Questo file fa parte della mia collezione di sbobinature, che è disponibile (e modificabile!) insieme ad altre in questa repo: https://github.com/fabfabretti/sboninamento-seriale-uniVR

Dichiarazioni

Semantica statica

emantica statica	
Assioma: dichiarazione vuota	$\mathcal{D}S_1:\; \vdash \mathrm{nil}:\emptyset$
Assioma: ambiente statico	$\mathcal{D}S_2:\ dash ho:\Delta$ se: $ hodash_\Delta$
Base: dichiarazione costante	$\mathcal{D}S_3: \ rac{\Delta dash_V \ e: au}{\Delta dash_V \ \operatorname{const} x: au = e:[x \leftarrow au]}$
Induttivo: composizione privata	$\mathcal{D}S_4: \ rac{\Delta dash_V \ d_1: \Delta_1 \ \Delta[\Delta_1] dash_{V \cup V'} \ d_2: \Delta_2}{\Delta dash_V \ d_1 ext{ in } d_2: \Delta_2}$
Induttivo: composizione sequenziale	$\mathcal{D}S_5: \ rac{\Delta dash_V \ d_1: \Delta_1 \ \Delta[\Delta_1] dash_{V \cup V'} \ d_2: \Delta_2}{\Delta dash_V \ d_1 \ ; \ d_2: \Delta_1[\Delta_2]}$
Base: dichiarazione variabile	$\mathcal{D}S_6: \ rac{\Delta dash e : au}{\Delta dash ext{var } x : au = e : [x \leftarrow au loc]}$
Base: dichiarazione procedura	$\mathcal{D}S_7: \ rac{ ext{form}: \Delta_0 \Delta[\Delta_0] dash_{V \cup V'} \ C}{\Delta dash_V \ ext{proc} \ P(ext{form}) C: [P = \mathcal{T}(ext{form}) ext{proc}]}$
Base: associazione parametri formali e attuali	$\mathcal{D}S_8: \ rac{ ext{form}: \Delta_0 \Delta dash_V \ ae: \mathcal{T}(ext{form})}{\Delta dash_V \ ext{form} = ae: \Delta_0}$

Semantica dinamica

Semantica amamica		
Assioma: dichiarazione vuota	$\mathcal{D}_1: \; \vdash \langle \mathrm{nil}, \sigma angle ightarrow_d \langle \emptyset, \sigma angle$	
Assioma: dichiarazione costante con costante	$\mathcal{D}_2: \ ho \vdash_{\Delta} \langle \mathrm{const} \ x : au = k, \sigma \rangle \rightarrow_d \langle [x \leftarrow k], \sigma \rangle$	$\mathcal{D}_{3-2}: \frac{\rho \vdash_{\Delta} \langle e, \sigma \rangle \to_{e}^{*} \langle k, \sigma \rangle}{\rho \vdash_{\Delta} \langle \text{const } x : \tau = e, \sigma \rangle \to_{d} \langle [x \leftarrow k], \sigma \rangle}$
Base: dichiarazione costante con espressione	$\mathcal{D}_3: \ \frac{\rho \vdash_{\Delta} \langle e, \sigma \rangle \to_e \langle e', \sigma \rangle}{\rho \vdash_{\Delta} \langle \operatorname{const} x : \tau = e, \sigma \rangle \to_d \langle \operatorname{const} x : \tau = e', \sigma \rangle}$	

