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Compilers and Languages
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“Analysis and Verification (185.276, VU 2.0, ECTS 3.0)” SS 2019

Assignment 5

15 May 2019

Exercise 1 : (2+4+2+4 Points)

Is $x \geq 0 \wedge y > 0$ the weakest liberal precondition for the integer division program

$$\pi \;\equiv\; q := 0;\; r := x;\; \textsf{while } r \geq y \textsf{ do } q := q + 1;\; r := r - y \textsf{ od}$$

and the postcondition

$$x = q * y + r \wedge 0 \leq r < y \quad ?$$

If not:

1. Give a precondition wlp, $wlp \in \mathbf{Bexpr}$, which is the weakest liberal precondition.

Prove that your formula wlp is indeed the desired weakest liberal precondition, i.e., prove:

$$wlp \iff wlp(\pi, x = q * y + r \wedge 0 \leq r < y) \qquad (*)$$

2. To prove equivalence $(*)$, show in a first step that the Hoare assertion

   $$\{wlp\}\ \pi\ \{x = q * y + r \wedge 0 \leq r < y\}$$

   is partially correct, i.e., prove (by providing a linear proof sketch):

   $$\models_{pc}\ \{wlp\}\ \pi\ \{x = q * y + r \wedge 0 \leq r < y\}$$

3. What else has to be shown in order to prove $(*)$ and hence the equivalence of wlp and the weakest liberal precondition $wlp(\pi, x = q * y + r \wedge 0 \leq r < y)$?

4. Prove the properties identified in 3.).

Submission: Wednesday, 22 May 2019, before the lecture.