

A VC GENERATOR

Relativized wlp-calculus:

$$\text{wlp}'(\text{skip}, Q) \stackrel{\text{def}}{=} Q$$

$$\text{wlp}'(x := a, Q) \stackrel{\text{def}}{=} Q[a/x]$$

$$\text{wlp}'(S_1; S_2, Q) \stackrel{\text{def}}{=} \text{wlp}'(S_1; \text{wlp}'(S_2, Q))$$

$$\text{wlp}'(\text{if } b \text{ then } S_1 \text{ else } S_2, Q) \stackrel{\text{def}}{=} b \Rightarrow \text{wlp}'(S_1, Q) \wedge \neg b \Rightarrow \text{wlp}'(S_2, Q)$$

$$\text{wlp}'(\{I\} \underline{\text{while}} \ b \ \underline{\text{do}} \ S, Q) \stackrel{\text{def}}{=} I$$

For loop-free statements $S \in \text{Stm}$, define:

$$\text{vc}(\{P\} S \{Q\}) \stackrel{\text{def}}{=} \begin{cases} \{P \Rightarrow \text{wlp}'(S, Q)\} & \text{if } P \neq \text{wlp}'(S, Q) \\ \emptyset & \text{otherwise} \end{cases}$$

Otherwise, define:

$$\text{vc}(\{P\} S_1; S_2 \{Q\}) \stackrel{\text{def}}{=} \text{vc}(\{P\} S_1 \{ \text{wlp}'(S_2, Q) \}) \cup \text{vc}(\{ \text{wlp}'(S_2, Q) \} S_2 \{Q\})$$

$$\text{vc}(\{P\} \text{if } b \text{ then } S_1 \text{ else } S_2 \{Q\}) \stackrel{\text{def}}{=} \text{vc}(\{P \wedge b\} S_1 \{Q\}) \cup \text{vc}(\{P \wedge \neg b\} S_2 \{Q\})$$

$$\text{vc}(\{P\} \{I\} \underline{\text{while}} \ b \ \underline{\text{do}} \ S \{Q\}) \stackrel{\text{def}}{=} \{P \Rightarrow I, I \wedge \neg b \Rightarrow Q\} \cup \text{vc}(\{I \wedge b\} S \{I\})$$