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CSC410, Fall 2016 - Homework 4

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Lecture: Tuesday

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Grace Day Tokens Usage: 1

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Problem 1,

1, void problem1( )

w=820;y=410; $\boxed{\text{def=\{w,y\},use=\{\}}}$ FALSE

while(y > 400){ $\boxed{\text{def= \{\},use = \{y\}}}$

TRUE

if(y == 400){ $\boxed{\text{def= \{\}, use = \{y\}}}$ FALSE

TRUE

z = 1000;} $\boxed{\text{def=\{z\},use=\{\}}}$

{z = w + 5;} $\boxed{\text{def=\{z\},use=\{w\}}}$

y = 400; } $\boxed{\text{def=\{y\},use = \{\}}}$

return; $\boxed{\text{def=\{\}, use =\{\}}}$

2,statement 3: while(y>400)

and

statement 9: y = 400;

require calculating the intersection of the fact of two(or more) other statements.

3, (Green arrors denotes the true executtion while red denotes the false one)

U == unknown

N == not a constant

void problem1( ) (w,y,z)

w=820; (U,U,U) → (820,U,U)

y=410; (820,U,U) → (820,410,U)

while(y > 400){ (820,N,N)→ (820,N,N)

if(y == 400){ (820,N,N) → (820,N,N)

z = 1000;} (820,N,N) → (820,N,1000)

{z = w + 5;}(820,N,N)→(820,N,N)

y = 400; } (820,N,N) →(820,400,N)

return; (820,N,N)→(820,N,N)

stmt	in	out	If union or intersection, write here which statements are the input to the result
1 w = 820	**(w,y,z)** = (U,U,U)	(820,U,U)	
2 y=410	(820,U,U)	(820,410,U)	
3 whie (y>400){	(820,N,N)	(820,N,N)	stmt2 Union stmt 9
4 if(y == 410){	(820,N,N)	(820,N,N)	
5 z= 1000	(820,N,N)	(820,N,1000)	
6 }else{	N/A	N/A	
7 z = w + 5	(820,N,N)	(820,N,N)	
8 }	N/A	N/A	
9 y = 400	(820,N,N)	(820,400,N)	stmt5 Union stmt 7
10 }			
11 return	(820,N,N)	(820,N,N)	

4,

Forward flow and all-paths analysis.

Problem2, (c at the end of use denotes compute use while p denotes predicate use)

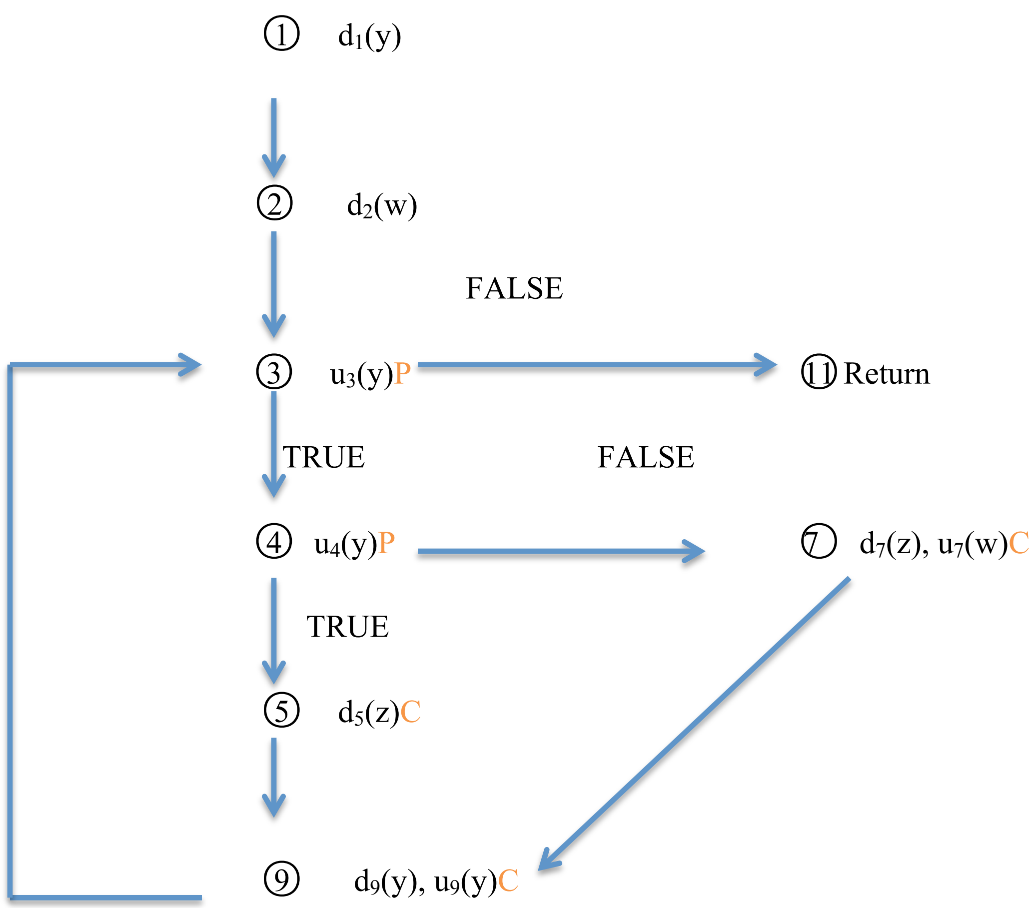
1. void problem2(int y){ $d_1(y)$
2. w = 820 $d_2(w)$
3. while (y > 400) { $u_3(y)$ P
4. if (y == 410) { $u_4(y)$ P
5. z = 1000; $d_5(z)$ C
6. } else {
7. z = w+5; $d_7(z)$, $u_7(w)$ C
8. }

