Several Definitions

Definition 1. (Priority Sequences) *Given the language of the classical epistemic logic $\mathcal{L}_{\mathrm{EL}}$, a priority structure is a tuple $\mathcal{G} = \langle \Phi, \prec \rangle$ such that:*

- $\Phi \subset \mathcal{L}_{\mathrm{EL}}$ *and* Φ *is finite;*
- $\prec$ *is a strict order on* Φ *such that for all formulas* $\varphi, \psi \in \Phi$*, it holds that:*
  if $\varphi \prec \psi$*, then* ψ *logically implies* φ*.*

Definition 2. (Epistemic Betterness Structures Based On Priority Structures) *Given an $\mathcal{L}_{\mathrm{EL}}$-priority structure $\mathcal{G} = \langle \Phi, \prec \rangle$, the structure $M = \langle S, \sim_1, \cdots, \sim_n, \leqslant_{\mathcal{G}}, V \rangle$ is an epistemic betterness structure based on $\mathcal{G}$ where*

- S *is a nonempty set of states;*
- $\sim_i$: $S \times S$ *is the epistemic relation for agent i (equivalence relation);*
- $V : \mathbf{P} \to \mathcal{P}(S)$*;*
- $\leqslant_{\mathcal{G}}$: $S \times S$ *such that* $s \leqslant_{\mathcal{G}} s' \iff \forall \varphi \in \Phi : s \in \|\varphi\|_V \Rightarrow s' \in \|\varphi\|_V$.

Here, $\|\varphi\|_V = \{s \in S \mid M, s \models \varphi$ *and* $\varphi \in \Phi\}$.

Definition 3. (Semantics of $\bigcirc(\varphi|\psi)$) *Let $M = \langle S, \sim_1, \cdots, \sim_n, \leqslant_{\mathcal{G}}, V \rangle$ be an epistemic betterness structure based on the priority structure $\mathcal{G}$.*

$$M_{\mathcal{G}}, s \models \bigcirc(\varphi|\psi) \quad \textit{iff} \quad \max\nolimits_{\leqslant_{\mathcal{G}}} \|\psi\|_M \subseteq \|\varphi\|_M.$$

Definition 4. (Semantics of $\bigodot_i(\varphi|\psi)$) *Let $M = \langle S, \sim_1, \cdots, \sim_n, \leqslant_{\mathcal{G}}, V \rangle$ be an epistemic betterness structure based on the priority structure $\mathcal{G}$.*

$$M_{\mathcal{G}}, s \models \bigodot\nolimits_i(\varphi|\psi) \quad \textit{iff} \quad \max\nolimits_{\leqslant_{\mathcal{G}}}(\|\psi\|_M \cap [s]^{\sim_i}) \subseteq \|\varphi\|_M.$$