Induttiva: composizione sequenziale	$egin{aligned} \mathcal{D}_4: & rac{ ho dash_\Delta \left\langle d,\sigma ight angle ightarrow_d \left\langle d',\sigma' ight angle}{ ho dash_\Delta \left\langle d;d_1,\sigma ight angle ightarrow_d \left\langle d';d_1,\sigma' ight angle} \ \mathcal{D}_5: & rac{ ho [ho_0] dash_{\Delta [\Delta_0]} \left\langle d_1,\sigma ight angle ightarrow_d \left\langle d'_1,\sigma' ight angle}{ ho dash_\Delta \left\langle ho_0\;;d_1,\sigma ight angle ightarrow_d \left\langle ho_0\;;d'_1,\sigma' ight angle} \ \mathcal{D}_6: & ho dash_\Delta \left\langle ho_0\;; ho_1,\sigma ight angle ightarrow_d \left\langle ho_0\;[ho_1],\sigma ight angle} \end{aligned}$	$\mathcal{D}_{4-5}: \frac{\rho \vdash_{\Delta} \langle d, \sigma \rangle \to_{d}^{*} \langle \rho_{0}, \sigma' \rangle}{\rho \vdash_{\Delta} \langle d \; ; \; d_{1}, \sigma \rangle \to_{d} \langle \rho_{0} \; ; \; d_{1}, \sigma' \rangle}$ $\mathcal{D}_{5-6}: \frac{\rho[\rho_{0}] \vdash_{\Delta[\Delta_{0}]} \langle d_{1}, \sigma \rangle \to_{d}^{*} \langle \rho_{1}, \sigma' \rangle}{\rho \vdash_{\Delta} \langle \rho_{0} \; ; \; d_{1}, \sigma \rangle \to_{d} \langle \rho_{0}[\rho_{1}], \sigma' \rangle}$
Induttiva: composizione privata	$egin{aligned} \mathcal{D}_7 : & rac{ ho dash_\Delta \left\langle d, \sigma ight angle ightarrow_d \left\langle d', \sigma' ight angle}{ ho dash_\Delta \left\langle d ext{ in } d_1, \sigma ight angle ightarrow_d \left\langle d' ext{ in } d_1, \sigma' ight angle} \ & \mathcal{D}_8 : & rac{ ho [ho_0] dash_\Delta [\Delta_0] \left\langle d_1, \sigma ight angle ightarrow_d \left\langle d'_1, \sigma' ight angle}{ ho dash_\Delta \left\langle ho_0 ext{ in } d_1, \sigma ight angle ightarrow_d \left\langle ho_0 ext{ in } d'_1, \sigma' ight angle} \ & \mathcal{D}_9 : & ho dash_\Delta \left\langle ho_0 ext{ in } ho_1, \sigma ight angle ight. onumber \ \left\langle ho_0 ext{ in } ho_1, \sigma ight angle ight.$	$egin{aligned} \mathcal{D}_{7-8} : & rac{ ho dash_\Delta \left\langle d, \sigma ight angle ightarrow_d^* \left\langle ho_0, \sigma' ight angle}{ ho dash_\Delta \left\langle d ext{ in } d_1, \sigma ight angle ightarrow_d \left\langle ho_0 ext{ in } d_1, \sigma' ight angle} \ & \ \mathcal{D}_{8-9} : & rac{ ho [ho_0] dash_\Delta [\Delta_0] \left\langle d_1, \sigma ight angle ightarrow_d \left\langle ho_1, \sigma' ight angle}{ ho dash_\Delta \left\langle ho_0 ext{ in } d_1, \sigma ight angle ightarrow_d \left\langle ho_1, \sigma' ight angle} \end{aligned}$
Assioma: dichiarazione variabile su costante	$\mathcal{D}_{10}:\; ho dash_\Delta \; \langle \mathrm{var} \; x : au = k, \sigma angle ightarrow_d \; \langle [x \leftarrow l], \sigma[l \leftarrow k] angle \ l \in Loc_ au \; \mathrm{nuova \; locazione}$	
Base: dichiarazione variabile su espressione	$\mathcal{D}_{11}: \frac{\rho \vdash_{\Delta} \langle e, \sigma \rangle \rightarrow_{e} \langle e', \sigma \rangle}{\rho \vdash_{\Delta} \langle \operatorname{var} x : \tau = e, \sigma \rangle \rightarrow_{d} \langle \operatorname{var} x : \tau = e', \sigma \rangle}$	$\mathcal{D}_{11}: rac{ ho dash_\Delta \langle e, \sigma angle ightarrow_e^* \langle k, \sigma angle}{ ho dash_\Delta \langle \mathrm{var} x : au = e, \sigma angle ightarrow_d \langle [x \leftarrow l], \sigma[l \leftarrow k] angle}$
Assioma: dichiarazione procedura	$\mathcal{D}_{12}: \ ho dash_\Delta \ \langle \operatorname{proc} P()C, \sigma angle ightarrow_d \ \langle [P \leftarrow \lambda \epsilon. C'], \sigma angle$	
Assioma: dichiarazione procedura	$\mathcal{D}_{13}: \ ho dash_\Delta \ \langle \mathrm{proc} \ P(\mathrm{form}) C, \sigma angle ightarrow_d \ \langle [P \leftarrow \lambda \ \mathrm{form}. \ C'], \sigma angle$	
Associazione formali e attuali	$\mathcal{D}_{14}: rac{ ho dash_\Delta \langle e, \sigma angle ightarrow_e \langle e', \sigma angle}{ ho dash_\Delta \langle (e', ae), \sigma angle} \ \mathcal{D}_{15}: rac{ ho dash_\Delta \langle ae, \sigma angle ightarrow_{ae} \langle ae', \sigma angle}{ ho dash_\Delta \langle (k, ae), \sigma angle ightarrow_{ae} \langle (k, ae'), \sigma angle} \ \mathcal{D}_{16}: rac{ ho dash_\Delta \langle ae, \sigma angle ightarrow_{ae} \langle ae', \sigma angle}{ ho dash_\Delta \langle form = ae, \sigma angle ightarrow_{d} \langle form = ae', \sigma angle} \ $	

