

F14
Domain theory

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Denotational semantics

$$\mathcal{S}_{ds} \in \mathbf{Stm} \rightarrow (\mathbf{State} \leftrightarrow \mathbf{State})$$

$$\mathcal{S}_{ds}[[x := a]]\sigma \triangleq \sigma[x \mapsto \mathcal{A}[[a]]\sigma]$$

$$\mathcal{S}_{ds}[[\text{skip}]]\sigma \triangleq \sigma$$

or

$$\mathcal{S}_{ds}[[x := a]] \triangleq \lambda\sigma. \sigma[x \mapsto \mathcal{A}[[a]]\sigma]$$

$$\mathcal{S}_{ds}[[\text{skip}]] \triangleq \lambda\sigma. \sigma$$

Denotational semantics

$$\mathcal{S}_{ds}[[S_1; S_2]]\sigma \triangleq \mathcal{S}_{ds}[[S_2]](\mathcal{S}_{ds}[[S_1]]\sigma)$$

$$\mathcal{S}_{ds}[[\text{if } b \text{ then } S_1 \text{ else } S_2]]\sigma \triangleq \\ \mathcal{B}[[b]]\sigma ? \mathcal{S}_{ds}[[S_1]]\sigma : \mathcal{S}_{ds}[[S_2]]\sigma$$

or

$$\mathcal{S}_{ds}[[S_1; S_2]] \triangleq \mathcal{S}_{ds}[[S_2]] \circ \mathcal{S}_{ds}[[S_1]]$$

$$\mathcal{S}_{ds}[[\text{if } b \text{ then } S_1 \text{ else } S_2]] \triangleq \\ \lambda\sigma. (\mathcal{B}[[b]]\sigma ? \mathcal{S}_{ds}[[S_1]]\sigma : \mathcal{S}_{ds}[[S_2]]\sigma)$$

Denotational semantics

$$\mathcal{S}_{ds}[[\text{while } b \text{ do } S]]\sigma \triangleq \\ \mathcal{B}[[b]]\sigma ? \sigma : \mathcal{S}_{ds}[[S; \text{while } b \text{ do } S]]\sigma$$