Software testing 2014

ASSIGNMENT 3 - CFG FOR SOURCE AND INTEGRATION

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1 Create a Control Flow Graph (CFG)

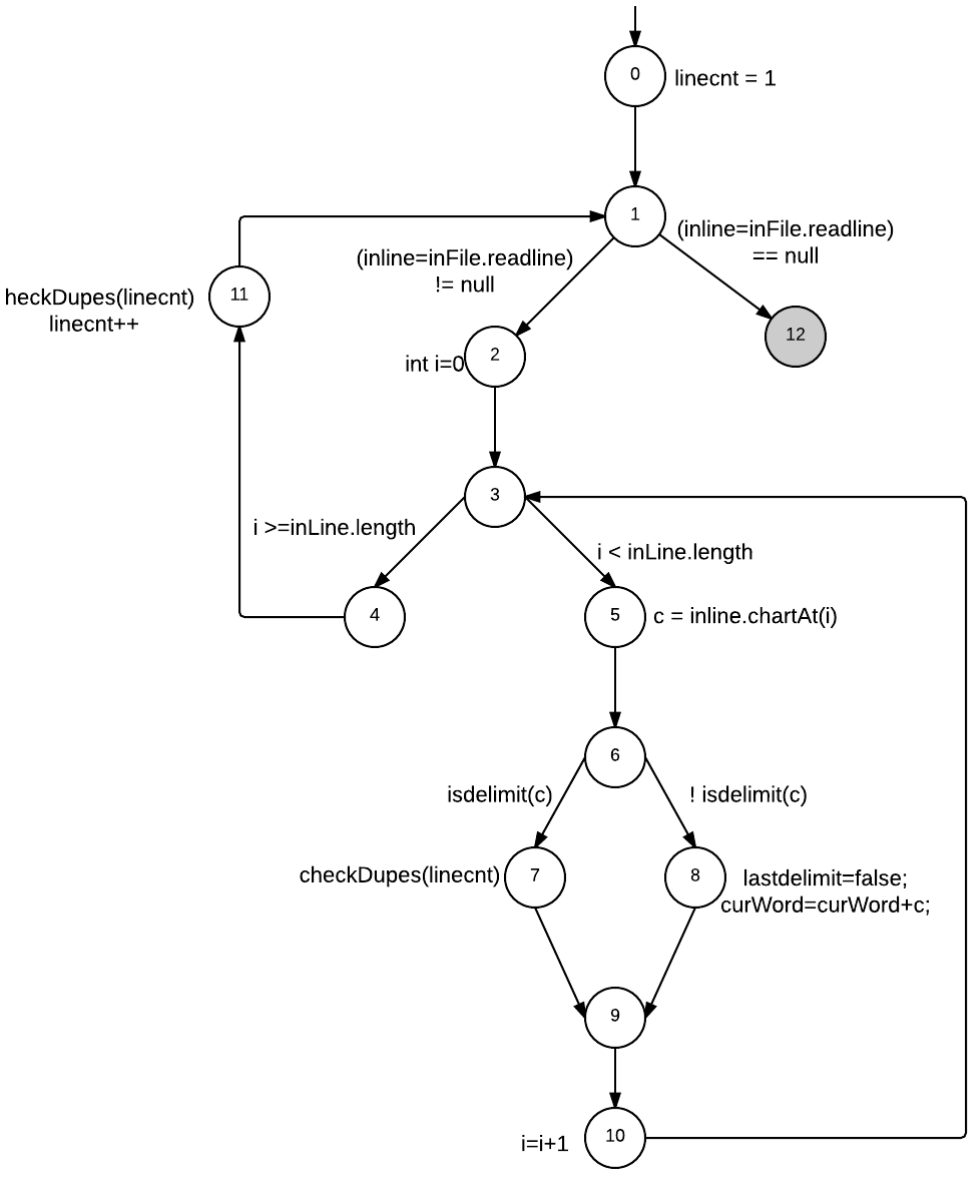

Figure 1: CFG of the void stut() method

2 Test requirement for each criterion

1. Node coverage (NC)
   $TR = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

2. Edge coverage (EC)
   $TR = \{(0, 1), (1, 2), (1, 12), (2, 3), (3, 4), (3, 5), (4, 11),$
   $(5, 6), (6, 7), (6, 8), (7, 9), (8, 9), (9, 10), (10, 3), (11, 1)\}$

