

Dynamic Epistemic Logic

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Exercise Sheet 2

Due: November 3rd, 2016, 10:00

Exercise 2.1 (Hanabi II, 1+2)

Consider the following scenario in our two-player, four-card version of Hanabi. Agent a has been dealt a red 2 and agent b has been dealt a red 1. Afterwards, agent a announces that agent b 's card is a 1.

- (a) Model the situation after the announcement as pointed epistemic model (M, s) .
- (b) Show that $(M, s) \models K_a K_b (b_{r1} \vee b_{g1}) \wedge K_b (\hat{K}_a a_{r2} \wedge \hat{K}_a a_{g2})$. Specify all intermediate steps.

Exercise 2.2 (Validity of S5 axioms, 2+2+2)

Show that the following *axioms* are valid in the class of reflexive, Euclidean Kripke frames (S5).

- (a) $K_a(\phi \rightarrow \psi) \rightarrow (K_a\phi \rightarrow K_a\psi)$
- (b) $K_a\phi \rightarrow \phi$
- (c) $\hat{K}_a\phi \rightarrow K_a\hat{K}_a\phi$

Exercise 2.3 (Satisfiability in S5, 1+1+1)

Show that the following \mathcal{L}_K formulas are satisfiable in S5.

- (a) $K_a(p \wedge \hat{K}_b\neg p)$
- (b) $K_a K_b p \wedge \neg K_b K_a p$
- (c) $\neg p \wedge \hat{K}_2 K_1 p \wedge \hat{K}_1 K_2 p \wedge K_2 \hat{K}_1 p \wedge K_1 \hat{K}_2 p$