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§5. Dynamic Behavior of Programs

5.1 Creation

In the beginning, we must create two sets Q_0 and V_0 .

5.1.1 All $\langle \text{expression} \rangle$'s in standard $\langle \text{declaration} \rangle$'s are rewritten in the form of normal (as defined in the next paragraph).

5.1.2 Let V_0 stand for the set of the all $\langle \text{identifier} \rangle$'s declared by some standard $\langle \text{declaration} \rangle$, and let $\alpha(V)$ be able, and $q(V)$ be an abstract element, different from each other, for each $\langle \text{variable} \rangle V$ in V_0 .

5.1.3 Let Q_0 stand for the set

$$\{ q(V) \mid V \in V_0 \},$$

and let $v(Q)$ be the value of Q for each $Q \in Q_0$.

(If standard $\langle \text{declaration} \rangle$ of a $\langle \text{variable} \rangle V \in V_0$ is of the form

"let V be procedure $(T_1, \dots, T_n)$ T by $((V_1, \dots, V_n)E)$ "

and $q(V) = Q$, then

$v(Q)$ is $(V_1, \dots, V_n)E$.)

5.1.4 Let $Q0$ stand for an abstract element $\notin Q_0$, and let $L0$ stand for a $\langle \text{label} \rangle$.

5.2 Normalization

Let E_1 stand for a legal program, V_1 stand for the set of the all $\langle \text{identifier} \rangle$'s contained in E_1 , and L_1 stand for the set of the all $\langle \text{label} \rangle$'s contained in E_1 .

1) Let V stand for $V_0 \cup V_1$, and let $\alpha(V)$ be inable for $V \in V - V_0$.

2) Let L stand for $L_1 \cup \{L0\}$.

3) Let Q stand for $Q_0 \cup \{Q0\}$, and let $v(Q0)$ be done.

4) $r(E_1) \Rightarrow E_2$.

5) Let D be a $\langle \text{form declaration} \rangle$ in E_2 of the form

"let G represent F "

with a $\langle \text{form} \rangle G$ and an $\langle \text{expression} \rangle F$.

$$q(V) \Rightarrow V ;$$

Replace in E_2 D with

"let V be F ;

let G represent V ; "

6) Let E' be a $\langle$ form call $\rangle$ in E_2 , of the form

" $P_0 E_1' P_1 E_2' P_2 \dots P_{n-1} E_n' P_n$ "

where $E_1', \dots, E_n'$ be $\langle$ expression $\rangle$'s and P_i be empty or a sequence of $\langle$ mark $\rangle$'s for $i = 0, 1, \dots, n$. If the operator form

$(P_0 t(E_1') P_1 t(E_2') P_2 \dots P_{n-1} t(E_n') P_n)$ is declared by a declaration of the form

"let G represent F ",

then, replace E' in E_2 with

" $(F)(E_1', \dots, E_n')$ ".

7) When T is a $\langle$ typifier $\rangle$ in E_2 , replace T in E_2 with $t(T)$.

8) Eliminate all $\langle$ form declaration $\rangle$ and $\langle$ mark declaration $\rangle$ in E_2 , and let E stand for the result.

An $\langle$ expression $\rangle$ of the form as E is called normal.

5.3 Elaboration of a Normal Program

$e(E)$;

if the result is a quantity Q , then the elaboration of E is thus completed, but

if the result is a $\langle$ label $\rangle$ L , then the elaboration of E is undefined.