3. Edge-Pair coverage (EC)
   $TR = \{(0, 1, 2), (0, 1, 12), (1, 2, 3), (2, 3, 4), (2, 3, 5), (3, 4, 11), (3, 5, 6), (4, 11, 1), (5, 6, 7),$
   $(5, 6, 8), (6, 7, 9), (6, 8, 9), (7, 9, 10), (8, 9, 10), (9, 10, 3), (10, 3, 4), (10, 3, 5)(11, 1, 2), (11, 1, 12)\}$

3 Def and uses (figure 2)

4 DU-pairs, DU-paths and TR for AUC

4.1 DU-Pairs for "linecnt"

$Du - pairs = \{(0, 7), (0, 11), (11, 7))\}$

4.2 DU-Paths

$Du - paths = \{[0, 1, 2, 3, 5, 6, 7], [0, 1, 2, 3, 4, 11], [11, 1, 2, 3, 5, 6, 7]\}$

4.3 Test requirement (TR) for AUC and Test paths

Test requirements are $TR = \{[0, 1, 2, 3, 5, 6, 7], [0, 1, 2, 3, 4, 11], [11, 1, 2, 3, 5, 6, 7]\}$; and few possible test paths

$TP = \{[0, 1, 2, 3, 4, 11, 1, 12], [0, 1, 3, 5, 6, 7, 9, 10, 3, 4, 11, 1, 12], [0, 1, 2, 3, 4, 11, 1, 2, 3, 5, 6, 7, 9, 10, 3, 4, 11, 1, 1$

5 List of all the call sites

There is only 3 call sites, on edges $(6, 7) and (6, 8)$; line 71 in my source code. As return from a call is also consider as a call site on line 123 we have a call site.

6 List the last-defs and first-uses for each variable involved in the call

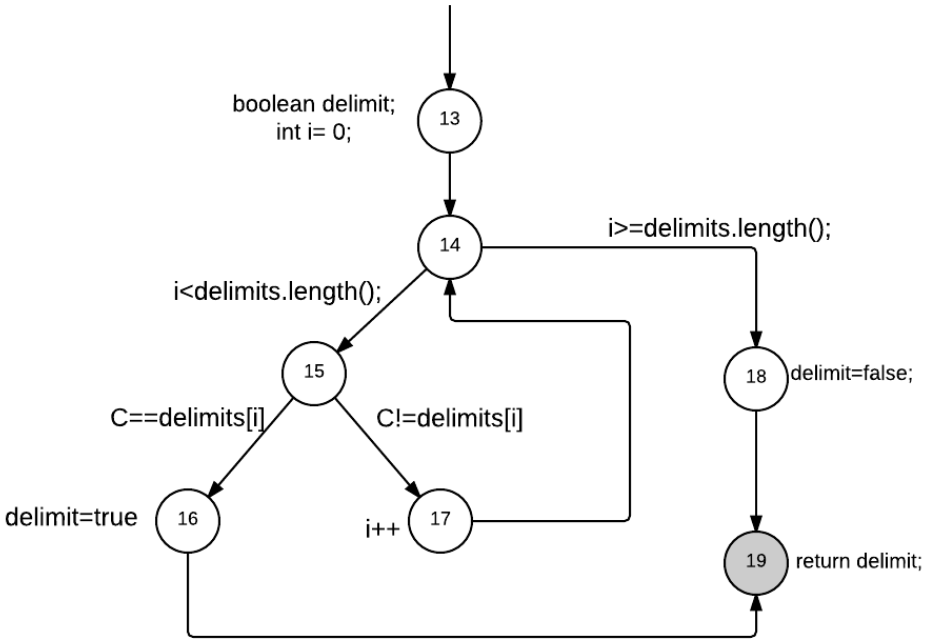

Figure 3: CFG for isDelimit() method

$last\_defs = \{5, 16, 18\}$
$first\_uses = \{(6, 7), (6, 8), (14, 15)(14, 18), (15, 16), (15, 17)\}$