9. y -= 1; $d_9(y)$, $u_9(y)$ C

10. }

11. return;

C means C-use while P means P-use



1,

Requires $d_1(y)$, $d_2(w)$ and $d_9(y)$ reach its use at least once respectively.

1,2,3 ($d_1(y)$ to $u_3(y)$)

1,2,3,4,7 ($d_2(w)$ to $u_7(w)$)

9,3,11 ($d_9(y)$ to $u_3(y)$)

Thus, test cases{1,2,3} ,{1,2,3,4,7}, {9,3,11} allows 100% All-Defs Coverage.

2,

Requires :

$d_1(y)$ to $u_3(y)$ (1) $d_9(y)$ to $u_3(y)$(4) $d_2(w)$ to $u_7(w)$(7)

$d_1(y)$ to $u_4(y)$ (2) $d_9(y)$ to $u_4(y)$(5)

$d_1(y)$ to $u_9(y)$ (3) $d_9(y)$ to $u_9(y)$(6)

Test cases:

1,2,3,4,5,9 satisfies (1)(2)(3)

9,3,4,5,9 satisfies (4)(5)(6)

1,2,3,4,7 satisfies (7)

Thus, test cases {1,2,3,4,5,9}{9,3,4,5,9}{1,2,3,4,7}allow 100% "All-Uses" coverage

3,

All-du Paths:

Requires : A: $d_1(y)$ to $u_3(y)$,

$d_1(y)$ to $u_4(y)$,

both paths for $d_1(y)$ to $u_9(y)$

B: $d_9(y)$ to $u_3(y)$

$d_9(y)$ to $u_4(y)$

both paths for $d_9(y)$ to $u_9(y)$

C: $d_2(w)$ to $u_7(w)$

Test cases:

1,2,3,4,5,9 satisfies A

9,3,4,5,9 satisfies B

1,2,3,4,7 satisfies C

Thus {1,2,3,4,5,9},{9,3,4,5,9}and {1,2,3,4,7} allow 100% "All-DU-Paths" coverage

4,

All C-use, some P-use :

Test case : 1,2,3,4,7

It is All C-use of $d_2(w)$, and some P-use for $d_1(y)$

(By the annotated CFG above)

5,

All P-use, some C-use:

1,2,3,4,7

It is All P-use of $d_1(y)$, and some P-use for $d_2(w)$

(By the annotated CFG above)

Problem 3,

1,

Since this is the simplified code, x,y,z are defined before statement 1

void problem3( ) def={x,y,z},use={}

↓

w = x + y + z; def={w},use={x,y,z}

↓ FALSE

if(y > 10)def={},use={y} →→→→→→→→ w = 2x; def={w},use={x}

↓ TRUE ↓

w = x - y; def={w},use={x,y} ↓

↓ ↓

y += w; def={y},use={w,y} ←←←←←←←←← ↓

↓

return; def={},use={}

2,

statement 7 : y +=w.

3, Notation : (X,Y,Z,w)

stmt	in	out	If union or intersection, write here which statements are the input to the result
void problem3()		{x,y,z}	
1 w = x + y + z	{x,y,z}	{x,y}	
2 if(y > 10){	{x,y}	{x,y}	
3 w = x-y	{x,y}	{y,w}	
4 }else{			
5 w= 2x	{x,y}	{y,w}	
6 }	N/A	N/A	
7 y += w	{y,w}	{}	intersection of stmt 3 and 5
8 return;	{}	{}	

4,

backward flow analysis, as well as one path analysis.