

Jason Zhang jzhan127

Assignment 6

Collaborators: Dan Qian

1.

a. $e ::= e' \text{ (fb regular)} \mid \{l=e; \dots; l=e\} \mid e.l \mid e @ e$

$l ::= \text{labels (strings)}$

$v ::= \{l=v; \dots; l=v\} \mid \dots, \text{ (other integers)}$

b. $\frac{}{v \Rightarrow v}$

$$\frac{\{l=e; \dots; l=e\}: \quad n \geq 0, e_1 \Rightarrow v_1, \dots, e_n \Rightarrow v_n}{\{l=e; \dots; l \neq e_n\} \Rightarrow \{l_1=v_1; \dots; l_n=v_n\}}$$

$$\frac{e.l: \quad e \Rightarrow \{l_1=v_1; \dots; l_n=v_n\}, \quad l=l_i, \quad 1 \leq i \leq n}{e.l \Rightarrow v_i}$$

$$e @ e: \quad e_1 \Rightarrow \{l_1=v_1; \dots; l_n=v_n\}, \quad e_2 \{l_j=v_j; \dots; l_m=v_m\} \quad \begin{matrix} n, m \geq 0 \\ 1 \leq i \leq n \\ 1 \leq j \leq m \end{matrix}$$

$$\frac{e_1 @ e_2 \Rightarrow \{l_r=v_r; \dots; l_k=v_k\} \quad 1 \leq r \leq k \quad \begin{matrix} \text{if } l_r \in e_1, e_2 \\ \text{then } l_r = v_r \in e_2 \end{matrix}}{k \geq 0} \quad \text{(Always choose right one)}$$

$$1. c. (\{a=5; b=7\} @ \{b=1+2\}). b \Rightarrow 3$$

$$\frac{\overline{5 \Rightarrow 5} \quad \overline{7 \Rightarrow 7}}{\{a=5; b=7\}}, \quad \frac{\overline{1 \Rightarrow 1} \quad \overline{2 \Rightarrow 2}}{1+2 \Rightarrow 3}$$

$$\{a=5; b=7\} @ \{b=1+2\} \Rightarrow \{a=5; b=3\}, \quad \overline{b \Rightarrow b}$$

$$(\{a=5; b=7\} @ \{b=1+2\}). b \Rightarrow 3$$

3 a.

Let pointC = Fun ix \rightarrow Fun iy \rightarrow

{ x = ix;

y = iy;

mag = Fun this \rightarrow Fun _ \rightarrow Sqrt(Sqr(this.x) + Sqr(this.y));

isZero = Fun this \rightarrow Fun _ \rightarrow this.mag this {} }

} In

Let cPointC = Fun ix \rightarrow Fun iy \rightarrow Fun ic \rightarrow

Let super = pointC ix iy In

~~Let~~ Super @

{ C = ic;

mag = Fun this \rightarrow Fun _ \rightarrow mult(super.mag this {})(this.bright this {});

bright = Fun this \rightarrow Fun _ \rightarrow this.c.r + this.c.g + this.c.b

} In

Let cp = cPointC 0 10 {r=0; g=0; b=0} In

cp.isZero cp {} }

\rightarrow

3 b.

Let point C = Fun ix \rightarrow Fun iy \rightarrow

{ x = ix;

y = iy;

mag = Fun this \rightarrow Fun \rightarrow Sqrt (Sqr(this.x) + Sqr(this.y));

isZero = Fun this \rightarrow Fun \rightarrow this.mag this { }

} In

Let color C = Fun ic \rightarrow

{ c = ic;

bright = Fun this \rightarrow Fun \rightarrow this.c.r + this.c.g + this.c.b

} In

Let cPoint C = Fun ix \rightarrow Fun iy \rightarrow Fun ic \rightarrow

Let Super1 = point C ix iy In

Let Super2 = color C ic In

Super1 @ Super2 @

{ mag = Fun this \rightarrow Fun \rightarrow mult (Super1.mag ~~this~~ this { })

(Super2.bright this { }) }

} In

Let cp = cPoint C o 10 { r=0; g=0; b=0 } In

cp.isZero cp { }