

Semantyka i weryfikacja - praca domowa nr 2  
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## 1 Expressions

### 1.1 $e$

$$\llbracket e \rrbracket_{\varrho_V, \varrho_P, s} = q \in \mathbb{Q}$$

### 1.2 $x$

$$\llbracket x \rrbracket_{\varrho_V, s} = s(\varrho_V x)$$

### 1.3 $e + e$

$$\llbracket e_1 + e_2 \rrbracket_{\varrho_V, s} = \llbracket e_1 \rrbracket_{\varrho_V, s} + \llbracket e_2 \rrbracket_{\varrho_V, s}$$

### 1.4 $e * e$ , $e - e$ - analogicznie

## 2 Bool Expressions

### 2.1 $true$

$$\llbracket true \rrbracket_{\varrho_V, s} = tt$$

### 2.2 $false$

$$\llbracket false \rrbracket_{\varrho_V, s} = ff$$

### 2.3 $e < e$

$$\llbracket e_1 < e_2 \rrbracket \varrho_V, s = ifte( \llbracket e_1 \rrbracket \varrho_V, s < \llbracket e_2 \rrbracket \varrho_V, s, tt, ff )$$

### 2.4 $e = e, b \wedge b, \neg b$ - analogicznie

## 3 Declarations

### 3.1 $\text{var } x = e$

$$\begin{aligned} \llbracket \text{var } x = e \rrbracket \varrho_V, \varrho_P, s &= \varrho_V[x \mapsto l], \varrho_P, s[l \mapsto n] \\ \text{where } l &= \text{newloc}(s), n = \llbracket e \rrbracket \varrho_V, s \end{aligned}$$

### 3.2 $\epsilon$

$$\llbracket \epsilon \rrbracket \varrho_V = id_P$$

### 3.3 $\text{proc } p(x) \text{ I}$

$$\begin{aligned} \llbracket \text{proc } p(x) \text{ I} \rrbracket \varrho_V \varrho_P &= \varrho_P[p \mapsto P] \\ \text{where } P &= \lambda.s : \text{State}. \llbracket I \rrbracket \varrho_V \varrho_P[p \mapsto P] s[l \mapsto \llbracket s(\varrho_V x) \rrbracket \varrho_V, s], \\ & l = \text{newloc}(s) \end{aligned}$$

### 3.4 $D_1; D_2$

$$\begin{aligned} \llbracket D_1; D_2 \rrbracket \varrho_V \varrho_P &= \llbracket D_2 \rrbracket \varrho'_P \varrho'_D \\ \text{where } \varrho'_P \varrho'_D &= \llbracket D_1 \rrbracket \varrho_V \varrho_P \end{aligned}$$

## 4 Instructions

### 4.1 skip

$$\llbracket skip \rrbracket \varrho_V, \varrho_P, s = \varrho_V, \varrho_P, s$$

### 4.2 $x := e$

$$\llbracket x := e \rrbracket \varrho_V, \varrho_P, s = \varrho_V \varrho_P s[(\varrho_V x) \mapsto \llbracket e \rrbracket \varrho_V, s]$$

### 4.3 $I_1; I_2$

$$\llbracket I_1; I_2 \rrbracket = \llbracket I_2 \rrbracket \circ \llbracket I_1 \rrbracket$$

### 4.4 if $b$ then $I_1$ else $I_2$

$$\llbracket if\ b\ then\ I_1\ else\ I_2 \rrbracket \varrho_V, \varrho_P, s = ifte(\llbracket b \rrbracket \varrho_V, \varrho_P, s, \llbracket I_1 \rrbracket \varrho_V, \varrho_P, s, \llbracket I_2 \rrbracket \varrho_V, \varrho_P, s)$$

### 4.5 while $b$ do $I$

$$\llbracket while\ b\ do\ I \rrbracket \varrho_V, \varrho_P, s = ifte(\llbracket b \rrbracket \varrho_V, \varrho_P, s, \llbracket while\ b\ do\ I \rrbracket(\llbracket I \rrbracket \varrho_V, \varrho_P, s), \varrho_V, \varrho_P, s)$$

### 4.6 begin $D$ ; $I$ end

$$\llbracket begin\ D;\ I\ end \rrbracket = TODO$$

### 4.7 call $p(x)$

$$\llbracket call\ p(x) \rrbracket = TODO$$