

COP 6556 – Homework #2
10 points, Due Feb. 10 (Thursday)

The syntax of commands of a simple imperative language with a repeat construct is given by:

$c ::= X := e \mid c0; c1 \mid \text{if } b \text{ then } c0 \text{ else } c1 \mid \text{repeat } c \text{ until } b$

where X is a location, e is an arithmetic expression, b a Boolean expression and $c, c0, c1$ range over commands. A repeat statement executes statement c and then tests expression b . If b is true, the loop terminates; otherwise, the loop continues.

- (1) Define an operational semantics in the form of rules to generate transitions of the form $\langle c, \sigma \rangle \rightarrow \sigma'$ meaning the execution of c from state σ terminates in state σ' ;
- (2) Define a denotational semantics for commands in which each command c is denoted by a partial function $C[[c]]$ from states to states;
- (3) Sketch the proof of the equivalence between the operational and denotational semantics, that $\langle c, \sigma \rangle \rightarrow \sigma'$ iff $C[[c]]\sigma = \sigma'$, only giving the case where c is a repeat loop.