Concepts of Programming Languages

http://proglang.informatik.uni-freiburg.de/teaching/konzepte/2009ss/

Exercise Sheet 5

2009-05-21

Exercise 1 (Statements; (7+3) points)
In this exercise, we consider a statement-oriented language. The language is informally specified as follows:

Values   As in IMPLICIT-REFS.

Syntax   Use the following syntax:

$$
\begin{aligned}
Program &::= Statement \\
Statement &::= Identifier \text{ = } Expression \\
&::= \texttt{print } Expression \\
&::= \{Statement^{*(;)}\} \\
&::= \texttt{if } Expression\ Statement\ Statement \\
&::= \texttt{while } Expression\ Statement \\
&::= \texttt{var } Identifier^{*(,)}\text{; } Statement
\end{aligned}
$$

The nonterminal *Expression* refers to the language of expressions of IMPLICITREFS.

Semantics   A program is a statement. A statement does not return a value, but acts by modifying the store and by printing. Assignment statements work in the usual way. A `print` statement evaluates its actual parameter and prints the result. The `if` statement works in the usual way. A block statement, defined in the last production for *Statement*, binds each of the declared variables to an uninitialized reference and then executes the body of the block. The scope of these bindings is the body.

Examples   Exercise 4.22 on page 122 in the EOPL book contains sample programs for this language.

(a) Write a formal specifications for statements using assertions like

$$(\texttt{result-of } stmt\ \rho\ \sigma_0)\text{ = }\sigma_1$$

where ρ is an environment binding variables to locations, and σ_0 and σ_1 are stores mapping locations to values. Note that the specification does not include information about printed values.

(b) Extend your specification from part (a) so that it also includes information about which values are printed in which order.

Exercise 2 (Parameter-Passing; (2+2+2) points)

(a) Write out the specification rules for CALL-BY-REFERENCE.

(b) Write out the specification rules for CALL-BY-NAME.

(c) Write out the specification rules for CALL-BY-NEED.

Submission

On paper (please don't send me emails). The strict submission deadline is **2009-05-28, 2:15 pm** (before the exercise session).