Program Analysis and Verification

Course 0368-4479 / 2014/15 - Semester B

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Home Work Assignment #1

Due: Lesson 7

In the following, we refer to the “Semantics with Application” book as “the book”.
The book can be found here: http://www.daimi.au.dk/~bra8130/Wiley_book/wiley.html.

Part 1: Operational Semantics

1. Solve Ex 2.8 and 2.18 in the book.
2. In the previous question, you were asked to extend the `While` language with a new construct (a `for` loop). Extend the proof of theorem 2.26 in the book (semantic equivalence) to handle `for` commands.
3. Solve Ex 2.34, 2.35 and 2.36 in the book.

Part 2: Axiomatic Semantics

4. Solve Ex 6.10, 6.11, 6.14, 6.15
5. Solve Ex 6.25 in the book for all statements except while
    1. Bonus: Prove the complements of the inference rule for while statement.
6. Give a (non-trivial) specification for the following program and prove it using Owicki-Gries logic

    $$\{X=A \wedge Y=B\}\ x:=X;\ Y:=1 \parallel y:=Y;\ X:=x\ \{\ \ldots\ \}\ .$$

7. Define a rely/Guarantee logic for programs with thread-local and thread-shared integer variables, and prove its soundness. Use the logic to prove the program in question 6.