

Dynamic Epistemic Logic

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Exercise Sheet 9

Due: January 12th, 2016, 10:00

Exercise 9.1 (Action emulation, 2+2 points)

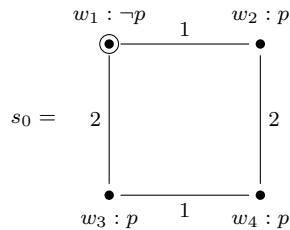
Consider the following action models (for the one-agent case):

$$a_1 = \begin{array}{c} \bullet \\ \hline e_1 : p \vee q \end{array}, \quad a_2 = \begin{array}{c} \bullet \quad \bullet \\ \hline e_2 : p \quad e_3 : q \end{array}, \quad a_3 = \begin{array}{c} \bullet \quad \bullet \quad \bullet \\ \hline e_4 : p \quad e_5 : q \quad e_6 : p \vee q \end{array}$$

- Show that a_1 and a_3 are emulous.
- Show that a_2 and a_3 are emulous.

Exercise 9.2 (Bisimilarity and action properties, 2+2+2+1+1 points)

Consider the following epistemic state s_0 , alongside the *Mayset* actions from Exercise 8.2. The state represents the situation where no agent has pressed the switch yet, but both agents have had the opportunity to do so.



We say that an action a is *self-absorbing* if for all states s in which a is applicable, a is also applicable in $s \otimes a$, and $s \otimes a \otimes a$ is bisimilar to $s \otimes a$. We say that two actions a_1 and a_2 *commute* if for all states s where a_1 is applicable in s and a_2 is applicable in $s \otimes a_1$, also a_2 is applicable in s , and a_1 is applicable in $s \otimes a_2$, and $s \otimes a_1 \otimes a_2$ is bisimilar to $s \otimes a_2 \otimes a_1$.

- Show that s_0 , and $s_0 \otimes \text{Mayset}'_1$, and $s_0 \otimes \text{Mayset}'_2$ are bisimilar.
- Show that Mayset_1 and Mayset_2 are self-absorbing actions.
- Show that Mayset_1 and Mayset_2 commute.
- Give an example for an action that is not self-absorbing.
- Give an example for actions that do not commute.