# Quantifying over public announcements does not have the finite model property.

## No Finite Model Property for Logics of Quantified Announcements

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## 1 Quantifying Over Public Announcements

**Arbitrary Public Announcement Logic** (APAL): over all formulas of EL; PAL + $[!]\varphi$.
**Group Announcement Logic** (GAL): over formulas of EL known to the agents in a group; PAL + $[G]\varphi$.
**Coalition Announcement Logic** (CAL): double quantification over formulas known to agents in a coalition, and formulas known to agents in the anti-coalition; PAL + $[\![G]\!]\varphi$.

## 2 Semantics

Let $M = (S, R, V)$ be an epistemic model and $M^\varphi$ contain only $\varphi$-states.

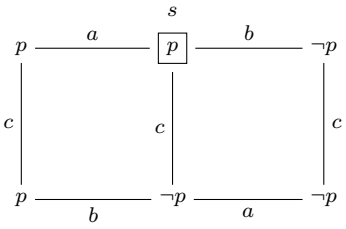
$$
\begin{array}{lll}
M_s \models \Box_a \varphi & \text{iff} & \forall t \in S : s \sim_a t \text{ implies } M_t \models \varphi \\
M_s \models [\varphi]\psi & \text{iff} & M_s \models \varphi \text{ implies } M^\varphi_s \models \psi \\
M_s \models [!]\varphi & \text{iff} & \forall \psi \in \mathcal{EL} : M_s \models [\psi]\varphi \\
M_s \models [G]\varphi & \text{iff} & \forall \psi_G : M_s \models [\psi_G]\varphi \\
M_s \models [\![G]\!]\varphi & \text{iff} & \forall \psi_G \exists \chi_{\overline{G}} : M_s \models \psi_G \to \langle \psi_G \wedge \chi_{\overline{G}} \rangle \varphi
\end{array}
$$

## 3 Results

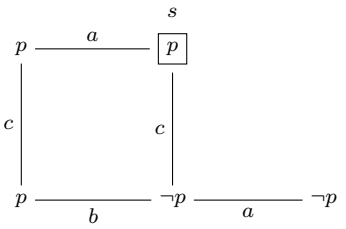
**None** of APAL, GAL, and CAL have **the finite model property**.

## Examples

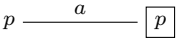
**Initial Configuration**



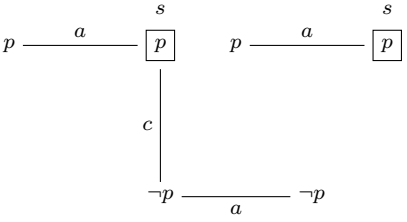

**APAL Example**: do we have an announcement to remove the state to the right of the initial one? Yes! $\psi := \neg p \to \Diamond_a \Diamond_c p$




**GAL Example**: can agent $a$ remove all $\neg p$-states? Yes! $\psi_a := \Box_a p$




**CAL Example**: can agent $a$ remove **only** upper right and bottom left states in the presence of opponents? Depends on $b$ and $c$. If $b$ and $c$ remain silent, then yes (model on the right), if they make an informative announcements, then not (model on the right).

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