Espressioni

Semantica statica

Assioma: espressione vuota	$\mathcal{E}S_1:\ dash n: \mathrm{int}$
Assioma: int	$\mathcal{E}S_1:\ dash n: \mathrm{int}$
Assioma: bool	$\mathcal{E}S_2: \vdash t: \text{bool}$
Assioma: identificatori	$\mathcal{E}S_3: \ \Delta \vdash_V \ I: au \ \ \mathrm{se} : \Delta(I) \in \{ au, au loc\}, \ I \in V$
Induttivo: bop	$\mathcal{E}S_4: \ rac{\Delta dash_V \ e_1 : au_1 \Delta dash_V \ e_2 : au_2}{\Delta dash_V \ e_1 \ \mathrm{bop} \ e_2 : au_\mathrm{bop}(au_1, au_2)}$
Induttivo: op	$\mathcal{E}S_5: \; rac{\Delta dash_V \; e_1 : au_1 \Delta dash_V \; e_2 : au_2}{\Delta dash_V \; e_1 \; \mathrm{op} \; e_2 : au_\mathrm{op}(au_1, au_2)}$
Induttivo: not	$\mathcal{E}S_6: \ rac{\Delta dash_V \ e_0 : \mathrm{bool}}{\Delta dash_V \ \mathrm{not} \ e_0 : \mathrm{bool}}$

Semantica dinamica

Assioma: identificator i	$\mathcal{E}_2: ho dash_\Delta \ \langle I, \sigma angle ightarrow_e \ \langle n, \sigma angle ext{se: } ho(I) = n ext{ o } (ho(I) = l ext{ e } \sigma(l) = n)$	
Assioma: op fra due int	$\mathcal{E}_1: hodash_\Delta\langle m\ ext{op}\ n,\sigma angle ightarrow_e\langle k,\sigma angle ext{se:} m\ \mathbf{op}\ n=k$	$\mathcal{E}_{3-4}: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle m, \sigma angle}{ ho dash_\Delta \ \langle e ext{ op } e_0, \sigma angle ightarrow_e \ \langle k ext{ op } e_0, \sigma angle}$
Induttivo: op fra due e	$\mathcal{E}_3: rac{ ho dash_\Delta \langle e, \sigma angle ightarrow_e \langle e', \sigma angle}{ ho dash_\Delta \langle e ext{ op } e_0, \sigma angle ightarrow_e \langle e' ext{ op } e_0, \sigma angle}$	
	$\mathcal{E}_4: \frac{\rho \vdash_{\Delta} \langle e, \sigma \rangle \to_e \langle e', \sigma \rangle}{\rho \vdash_{\Delta} \langle m \text{ op } e, \sigma \rangle \to_e \langle m \text{ op } e', \sigma \rangle}$	$\mathcal{E}_{4-1}: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle n, \sigma angle}{ ho dash_\Delta \ \langle m ext{ op } e, \sigma angle ightarrow_e \ \langle k, \sigma angle} \ ext{se op } n = k ext{ con } m, n, k \in \mathcal{N}$
Assioma: bop fra due bool	$\mathcal{E}_5: hodash_\Deltara{t_1\ \mathrm{bop}\ t_2,\sigma} ightarrow_era{t_1,\sigma}\ se:\ t_1\ \mathbf{op}\ t_2=t,\ t_1,t_2,t\in\mathcal{B}$	$\mathcal{E}_{3'-6}: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle t, \sigma angle}{ ho dash_\Delta \ \langle e ext{ bop } e_0, \sigma angle ightarrow_e \ \langle t ext{ bop } e_0, \sigma angle}$
Induttivo: bop fra due e	$\mathcal{E}_{3'}: rac{ ho dash_\Delta \langle e, \sigma angle ightarrow_e \langle e', \sigma angle}{ ho dash_\Delta \langle e ext{ bop } e_0, \sigma angle ightarrow_e \langle e' ext{ bop } e_0, \sigma angle}$	$\mathcal{E}_{6-5}: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle t_2, \sigma angle}{ ho dash_\Delta \ \langle t_1 \ \mathrm{bop} \ e, \sigma angle ightarrow_e \ \langle t, \sigma angle}$
	$\mathcal{E}_6: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e \ \langle e', \sigma angle}{ ho dash_\Delta \ \langle t \ \mathrm{bop} \ e, \sigma angle ightarrow_e \ \langle t \ \mathrm{bop} \ e', \sigma angle}$	se t_1 op $t_2=t$ con $t_1,t_2,t\in\mathcal{B}$

