## Dynamic Epistemic Logic

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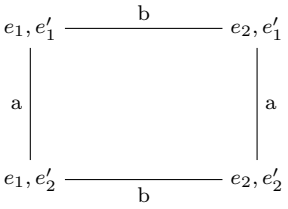
# Exercise Sheet 7

**Due: June 19th, 2019, 16:00**

**Exercise 7.1** (Applicability of events, 4 points)

Recall the example from the lecture concerning a composition of read actions and its simplified form (in both cases, the precondition for $e_1, e_1'$ is $p$ and the precondition for $e_2, e_2'$ is $\neg p$. For both $e_1, e_2'$ and $e_2, e_1'$, the precondition is $\bot$):

$(Read_a; Read_b) =$




$Bothread =$ $e_1, e_1'$ $e_2, e_2'$

Show that from an arbitrary state, the application of $(Read_a; Read_b)$ and its simplified version *Bothread* is equivalent, i.e., for any epistemic state $s$ and formula $\varphi \in \mathcal{L}^{\text{act}}_{KC\otimes}(A, P)$, it holds that $s \models [(Read_a; Read_b)]\varphi$ iff $s \models [Bothread]\varphi$.

**Exercise 7.2** (Public announcements, 4 points)

We define the action model $\text{pub}(\varphi)$ for publicly announcing $\varphi$ as $(\langle S, \sim, \text{pre}\rangle, s)$ with domain $S = \{s\}$, precondition $\text{pre}(s) = \varphi$, and $s \sim_a s$ for all agents $a$. Show that $[\text{pub}(\varphi)]\psi$ (using the semantics of action model logic) is equivalent to $[\varphi]\psi$ (using the semantics of public announcement logic).

**Exercise 7.3** (Action model for *Bothmayread*, 4 points)

Consider again the letter example from the lecture. Define an action model *Bothmayread*, in which both agents consider it possible that the other may have read the letter, and where, in fact, both read the letter. Apply the action to the example's initial state where both agents don't know the content of the letter and this is common knowledge.