For the shared variable *delimits* the last definition is on *line 16*. We assume that there is a fake node with the number 99. It cannot be included in any CFG. So we can update the last_defs set.

$last\_defs = \{5, 16, 18, 99\}$

7 List all DU-pairs for each call site

Pairs : (last_def, first_use)

- $(5, (15, 16))$
- $(5, (15, 17))$
- $(16, (6, 8))$
- $(16, (6, 7))$

- $(18, (6, 8))$
- $(18, (6, 7))$
- $(99, (14, 15))$
- $(99, (14, 18))$

8 List test requirements for the All-coupling-Use coverage criterion

Criterion: From every last_def to every first_use.

- $(5, 6, 13, 14, 15, 16, 19)$
- $(5, 6, 13, 14, 15, 17, 14, 15, 16, 19)$
- $(16, 19, 8)(notfeasible)$
- $(16, 19, 7)(duplicate)$
- $(18, 19, 8)$
- $(18, 19, 7)(notfeasible)$
- $(99, 13, 14, 15))(duplicate)$
- $(99, 13, 14, 18))(notfeasible)$

9 Identify test inputs

9.1 Inputs 1

1. Inputs
   - The first line should be empty
   - The second line contains 2 characters: the first is a delimiter (tabulation) and the second one a normal character ('a').
2. Test path
   $TP1 = \{[0, 1, 2, 3, 4, 11, 1, 2, 3, 5, 6, 7, 9, 10, 3, 5, 6, 8, 9, 10, 3, 4, 11, 1, 12]\}$
3. Test requirements
   a) Edge Pair
   $TR = \{(0, 1, 2), (1, 2, 3), (2, 3, 4), (2, 3, 5), (3, 4, 11), (3, 5, 6), (4, 11, 1), (5, 6, 7), (5, 6, 8), (6, 7, 9), (6, 8,$
   $(7, 9, 10), (8, 9, 10), (9, 10, 3), (10, 3, 5), (10, 3, 4), (11, 1, 2), (11, 1, 12)\}$

b) All-Uses coverage
$TR = \{[11, 1, 2, 3, 5, 6, 7], [0, 1, 2, 3, 4, 11]\}$

c) All-coupling-Use $TR = \{(5, 6, 13, 14, 15, 16, 19, 7), (18, 19, 8)\}$

4. Coverage level (cumulative)
   a) Edge Pair : 18/19
   b) All-Uses coverage: 2/3
   c) All-coupling-Use: 2/3

9.2 Inputs 2

1. Inputs
   - Empty file
2. Test path
   $TP2 = \{[0, 1, 12]\}$
3. Test requirements
   a) Edge Pair
   $TR = \{(0, 1, 12)\}$
   b) All-Uses coverage
   $TR = \{\}$
   c) All-coupling-Use $TR = \{\}$
4. Coverage level (cumulative)
   a) Edge Pair : 19/19
   b) All-Uses coverage: 2/3
   c) All-coupling-Use: 2/3

