

Dataflow Analysis

Part II

(partial)

Init: Statement \rightarrow Lab

$\text{init}([x:=a]^l) = l$

$\text{init}([\text{skip}]^l) = l$

$\text{init}(S_1; S_2) = \text{init}(S_1)$

$\text{init}(\text{if } [b]^l \text{ then } S_2 \text{ else } S_3) = l$

$\text{init}(\text{while } [b]^l \text{ do } S) = l$

$final \text{ : Statement} \rightarrow \mathcal{P}(Lab)$

$$final([x:=a]^l) = \{l\}$$

$$final([skip]^l) = \{l\}$$

$$final(S_1; S_2) = final(S_2)$$

$$final(\text{if } [b]^l \text{ then } S_1 \text{ else } S_2) = \begin{matrix} final(S_1) \\ \cup \\ final(S_2) \end{matrix}$$

$$final(\text{while } [b]^l \text{ do } S) = \{l\}$$

Flows. $\text{flow} : \text{Statement} \rightarrow \mathcal{P}(\text{Lab} \times \text{Lab})$

$$\text{flow}([x:=a]^l) = \emptyset$$

$$\text{flow}([\text{skip}]^l) = \emptyset$$

$$\text{flow}(S_1; S_2) =$$

$$\text{final}(S_1) \times \{\text{init}(S_2)\}$$

$$\cup \text{flow}(S_1) \cup \text{flow}(S_2)$$

$$\text{flow}(\text{if } [b]^l \text{ then } S_1 \text{ else } S_2) = \{(\ell, \text{init}(S_1))\} \cup \{(\ell, \text{init}(S_2))\} \cup \text{flow}(S_1) \cup \text{flow}(S_2)$$

$$\begin{aligned} \text{flow}(\text{while } [b]^l \text{ do } S) \\ = \{ (l, \text{init}(S)) \} \cup \text{flow}(S) \\ \cup (\text{final}(S) \times \{l\}) \end{aligned}$$

Reverse flows

$$\text{flow}^R(S) = \{ (l, l') \mid (l', e) \in \text{flow}(S) \}$$

Reaching definitions .

$$RD_{\text{entry}}(l) = \{$$

Kill gen

$$l = \text{init}(S_*)$$