

Formal Semantics of Programming Languages

Exercise 4 (February 9)

Wolfgang Schreiner
Wolfgang.Schreiner@risc.uni-linz.ac.at

January 9, 2007

The exercise is to be submitted by **February 9** (hard deadline)

1. as a single PDF file sent to me per email, or
2. as a paper report (cover page with full name and Matrikelnummer, pages stapled) addressed to “Wolfgang Schreiner, Research Institute for Symbolic Computation (RISC)” and put into a university mailbox.

1 Languages with Contexts

1. Augment the language of Figure 7.2 to include procedures and procedure invocations:

$$\begin{aligned} D &::= \dots \mid \mathbf{proc} \ I = C. \\ C &::= \dots \mid \mathbf{call} \ I. \end{aligned}$$

Give the semantic equations for these constructs under each of the following assumptions:

- (a) The *Denotable-value* domain is augmented with the summand $Proc = Store \rightarrow Poststore_{\perp}$ to accommodate procedures.
- (b) The *Denotable-value* domain is augmented with the summand $Proc = Environment \rightarrow Store \rightarrow Poststore_{\perp}$ to accommodate procedures.

What kind of scoping is used in each case?

2. Integrate the domain of one-dimensional arrays *1DArray* into the language of Figure 7.2. Define operations for the construction of an array (allocation of an array of certain bounds initialized in all positions with a user-defined value) and for the usual indexed read/write access to its elements.