Semantics III

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Analyzing a Mandarin topic chain in PLA

Analysis tree for $[\![\exists x(x = a \wedge Y^1 x \wedge P^1 x)]\!]^{\mathcal{M},g}$

$$
\begin{array}{llllll}
\exists x & (x = a & \wedge & Y^1 x & \wedge & P^1 x) \\
\cline{2-2}\cline{4-4}\cline{6-6}
 & \{i \in c : g(x) = [\![a]\!]_{\mathcal{M}}\} & & \{i \in c : g(x) \in [\![Y^1]\!]_{\mathcal{M}}\} & & \{i \in c : g(x) \in [\![P^1]\!]_{\mathcal{M}}\} \\
 & = c_2 & & & & \\
\cline{2-4}
 & \multicolumn{3}{l}{c_2[\![Y^1 x]\!]^{\mathcal{M},g}} & & \\
 & \multicolumn{3}{l}{= \quad \{j \in c_2 : g(x) \in [\![Y^1]\!]_{\mathcal{M}}\}} & & \\
 & \multicolumn{3}{l}{= \quad \{i \in c : g(x) = [\![a]\!]_{\mathcal{M}} \;\&\; g(x) \in [\![Y^1]\!]_{\mathcal{M}}\}} & & \\
\cline{2-6}
 & \multicolumn{5}{l}{\{i \in c : g(x) = [\![a]\!]_{\mathcal{M}} \;\&\; g(x) \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; g(x) \in [\![P^1]\!]_{\mathcal{M}}\}} \\
\hline
\multicolumn{6}{l}{\{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in c[\![x = a \wedge Y^1 x \wedge P^1 x]\!]^{\mathcal{M},g[x/d]}\}} \\
\multicolumn{6}{l}{= \quad \{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in \{j \in c : d = [\![a]\!]_{\mathcal{M}} \;\&\; d \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; d \in [\![P^1]\!]_{\mathcal{M}}\}} \\
\multicolumn{6}{l}{= \quad \{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; d = [\![a]\!]_{\mathcal{M}} \;\&\; d \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; d \in [\![P^1]\!]_{\mathcal{M}}\}}
\end{array}
$$

Updating the null info. state

$$
\begin{array}{ll}
\multicolumn{2}{l}{\{\langle\rangle\}[\![\exists x(x = a \wedge Y^1 x \wedge P^1 x)]\!]^{\mathcal{M},g}} \\
= & \{a : a = [\![a]\!]_{\mathcal{M}} \;\&\; a \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; a \in [\![P^1]\!]_{\mathcal{M}}\} \\
= & c_1
\end{array}
$$

Analysis tree for $[\![\exists x(J^2 x \top_1 \wedge G^1 x)]\!]^{\mathcal{M},g}$

$$
\begin{array}{llll}
\exists x & (J^2 x \top_1 & \wedge & G^1 x) \\
\cline{2-2}\cline{4-4}
 & \{i \in c : \langle g(x), i_1\rangle \in [\![J^2]\!]_{\mathcal{M}}\} & & \{i \in c : g(x) \in [\![G^1]\!]_{\mathcal{M}}\} \\
\cline{2-4}
 & \multicolumn{3}{l}{\{i \in c : \langle g(x), i_1\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; g(x) \in [\![G^1]\!]_{\mathcal{M}}\}} \\
\hline
\multicolumn{4}{l}{\{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in c[\![J^2 x \top_1 \wedge G^1 x]\!]^{\mathcal{M},g[x/d]}\}} \\
\multicolumn{4}{l}{= \quad \{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in \{j \in c : \langle d, j_1\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; d \in [\![G^1]\!]_{\mathcal{M}}\}} \\
\multicolumn{4}{l}{= \quad \{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in c \;\&\; \langle d, i_1\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; d \in [\![G^1]\!]_{\mathcal{M}}\}}
\end{array}
$$

Updating info. state c_1

$$
\begin{array}{ll}
\multicolumn{2}{l}{c_1[\![\exists x(J^2 x \top_1 \wedge G^1 x)]\!]^{\mathcal{M},g}} \\
= & \{j \cdot i : i \in c_1 \;\&\; \langle j, i_1\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; j \in [\![G^1]\!]_{\mathcal{M}}\} \\
= & \{\langle j, a\rangle : a = [\![a]\!]_{\mathcal{M}} \;\&\; a \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; a \in [\![P^1]\!]_{\mathcal{M}} \;\&\; \langle j, a\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; j \in [\![G^1]\!]_{\mathcal{M}}\} \\
= & c_2
\end{array}
$$

Analysis tree for $[\![\exists x B^2 x \top_2]\!]^{\mathcal{M},g}$

$$\begin{array}{ll}
\exists x & B^2 x \top_2 \\ \cline{2-2}
 & \{i \in c : \langle g(x), i_2\rangle \in [\![B^2]\!]_{\mathcal{M}}\} \\ \hline
\multicolumn{2}{l}{\{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in c[\![B^2 x \top_2]\!]^{\mathcal{M},g[x/d]}\}} \\
= & \{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in \{k \in c : \langle d, k_2\rangle \in [\![B^2]\!]_{\mathcal{M}}\} \\
= & \{d \cdot i : d \in \mathcal{D}_{\mathcal{M}} \;\&\; i \in c \;\&\; \langle d, i_2\rangle \in [\![B^2]\!]_{\mathcal{M}}\}
\end{array}$$

Updating info. state c_2

$$\begin{array}{ll}
\multicolumn{2}{l}{c_2[\![\exists x B^2 x \top_2]\!]^{\mathcal{M},g}} \\
= & \{b \cdot i : i \in c_2 \;\&\; \langle b, i_2\rangle \in [\![B^2]\!]_{\mathcal{M}}\} \\
= & \{b \cdot i : i \in \{\langle j, a\rangle : a = [\![a]\!]_{\mathcal{M}} \;\&\; a \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; a \in [\![P^1]\!]_{\mathcal{M}} \;\&\; \langle j, a\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; j \in [\![G^1]\!]_{\mathcal{M}}\} \;\&\; \langle b, i_2\rangle \in [\![B^2]\!]_{\mathcal{M}}\} \\
= & \{\langle b, j, a\rangle : a = [\![a]\!]_{\mathcal{M}} \;\&\; a \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; a \in [\![P^1]\!]_{\mathcal{M}} \;\&\; \langle j, a\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; j \in [\![G^1]\!]_{\mathcal{M}} \;\&\; \langle b, a\rangle \in [\![B^2]\!]_{\mathcal{M}}\}
\end{array}$$

Truth in $\mathcal{M}$

$$\mathcal{M} \vDash \exists x(x = a \wedge Y^1 x \wedge P^1 x) \wedge \exists x(J^2 x \top_1 \wedge G^1 x) \wedge \exists x B^2 x \top_2$$

$$iff\ \exists b, j, a \in \mathcal{D}_{\mathcal{M}}(a = [\![a]\!]_{\mathcal{M}} \;\&\; a \in [\![Y^1]\!]_{\mathcal{M}} \;\&\; a \in [\![P^1]\!]_{\mathcal{M}} \;\&\; \langle j, a\rangle \in [\![J^2]\!]_{\mathcal{M}} \;\&\; j \in [\![G^1]\!]_{\mathcal{M}} \;\&\; \langle b, a\rangle \in [\![B^2]\!]_{\mathcal{M}})$$