

Mini-SymEx – Weakest-Precondition Engine

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$$\begin{aligned}vc(v = e; P) &= vc(P)[v/e] \\vc(\text{if } c \text{ then } b_1 \text{ else } b_2; P) &= (c \rightarrow vc(b_1; P)) \wedge (\neg c \rightarrow vc(b_2; P)) \\vc(\text{choose } v : e; P) &= \exists v. e \wedge vc(P) \\vc(\text{havoc } v; P) &= \forall v. vc(P) \\vc(\text{assume } e; P) &= e \rightarrow vc(P) \\vc(\text{assert } e; P) &= e \wedge vc(P) \\vc(\text{assert } e; P) &= e \wedge (e \rightarrow vc(P)) \\vc(\epsilon) &= true\end{aligned}$$

Definition 1. A program P is valid w.r.t. to its specification iff $vc(P)$ is valid.

Example 1. Let us consider the following program P_0 :

```
int x = 0;
choose x : x > 0;
assert x == 2;
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$$\begin{aligned}vc(P_0) &= vc(x = 0; (\text{choose } x : x > 0; (\text{assert } x == 2; \epsilon))) \\&= vc((\text{choose } x : x > 0; (\text{assert } x == 2; \epsilon)))[x/0] \\&= (\exists x. x > 0 \wedge vc(\text{assert } x == 2; \epsilon))[x/0] \\&= (\exists x. x > 0 \wedge x = 2 \wedge vc(\epsilon))[x/0] \\&= (\exists x. x > 0 \wedge x = 2 \wedge true)[x/0] \\&= (\exists x. x > 0 \wedge x = 2 \wedge true)\end{aligned}$$