OPERATIONAL SEMANTICS FOR ACTOR CONFIGURATIONS

$$\kappa = \langle\langle \alpha \mid \mu \rangle\rangle^{\rho}_{\chi}$$

α is a function mapping actor names (represented as variables) to actor states.

μ is a multi-set of messages "en-route".

ρ is a set of receptionists

χ is a set of external actors.

Given $A = Dom(\alpha)$:

$$\rho \subseteq A \quad , \quad A \cap \chi = \emptyset$$

- if $\alpha(a) = (?_{a'})$, then $a' \in A$
- if $a \in A$, then $FV(\alpha(a)) \subseteq A \cup \chi$.
- if $\langle v_0 \Leftarrow v_1 \rangle \in \mu$, $FV(v_0, v_1) \subseteq A \cup \chi$.

$$\underline{\alpha} \in \mathbb{X} \xrightarrow{fin} As$$

$$As = (?_x) \cup (\mathbb{V}) \cup [\mathbb{E}]$$

$$\underline{\mu} \in M_\omega[\mathbb{M}]$$

$$\mathbb{M} = \langle \mathbb{V} \Leftarrow \mathbb{V} \rangle$$

$$\langle a \Leftarrow s \rangle$$

$$\underline{\rho}, \underline{\chi} \in P_\omega[\mathbb{X}]$$

$$\mathbb{V} = \mathbb{A}t \cup \mathbb{X} \cup \lambda \mathbb{X}.\mathbb{E} \cup pr(\mathbb{V}, \mathbb{V})$$

$$\mathbb{E} = \mathbb{V} \cup app(\mathbb{E}, \mathbb{E}) \cup \mathbb{F}_n(\mathbb{E}^n)$$

LABELLED TRANSITION RELATION ($\mapsto$)

<fun: a>

$$e \xrightarrow{\lambda}_{Dom(\alpha) \cup \{a\}} e' \Rightarrow$$

$$\langle\langle \alpha, [e]_a \mid \mu \rangle\rangle_{\chi}^{\rho} \mapsto \langle\langle \alpha, [e']_a \mid \mu \rangle\rangle_{\chi}^{\rho}$$

<newactor: a, a'>

$$\langle\langle \alpha, [R[newactor(e)]]_a \mid \mu \rangle\rangle_{\chi}^{\rho} \mapsto$$

$$\langle\langle \alpha, [R[a']]_a, [e]_{a'} \mid \mu \rangle\rangle_{\chi}^{\rho} \quad a' \text{ fresh}$$

<send: a, v_0, v_1>

$$\langle\langle \alpha, [R[send(v_0, v_1)]]_a \mid \mu \rangle\rangle_{\chi}^{\rho} \mapsto$$

$$\langle\langle \alpha, [R[nil]]_a \mid \mu, \langle v_0 \Leftarrow v_1 \rangle \rangle\rangle_{\chi}^{\rho}$$

LABELLED TRANSITION RELATION ($\mapsto$) CONTINUED

$\langle \text{receive} : v_0, v_1 \rangle$

$$\langle\!\langle \alpha, [\text{ready}(v)]_{v_0} \mid \langle v_0 \Leftarrow v_1 \rangle, \mu \rangle\!\rangle^{\rho}_{\chi} \mapsto$$

$$\langle\!\langle \alpha, [\text{app}(v, v_1)]_{v_0} \mid \mu \rangle\!\rangle^{\rho}_{\chi}$$

$\langle \text{out} : v_0, v_1 \rangle$

$$\langle\!\langle \alpha \mid \mu, \langle v_0 \Leftarrow v_1 \rangle \rangle\!\rangle^{\rho}_{\chi} \mapsto \langle\!\langle \alpha \mid \mu \rangle\!\rangle^{\rho'}_{\chi}$$

if $v_0 \in \chi$ and $\rho' = \rho \cup (FV(v_1) \cap Dom(\alpha))$

$\langle \text{in} : v_0, v_1 \rangle$

$$\langle\!\langle \alpha \mid \mu \rangle\!\rangle^{\rho}_{\chi} \mapsto \langle\!\langle \alpha \mid \mu, \langle v_0 \Leftarrow v_1 \rangle \rangle\!\rangle^{\rho}_{\chi'}$$

if $v_0 \in \rho$ and $FV(v_1) \cap Dom(\alpha) \subseteq \rho$

and $\chi' = \chi \cup (FV(v_1) - Dom(\alpha))$