Announcements

- HW2: Grades available in Gradescope
- HW3: grading in progress...
- HW4: due Apr 14
- HW5: will be released Apr 14, due May 1, and combine previous HW5 and HW6.
- Survey: Thanks for filling it out! Course staff will discuss today.
  - https://forms.gle/FM7mb9n4Gbze14Js6
  - Feedback is always welcome!!!! Email or post on Piazza...
Today, we will learn about

- Axiomatic Semantics
  - Pre- and Post-Conditions
  - Partial and Total Correctness
  - Validity of Assertions and Partial Correctness
  - Hoare Logic
Pre- and Post-Conditions
Partial Correctness and Total Correctness
Example
Invalid Example
Language of Assertions
Validity of Assertions
Validity of Assertions

\( \sigma \models_I \text{true} \) (always)

\( \sigma \models_I a_1 a_2 \) if \( A_{\text{Interp}}[a_1](\sigma, I)A_{\text{Interp}}[a_2](\sigma, I) \)

\( \sigma \models_I a_1 = a_2 \) if \( A_{\text{Interp}}[a_1](\sigma, I) = A_{\text{Interp}}[a_2](\sigma, I) \)

\( \sigma \models_I P_1 \land P_2 \) if \( \sigma \models_I P_1 \) and \( \sigma \models_I P_2 \)

\( \sigma \models_I P_1 \lor P_2 \) if \( \sigma \models_I P_1 \) or \( \sigma \models_I P_2 \)

\( \sigma \models_I P_1 \Rightarrow P_2 \) if \( \sigma \not\models_I P_1 \) or \( \sigma \models_I P_2 \)

\( \sigma \models_I \neg P \) if \( \sigma \not\models_I P \)

\( \sigma \models_I \forall i. \ P \) if \( \forall k \in \text{Int.} \ \sigma \models_I[i \mapsto k] \ P \)

\( \sigma \models_I \exists i. \ P \) if \( \exists k \in \text{Int.} \ \sigma \models_I[i \mapsto k] \ P \)

\[ A_{\text{Interp}}[n](\sigma, I) = n \]

\[ A_{\text{Interp}}[x](\sigma, I) = \sigma(x) \]

\[ A_{\text{Interp}}[i](\sigma, I) = I(i) \]

\[ A_{\text{Interp}}[a_1 + a_2](\sigma, I) = A_{\text{Interp}}[a_1](\sigma, I) + A_{\text{Interp}}[a_2](\sigma, I) \]
Validity of Partial Correctness
Hoare logic
Hoare logic, ctd.
Soundness and Completeness of Hoare Logic