Assioma: not	$\mathcal{E}_7: hodash_\Delta\langle ext{not}\ t_1,\sigma angle ightarrow_e\langle t,\sigma angle se: \mathbf{not}\ t_1,\sigma$	$egin{array}{l} \mathbf{t} \ t_1 = t, \ t \in \mathcal{B} \end{array}$	$\mathcal{E}_{8-7}: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle t_1, \sigma angle}{ ho dash_\Delta \ \langle \mathrm{not} \ e, \sigma angle ightarrow_e \ \langle t, \sigma angle}$
Induttivo: not e	$\mathcal{E}_8: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e \ \langle e', \sigma angle}{ ho dash_\Delta \ \langle \mathrm{not} \ e, \sigma angle ightarrow_e \ \langle \mathrm{not} \ e', \sigma angle}$		$se\ \mathbf{not}\ t_1=t\ \mathrm{con}\ t_1,t\in\mathcal{B}$

Comandi

Semantica statica

Semantica Statica	
Assegnamento	$\mathcal{C}S_1:\; rac{\Delta dash_V \; e : au}{\Delta dash_V \; x := e} \; , \; \Delta(x) = au loc$
If then else	$\mathcal{C}S_2: \ rac{\Delta dash_V \ e : \mathrm{bool} \Delta dash_V \ c_0 \Delta dash_V \ c_1}{\Delta dash_V \ \mathrm{if} \ e \ \mathrm{then} \ c_0 \ \mathrm{else} \ c_1}$
Sequenza	$\mathcal{C}S_3: \ rac{\Delta dash_V \ c_0 \Delta dash_V \ c_1}{\Delta dash_V \ c_0; c_1}$
Skip	$CS_4: \Delta \vdash_V \text{skip}$
While	$\mathcal{C}S_5: \ rac{\Delta dash_V \ e : \mathrm{bool} \Delta dash_V \ c}{\Delta dash_V \ \mathrm{while} \ e \ \mathrm{do} \ C}$
Blocco	$\mathcal{C}S_6: \ rac{\Delta dash_V \ d: \Delta' \Delta[\Delta'] dash_{V \cup V'} \ c}{\Delta dash_V \ d; c} \ \Delta' \ ext{su} \ V'$
Chiamata a funzione	$\mathcal{C}S_7: \; rac{\Delta dash_V \; ae : aet}{\Delta dash_V \; P(ae)} \Delta(P) = ext{aetproc}$

Semantica dinamica

Assegnament o	$\mathcal{C}_1: \ rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e \ \langle e', \sigma angle}{ ho dash_\Delta \ \langle x := e, \sigma angle ightarrow_c \ \langle x := e', \sigma angle}$	$\mathcal{C}_{1-2}: \; rac{ ho dash_\Delta \; \langle e, \sigma angle o_e^* \; \langle k, \sigma angle}{ ho dash_\Delta \; \sigma[l \mathrel{laphi} - k]} \; \; ho(x) = l$
Assioma: variabile / costante	$\mathcal{C}_2: \ ho dash_\Delta \ \langle x := k, \sigma angle ightarrow_c \ \ \sigma[l \leftarrow k], ho(x) = l$	

