

Reaching Definitions ← can work without SSA

reaches(l, x, l') — definition of temp x at line l reaches l'

$$\frac{\text{def}(l, x) \text{ succ}(l, l')}{\text{reaches}(l, x, l')}$$

$$\frac{\text{reaches}(l, x, l') \neg \text{def}(l', x) \text{ succ}(l', l'')}{\text{reaches}(l, x, l'')}$$

Complexity: $O(\#lines^2)$

Algorithm: propagate forward from definition

Optimisation

Optimise:
 runtime } main thing for us } want to improve average case
 mem use }
 code size }
 energy use }

Reg alloc optim

5. Coalesce non-interfering moves

i.e. $t \leftarrow s$ if t and s do not interfere
 so t and s can use same reg

↳ get $t \leftarrow t$, useless move

↳ eliminate

Greedy Coalescing

for each move $t \leftarrow s$:

if $\exists t, s \in E$:

skip

else if \exists colour $c \notin \text{col}(N(s) \cup N(t))$ that corresponds to a register:

coalesce s and t into fresh temp w

add w to graph with color w

connect w to $N(s) \cup N(t)$

remove s and t

replace s and t with w



Ex.

$N(x_0) \cup N(x_3)$



$x_0 \leftarrow x_4$
 $x_4 \leftarrow x_3$

skip
 can coalesce

$3 \leq 13$, coalesce needs new color



* Move examination order affects result, so maybe check important parts first

* Coalescing preserves SSA