9.3 Inputs 3

1. Inputs
   - The first line is an empty line
   - The second contains only a delimiter: 'space'
2. Test path
   $TP3 = \{[0, 1, 2, 3, 4, 11, 1, 2, 3, 5, 6, 7, 9, 10, 3, 4, 11, 1, 12]\}$
3. Test requirements
   a) Edge Pair
   $TR = \{(0, 1, 2), (1, 2, 3), (2, 3, 5), (3, 4, 11), (3, 5, 6), (4, 11, 1), (5, 6, 7), (6, 7, 9), (7, 9, 10), (9, 10, 3), (10, 3, 4), (11, 1, 2), (11, 1, 12)\}$

b) All-Uses coverage
$TR = \{[0, 1, 2, 3, 4, 11], [11, 1, 2, 3, 5, 6, 7]\}$

c) All-coupling-Use $TR = \{(5, 6, 13, 14, 15, 17, 14, 15, 16, 19, 7)\}$

4. Coverage level (cumulative)
   a) Edge Pair : 19/19
   b) All-Uses coverage: 2/3
   c) All-coupling-Use: 3/3

9.4 Inputs 4

1. Inputs
   - The file contains one line with only one delimiters: *space*.
2. Test path
   $TP4 = \{[0, 1, 2, 3, 5, 6, 7, 9, 10, 3, 4, 11, 1, 12]\}$
3. Test requirements
   a) Edge Pair
   $TR = \{(0, 1, 2), (1, 2, 3), (2, 3, 5), (3, 5, 6), (3, 4, 11)(4, 11, 1), (5, 6, 7), (6, 7, 9), (7, 9, 10), (9, 10, 3), (10, 3, 4), (11, 1, 12)\}$
   b) All-Uses coverage
   $TR = \{\}$
   c) All-coupling-Use $TR = \{[5, 6, 13, 14, 15, 17, 14, 15, 16, 19, 7]\}$
4. Coverage level
   a) Edge Pair : 19/19
   b) All-Uses coverage: 3/3
   c) All-coupling-Use: 3/3

9.5 Improvement (Figure 4)

We have figure out that our CFG could have been simplier. So we put the simplified CFG.

