

Модели лжи

1.1 Truthful and lying public announcements

Предлагается следующая эпистемическая модель $M=(S, R, V)$

$\mathcal{L}(!, i) \ni \varphi ::= p \mid \neg\varphi \mid (\varphi \wedge \psi) \mid B_a\varphi \mid [! \varphi]\psi \mid [i \varphi]\psi$

$\mathcal{M}, s \models p$ iff $s \in V_p$

$\mathcal{M}, s \models \neg\varphi$ iff $\mathcal{M}, s \not\models \varphi$

$\mathcal{M}, s \models \varphi \wedge \psi$ iff $\mathcal{M}, s \models \varphi$ and $\mathcal{M}, s \models \psi$

$\mathcal{M}, s \models B_a\varphi$ iff $\forall t \ni S : R_a(s, t)$ implies $\mathcal{M}, t \models \varphi$

$\mathcal{M}, s \models [! \varphi]\psi$ iff $\mathcal{M}, s \models \varphi$ implies $\mathcal{M}^\varphi, s \models \psi$

$\mathcal{M}, s \models [i \varphi]\psi$ iff $\mathcal{M}, s \models \neg\varphi$ implies $\mathcal{M}^\varphi, s \models \psi$

Аксиомы правдивого и ложного публичного объявления:

$[! \varphi]B_a\psi \leftrightarrow \varphi \rightarrow B_a[! \varphi]\psi$

$[i \varphi]B_a\psi \leftrightarrow \neg\varphi \rightarrow B_a[i \varphi]\psi$

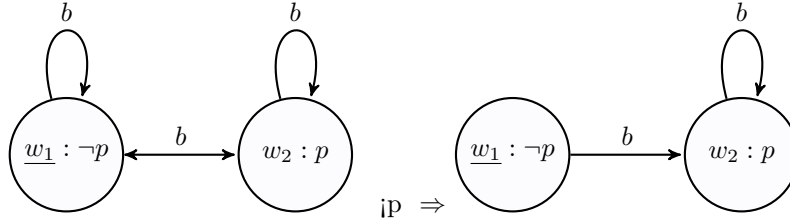


Рис. 1.1

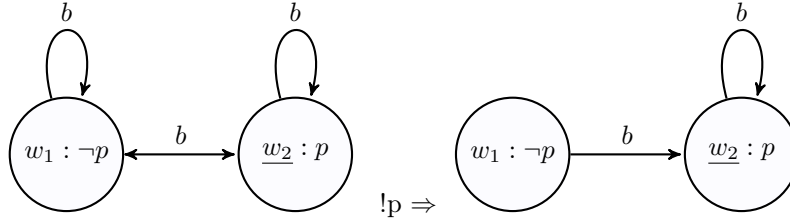


Рис. 1.2

1.2 Truthful and lying agent announcements

$\mathcal{L}(!_a, i_a) \ni \varphi ::= p \mid \neg\varphi \mid (\varphi \wedge \psi) \mid B_a\varphi \mid [! \varphi]\psi \mid [i \varphi]\psi \mid [!_a \varphi]\psi$

Определения:

$\mathcal{M}, s \models [!_a \varphi]\psi$ iff $\mathcal{M}, s \models B_a\varphi$ implies $\mathcal{M}_a^\varphi, s \models \psi$

$\mathcal{M}, s \models [i_a \varphi]\psi$ iff $\mathcal{M}, s \models B_a\neg\varphi$ implies $\mathcal{M}_a^\varphi, s \models \psi$

$\mathcal{M}, s \models [!_a \varphi]\psi$ iff $\mathcal{M}, s \models \neg(B_a\varphi \vee B_a\neg\varphi)$ implies $\mathcal{M}_a^\varphi, s \models \psi$

Аксиомы:

$$\begin{aligned}
 [!_a\varphi]B_b\psi &\longleftrightarrow B_a\varphi \rightarrow B_b[!_a\varphi]\psi \\
 [!_a\varphi]B_a\psi &\longleftrightarrow B_a\varphi \rightarrow B_a[!_a\varphi]\psi \\
 [!_a\varphi]B_b\psi &\longleftrightarrow B_a\neg\varphi \rightarrow B_b[!_a\varphi]\psi \\
 [!_a\varphi]B_a\psi &\longleftrightarrow B_a\neg\varphi \rightarrow B_a[!_a\varphi]\psi \\
 [!_a\varphi]B_b\psi &\longleftrightarrow \neg(B_a\varphi \vee B_a\neg\varphi) \rightarrow B_b[!_a\varphi]\psi \\
 [!_a\varphi]B_a\psi &\longleftrightarrow \neg(B_a\varphi \vee B_a\neg\varphi) \rightarrow B_a[!_a\varphi]\psi
 \end{aligned}$$

2.1 Action model

- $\mathcal{M} = (S, R, pre)$
- $R: A \rightarrow \mathcal{P}(S \times S)$
- $pre: S \rightarrow \mathcal{L}_x$

Action model for truthful and lying public announcement:

$$\begin{aligned}
 \mathcal{M}, s \models [!_a\varphi]\psi &\text{ iff } \mathcal{M} \otimes \mathcal{M}', (s, !) \models \psi, pre(!) = \varphi \\
 \mathcal{M}, s \models [i_a\varphi]\psi &\text{ iff } \mathcal{M} \otimes \mathcal{M}', (s, i) \models \psi, pre(i) = \varphi
 \end{aligned}$$

Пример:

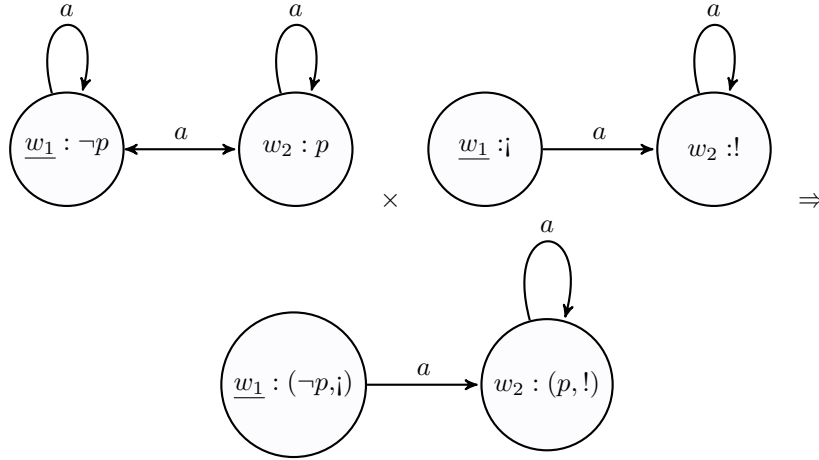


Рис. 2

2.2 Action model for agent announcement

$$\begin{aligned}
 \mathcal{M}, s \models [!_a\varphi]\psi &\text{ iff } \mathcal{M} \otimes \mathcal{M}'', (s, !_a) \models \psi \\
 \mathcal{M}, s \models [i_a\varphi]\psi &\text{ iff } \mathcal{M} \otimes \mathcal{M}'', (s, i_a) \models \psi \\
 \mathcal{M}, s \models [!_i\varphi]\psi &\text{ iff } \mathcal{M} \otimes \mathcal{M}'', (s, !_i) \models \psi
 \end{aligned}$$