

14F-1 Bookkeeping

- 0 pts Correct

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Exercise 4F-2. VCGen for Let

The problem with the given VCGen rule is that the original value of the variable x is not recovered after command c is executed.

Since let $x = e$ in c is equivalent to $t := x; x := e; c; x := t$, where t is a temporary variable that is not used in c , the actual VCGen rule can be expressed as

$$\begin{aligned} VC(\text{let } x = e \text{ in } c, B) &= VC(t := x; x := e; c; x := t, B) \\ &= VC(t := x, VC(x := e; c; x := t, B)) \\ &= [x/t] VC(x := e; c; x := t, B) \\ &= [x/t] VC(x := e, VC(c; x := t, B)) \\ &= [x/t][e/x] VC(c; x := t, B) \\ &= [x/t][e/x] VC(c, VC(x := t, B)) \\ &= [x/t][e/x] VC(c, [t/x]B) \end{aligned}$$

Exercise 4F-3. VCGen Mistakes

When the command c is (let $x = 5$ in skip), the post-condition B is ($x = 5$), and the evaluation of the variable x in state σ is $\sigma(x) = 0$, we have $\sigma \models VC(c, B)$ because x is indeed 5 after c is executed. Let σ' be a state such that $\langle c, \sigma \rangle \Downarrow \sigma'$, then $\sigma'(x) = 0$ since x should be reverted to the original value. Then, $\sigma' \not\models B$ because $\sigma'(x)$ is 0 instead of 5

Exercise 4F-4. Axiomatic Do-While

Since do c while b is equivalent to $c; \text{while } b \text{ do } c$, by applying the following Hoare's rule

$$\frac{\{A\}c_1\{B\} \quad \{B\}c_2\{C\}}{\{A\}c_1; c_2\{C\}},$$

we have

$$\frac{\vdash \{A\}c\{B\} \quad \vdash \{B\}\text{while } b \text{ do } c\{C \wedge \neg b\}}{\vdash \{A\}\text{do } c \text{ while } b\{C \wedge \neg b\}}$$

2 4F-2 VCGen for Let

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