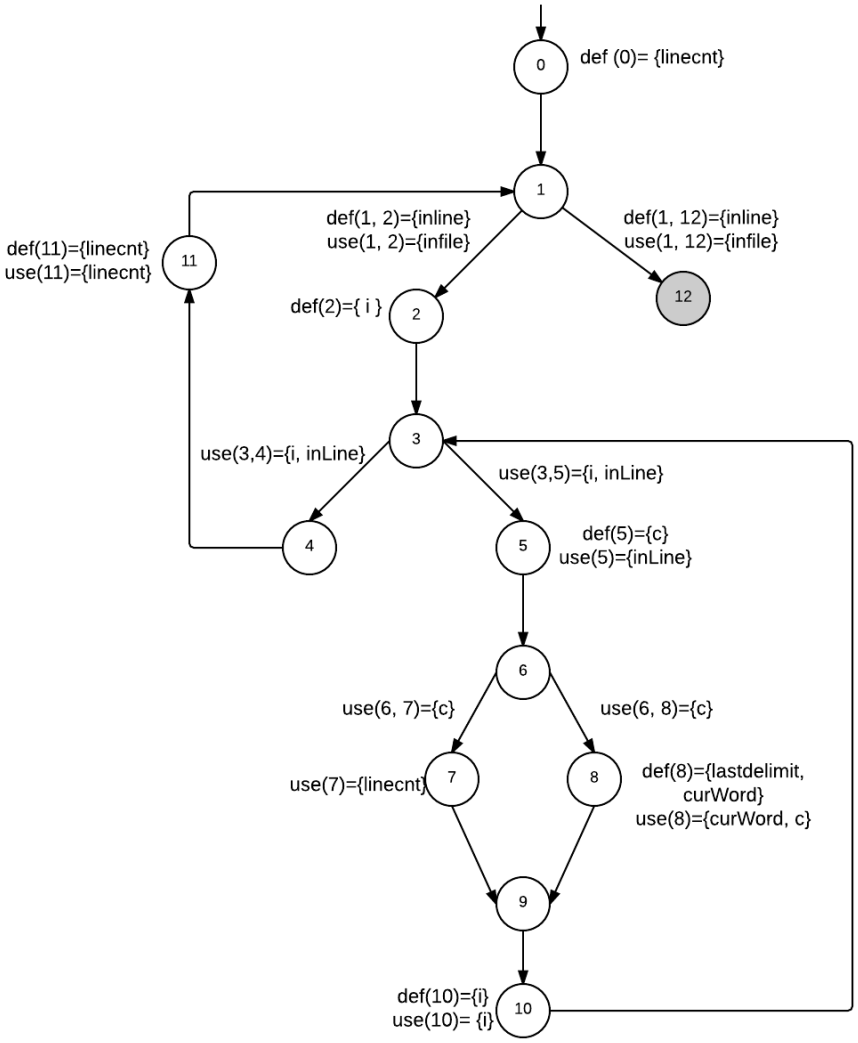

Figure 2: CFG with def and use method

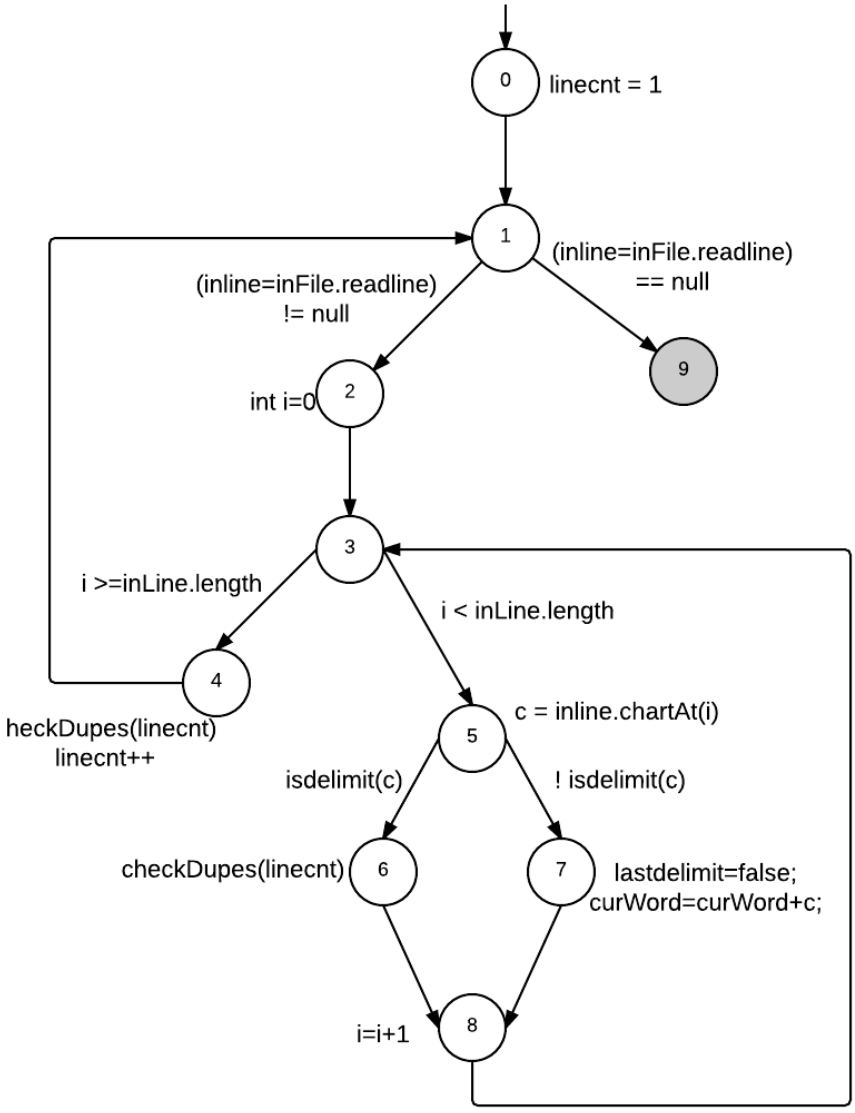

Figure 4: Simplified CFG with def and use method