

CS222, HW 3

Due Monday, June 1

May 22, 2009

1. Show in Public Announcement Logic that $\phi \rightarrow \langle \phi \rangle \psi$ is equivalent to $[\phi]\psi$.
2. We define a formula in Public Announcement Logic to be *successful* if $[\phi]\phi$ is valid. An example of an *unsuccessful* formula is the Moore sentence $p \wedge \neg K_a p$.
 - (a) Give formulas ϕ and ψ , such that both ϕ and ψ are successful, but $\phi \rightarrow \psi$ is not successful.
 - (b) Give formulas ϕ and ψ , both successful, but for which $[\phi]\psi$ is not successful.
3.
 - (a) Find a model with two agents, in which neither knows what the actual world is, but after public announcements of what each of them know, both come to know what the actual world is.
 - (b) Find a model with two agents, in which neither knows what the actual world is, but after public announcements of what each of them does **not** know, both come to know what the actual world is.
4.
 - (a) Show $[M,s]K_a\phi \leftrightarrow (pre(s) \rightarrow K_a[M,s]\phi)$ is not valid in Dynamic Epistemic Logic.
 - (b) Show $[M,s]K_a\phi \leftrightarrow (pre(s) \rightarrow \bigwedge_{s \sim_a t} K_a[M,t]\phi)$ is valid.
5. Consider the following situation: Agents a , b , and c have cards 1, 2, and 3, respectively, but no one else knows anyone else's card. The epistemic event that takes place is that a shows her card to b , and both a and b think c did not notice. But in fact c noticed. Give a model of the original situation and an action model of the event. Finally, compute the resulting model by taking product update of the original model and the action model.