If then else		$\mathcal{C}_{3-4}: \ rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle true, \sigma angle}{ ho dash_\Delta \ \langle ext{if e then c_0 else $c_1, \sigma angle} ightarrow_c \ \langle c_0, \sigma angle}$
	$\mathcal{C}_3: \ rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e \ \langle e', \sigma angle}{ ho dash_\Delta \ \langle ext{if e then c_0 else $c_1, \sigma angle} ightarrow_c \ \langle ext{if e' then c_0 else $c_1, \sigma angle}$	$ ho \vdash_{\Delta} \langle ext{if } e ext{ then } c_0 ext{ else } c_1, \sigma angle ightarrow_c \langle c_0, \sigma angle$
	$\mathcal{C}_4: \ ho \vdash_\Delta \langle ext{if true then } c_0 ext{ else } c_1, \sigma angle ightarrow_c \langle c_0, \sigma angle$	$\mathcal{C}_{3-5}: \ rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle false, \sigma angle}{ ho dash_\Delta \ \langle ext{if e then c_0 else $c_1, \sigma angle} ightarrow_c \ \langle c_1, \sigma angle}$
	$\mathcal{C}_5: \ ho dash_\Delta \ \langle ext{if false then } c_0 ext{ else } c_1, \sigma angle ightarrow_c \ \langle c_1, \sigma angle$	
Skip	$\mathcal{C}_6: ho \vdash_{\Delta} \langle \mathrm{skip}, \sigma angle ightarrow_{e} \sigma$	
Sequenza	$\mathcal{C}_7: \; rac{ ho dash_\Delta \; \langle c, \sigma angle o_c \; \langle c', \sigma' angle}{ ho dash_\Delta \; \langle c; c_0, \sigma angle o_c \; \langle c'; c_0, \sigma' angle}$	$\mathcal{C}_{7-8}: \ rac{ ho dash_\Delta \ \langle c, \sigma angle ightarrow_c^* \ \sigma'}{ ho dash_\Delta \ \langle c; c_0, \sigma angle ightarrow_c \ \langle c_0, \sigma' angle}$
	$\mathcal{C}_8: \; rac{ ho dash_\Delta \; \langle c, \sigma angle o_c \; \sigma'}{ ho dash_\Delta \; \langle c; c_0, \sigma angle o_c \; \langle c_0, \sigma' angle}$	
While	$\mathcal{C}_9: rac{ ho dash_\Delta \ \langle e, \sigma angle ightarrow_e^* \ \langle \mathrm{true}, \sigma angle}{ ho dash_\Delta \ \langle \mathrm{while} \ e \ \mathrm{do} \ c, \sigma angle ightarrow_c \ \langle c; \mathrm{while} \ e \ \mathrm{do} \ c, \sigma angle}$	
	$\mathcal{C}_{10}: \; rac{ ho dash_\Delta \; \langle e, \sigma angle \; ightarrow_e^* \; \langle \mathrm{false}, \sigma angle}{ ho dash_\Delta \; \langle \mathrm{while} \; e \; \mathrm{do} \; c, \sigma angle \; ightarrow_c \; \sigma}$	
Blocco / elaborare la dichiarazione	$\mathcal{C}_{11}: \; rac{ ho dash_\Delta \; \langle d, \sigma angle o_d \; \langle d', \sigma' angle}{ ho dash_\Delta \; \langle d; c, \sigma angle o_c \; \langle d'; c, \sigma' angle}$	$\mathcal{C}_{11-12}:\; \frac{\rho \vdash_{\Delta} \langle d,\sigma\rangle \to_{d}^{*} \langle \rho',\sigma'\rangle}{\rho \vdash_{\Delta} \langle d;c,\sigma\rangle \to_{c} \langle \rho';c,\sigma'\rangle}$
	$\mathcal{C}_{12}: \; rac{ ho[ho'] dash_{\Delta[\Delta']} \; \langle c, \sigma angle o_c \; \langle c', \sigma' angle}{ ho dash_\Delta \; \langle ho'; c, \sigma angle o_c \; \langle ho'; c', \sigma' angle} \; \; \; ho' dash_{\Delta'}$	$\mathcal{C}_{13-12}: \; rac{ ho[ho'] dash_{\Delta[\Delta']} \; \langle c, \sigma angle ightarrow_c^* \; \sigma'}{ ho dash_\Delta \; \langle ho'; c, \sigma angle ightarrow_c \; \sigma'} \; \; \; ho' dash_{\Delta'}$
	$\mathcal{C}_{13}: rac{ ho[ho'] dash_{\Delta[\Delta']} \langle c, \sigma angle ightarrow_c \sigma'}{ ho dash_\Delta \langle ho'; c, \sigma angle ightarrow_c \sigma'} \;\; ho' dash_{\Delta'}$	
Chiamata a funzione?	$\mathcal{C}_{14}: hodash_\Delta\langle P(ae),\sigma angle ightarrow_c\langle ext{form}=ae;C',\sigma angle ho(P)=\lambda ext{form.}C'$	