Exercise 24

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I present a possible list of inference-rule specifications for the five statement types other than while in the language described in Exercise 4.22 (page 122) of *Essentials of Programming Languages, Third Edition* by Daniel P. Friedman and Mitchell Wand.

Assignment statements

$$\frac{(\text{value-of } exp\ \rho\ \sigma_0) = (val, \sigma_1)}{(\text{result-of } (\text{assignment-stmt } id\ exp)\ \rho\ \sigma_0) = [\rho(id) = val]\sigma_1}$$

Print statements

$$\frac{(\text{value-of } exp\ \rho\ \sigma_0) = (val, \sigma_1)}{(\text{result-of } (\text{print-stmt } exp)\ \rho\ \sigma_0) = [\text{print-n} = val]\sigma_1}$$

Where n is the lowest positive integer such that print-n is not in σ_1. An external device seeking to determine the output of a program should examine the final store or any intermediary store's entries for print-n for positive integers n.

Block statements

$$\frac{(\text{null? } stmts) = \#t}{(\text{result-of } (\text{block-stmt } stmts)\ \rho\ \sigma) = \sigma}$$

$$\frac{(\text{null? } stmts) = \#f \qquad (\text{result-of } (\text{car } stmts)\ \rho\ \sigma_0) = \sigma_1}{(\text{result-of } (\text{block-stmt } stmts)\ \rho\ \sigma_0) = (\text{result-of } (\text{block-stmt } (\text{cdr } stmts))\ \rho\ \sigma_1)}$$

If statements

$$\frac{(\text{value-of } exp\ \rho\ \sigma_0) = (\#t, \sigma_1)}{(\text{result-of } (\text{if-stmt } test\ consequent\ alternative)\ \rho\ \sigma_0) = (\text{result-of } consequent\ \rho\ \sigma_1)}$$

$$\frac{(\text{value-of } exp\ \rho\ \sigma_0) = (\#f, \sigma_1)}{(\text{result-of } (\text{if-stmt } test\ consequent\ alternative)\ \rho\ \sigma_0) = (\text{result-of } alternative\ \rho\ \sigma_1)}$$

Var statements

$$\frac{(\text{null? } ids) = \#t}{(\text{result-of } (\text{var-stmt } ids\ stmt)\ \rho_0\ \sigma) = (\text{result-of } stmt\ \rho_0\ \sigma)}$$

$$\frac{(\text{null? } ids) = \#f \qquad [(\text{car } ids) = l]\rho_0 = \rho_1}{(\text{result-of } (\text{var-stmt } ids\ stmt)\ \rho_0\ \sigma) = (\text{result-of } (\text{var-stmt } (\text{cdr } ids)\ stmt)\ \rho_1\ \sigma)}$$

Where l is neither in σ nor of the form print-n where n is a positive integer.