

# Programming Languages (COP 4020/CIS 6930) [Fall 2014]

## Assignment VII

### Objectives

1. To gain experience setting up deductive systems.
2. To formalize static and dynamic semantics for a new programming language.

**Due Date:** Tuesday, October 28, 2014 (at the beginning of class, 5:00pm).

### Assignment Description

Do the following by yourself.

Recall the following language L from Assignment V:

types  $\tau ::= \text{bool} \mid \tau_1 \times \tau_2$

exprs  $e ::= x \mid \text{true} \mid \text{false} \mid e_1 \text{ NOR } e_2 \mid (e_1, e_2) \mid \text{let val } (x_1, x_2) = e_1 \text{ in } e_2 \text{ end}$

This language contains variables ( $x$ ), true and false literals, logical-NOR expressions, binary tuples, and let-expressions. Let-expressions in L have the same meaning as in ML, except that L's let-expressions always declare a pair of variables.

Define static and dynamic semantics for L. Assume that all variable names in all expressions under consideration have been made unique through alpha-conversion; hence, you never have to consider contexts containing more than one entry for the same variable. Also, assume that capture-avoiding substitution ( $[e/x]e'$ ) is already defined for L, so you can just use that notation ( $[e/x]e'$ ) without defining it.

As always, avoid making the definitions significantly more complicated than necessary. If you get stuck at any point, please explain in prose whatever you're having trouble formalizing.

### Submission Notes

- Turn in a hardcopy (handwritten or printed) version of your solutions. Please do not email solutions or upload them into Canvas.
- Write the following pledge at the end of your submission: "I pledge my Honor that I have not cheated, and will not cheat, on this assignment." Sign your name after the pledge. Not including this pledge will lower your grade 50%.
- You may submit solutions up to 2 days late with a 15% penalty.
- If you think there's a chance you'll be absent or late for class on the date this assignment is due, you are welcome to submit solutions early by giving them to me or a TA before or after class, or during any of our office hours.