

15F-1 Bookkeeping

- 0 pts Correct

Exercise 5F-2. VCGen Do-While [8 points]. For this, I'm going with the first option with the one Invariant.

$$\text{VC}(\text{do}_{Inv} c \text{ while } b, P) = \text{VC}(c, Inv) \wedge (\forall x_1, \dots, x_n. Inv \Rightarrow (b \Rightarrow \text{VC}(c, Inv) \wedge \neg b \Rightarrow P))$$

This follows a very similar inductive approach that was taken for the VC rule for the normal while.

Upon entry into the loop, we need to ensure $\text{VC}(c, Inv)$ holds.

For each iteration of the loop, Inv needs to hold before evaluating b . From here, if b is true then the c will immediately be executed so $\text{VC}(c, Inv)$ must hold in this case. If b is false, then the loop exits and the post condition P must hold.

Exercise 5F-3. VCGen Mistakes [20 points].

1. Targaryen
2. $A : \{x = 10\}$
3. $B : \{x = 10 \wedge x \leq 10\}$
4. $\sigma : (x = 10)$
5. $\sigma' : (x = 10)$
6. $c : \text{while } x > 10 \text{ do } x := x + 1$
7. $\langle \text{while } x > 10 \text{ do } x := x + 1, \sigma \rangle \Downarrow \sigma'$
8. $\sigma \models \{x = 10\}$
9. $\sigma' \models \{x = 10 \wedge x \leq 10\}$
10. It isn't possible to prove $\vdash \{x = 10\} \text{ while } x > 10 \text{ do } x := x - 1 \{x = 10 \wedge x \leq 10\}$

The hypotheses we get from this rule and these conditions and command is $\vdash \{x = 10\}x := x - 1\{x = 10\}$. This isn't something we can properly show, therefore this rule is incomplete..

2 5F-2 VCGen Do-While

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This follows a very similar inductive approach that was taken for the VC rule for the normal while.

Upon entry into the loop, we need to ensure $\text{VC}(c, Inv)$ holds.

For each iteration of the loop, Inv needs to hold before evaluating b . From here, if b is true then the c will immediately be executed so $\text{VC}(c, Inv)$ must hold in this case. If b is false, then the loop exits and the post condition P must hold.

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The hypotheses we get from this rule and these conditions and command is $\vdash \{x = 10\}x := x - 1\{x = 10\}$. This isn't something we can properly show, therefore this rule is incomplete..

1. Lannister
2. $A : \{x > 10 \Rightarrow true \wedge x \leq 10 \Rightarrow x = 10\}$
3. $B : \{x = 10\}$
4. $\sigma : (x = 10)$
5. $\sigma' : (x = 10)$
6. $c : \text{while } x > 10 \text{ do } skip$
7. $\langle \text{while } x > 10 \text{ do } skip, \sigma \rangle \Downarrow \sigma'$
8. $\sigma \models \{x > 10 \Rightarrow true \wedge x \leq 10 \Rightarrow x = 10\}$
9. $\sigma' \models \{x = 10\}$
10. It isn't possible to prove $\vdash \{x > 10 \Rightarrow true \wedge x \leq 10 \Rightarrow x = 10\} \text{ while } x > 10 \text{ do } skip \{x = 10\}$

From this, we get the hypotheses $\vdash \{true\}skip\{x > 10 \Rightarrow true \wedge x \leq 10 \Rightarrow x = 10\}$. We cannot produce a valid derivation for this, therefore the rule is incomplete.

3 5F-3 VCGen Mistakes

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