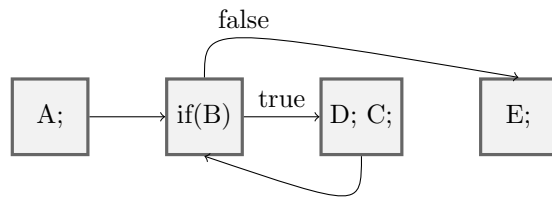# TDT4205 Problem Set 6

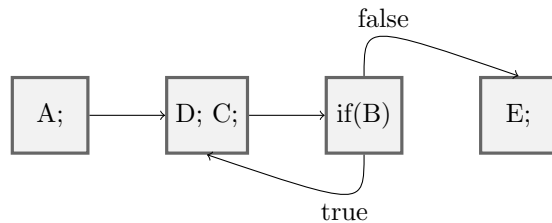Harald Husum

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1 Control Flow Graphs

1.1 for loop and while loop

This CFG is valid for both the for loop and the while loop.

1.2 do while loop

Only a small difference here from the previous example:

2 Optimizations

2.1 Copy propagation

On line 6, we have the copy $f = e$. We see that e is defined on line 5 to be: $e = b + c$. Consequently we can change line 6 to: $f = b + c$. On line 7 we have another copy: $g = f$. Since f is now defined as $f = b + c$, we get $g = b + c$ on line 7.

2.2   Common subexpression elimination

The expression $a = b + c$ on line 9 has a common subexpression with line 5: $e = b + c$. We eliminate this by changing line 9 to $a = e$.

2.3   Constant propagation

On line 1, 2, and 3, variables a, b, and c are defined as constants, respectively. On line 4, a is utilized, and we can change it to $d = 1 + x$. On line 5, e is defined in terms of both b and c. We propagate and fold, the result being $e = 5$. This means e is now also constant. Line 6 defines f: $f = e$. Propagating e yields $f = 5$, and f is a constant. Under the same reasoning, line 7 becomes $g = 5$, and g is a constant. On line 8, g ceases to be a constant, and on line 9, we can propagate again and change the definition to $a = 5$.