Dynamic Epistemic Logic

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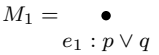
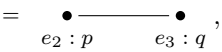
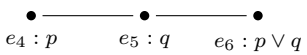
Exercise Sheet 9

Due: July 3rd, 2019, 16:00

Exercise 9.1 (Action emulation, 2+2 points)
Consider the following action models (for the single-agent case):

$M_1 =$ 

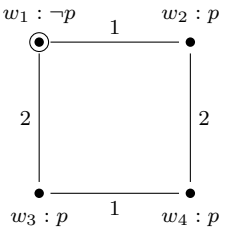
, $M_2 =$ 

, $M_3 =$ 

(a) Find a total emulation between M_1 and M_3. Show that the conditions (forth), (back) and (pre) are satisfied.

(b) Find a total emulation between M_2 and M_3. Show that the conditions (forth), (back) and (pre) are satisfied.

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.

$s_0 =$ 

We say that an action a is *self-absorbing* if for all states s in which a is applicablicable, 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 $s \otimes a_2 \otimes a_1$.

(a) Show that s_0, and $s_0 \otimes \mathit{Mayset}'_1$, and $s_0 \otimes \mathit{Mayset}'_2$ are bisimilar.

(b) Show that Mayset_1 and Mayset_2 are self-absorbing actions.

(c) Show that Mayset_1 and Mayset_2 commute.

(d) Give an example for an action that is not self-absorbing.

(e) Give an example for actions that do not commute.