Reduce to walk

Monday, July 11, 2022 9:58 PM

general Resource analysis

Better, More accurate. to reduce to finite walk

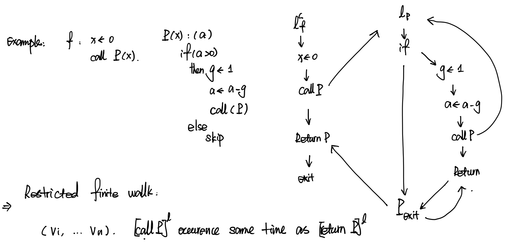
CFL-Reachability : labels of edges composing into a matched word

label matching can be reduced to restrict the occurence times equality

⇒ higher efficient, & symbolic occurence time.

for example:

① interprocedure call can be reduced to valid walk by



⇒ Restricted finite walk:

$(v_i, \dots v_n)$. call_P^i occurence some time as Return_P^i

can generalize to.

② Program slicing Problem:

Example Application ②:

program slicing Problem:

Backword / Forward slicing:

⇒ by define as a single-target L(slice)-problem:

where L defined as:

unbalanced-right := unbalanced-right matched | unbalanced-right); $1 \le i \le \text{callsite}$. ⇒ ✓

| ε

slice := unbalanced-right realizable.

⇒ by restricting inequality between occurence times of vertices.

③. Data flow

standard Data reachability definition analysis is a special case of valid walk.

by set the vertice kill x. weight 0

vertice gen x weight 1.

⇒ valid walk = feasible path.

① IFDS: (Interprocedural, Finite, Distributive, Subset problems)

⇒: 1. Supergraph G^*

2. $\mathbb{D}$: Domain of data flow facts. ⇝ $\Lambda \in \mathbb{D}$. the initial data fact.

Each program point ⇝ associated. exploded to a memember ⇝ $\in 2^{\mathbb{D}}$.

3. Assign of distributive dataflow functions: $2^{\mathbb{D}} \to 2^{\mathbb{D}}$, to edges of G^*.

⇒ solve it as realizable-path reachability problem.

⇒ exploded supergraph: $G^\#$. for each node in G^*:

⇒ $G^\#(n) = \{ V_{G^\#(n)}, E_{G^\#(n)} \}$.

$d \in V_{G^\#(n)}$: $d \in \mathbb{D}$: a dataflow fact.

$e = (d_1, d_2)$. $d_1 \in V_{G^\#(n_1)}$

$d_2 \in V_{G^\#(n_2)}$.

dataflow facts d_2 in node n_2. if d_1 is true in n_1.

↓ ↓ if : the fact transformation function from n_1 to n_2

... d_2 in node n_2. then $f(d_1) = d_2$ is true in n_2

⇒ Formally: $G^\#$:

$V = \forall$ node $n \in G^*$, $\exists$ a node $\langle n, \Lambda \rangle$ in $G^\#$

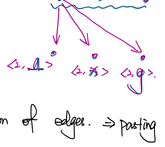
$\cup$ $\forall n \in G^*$. $d \in \mathbb{D}$. $\exists$ a node $\langle n, d \rangle$ in $G^\#$.

E: ① = edge $e = (\langle m, \Lambda \rangle, \langle n, d \rangle)$ $\forall d \in f(c)$.

$\cup$ ② edge $e = (\langle m, d_1 \rangle, \langle n, d_2 \rangle)$ $\forall d_1, d_2 \in \mathbb{D}$. $d_2 \in f(c, d_1) \wedge d_2 \notin f(c)$

$\cup$ ③ edge $e = (\langle m, \Lambda \rangle, \langle n, \Lambda \rangle)$.

Example:



data flow facts: $\Lambda \cup \{x, g\}$: • x: x is the possible uninitialized variable.

<1, x>: the node for start point in program where data flow fact x is true.

fact transformation function f: $\lambda S. \{x, g\}$

i.e. $x \; f(\Lambda) = \{x, g\} \Rightarrow$ edges: $(\langle 1, \Lambda \rangle, \langle 2, x \rangle)$. $(\langle 1, y \rangle, \langle 2, \Lambda \rangle)$

⇒ composition of edges. ⇒ pasting nodes.