? Try to match concepts, properties, ideas. Also consider notable mismatches.