

	1	movg \$1, !v	{v}	greedy → assign vars to regs as you see them
v	2	movg \$4b, !w	{v, w}	prob 1: vars eventually stop being useful
	3	movg !v, !x	{x, w}	and this ignores
	4	addg \$7, !x	{x, w}	prob 2: some vars matter more
	5	movg !x, !y	{x, w, y}	prob 3: linear (n')
y	6	addg \$4, !y	{x, w, y}	decide first
	7	movg !x, !z	{w, y, z}	
	8	addg !w, !z	{y, z} vs	quadratic (n <sup>2</sup> )
	9	movg !y, !t	{t, z}	
	10	negg !t	{t, z}	liveness-analysis (when is x needed?)
	11	movg !z, %rax	{t}	↓
	12	addg !t, %rax	∅	interference analysis (what conflicts?)
	13	jmp END	∅	↓

assignment

live-after set

i: instrs 1 ... n

if  $k = n$  a.w. Live Before (k+1)

$$LiveAfter(k) = \emptyset$$

$$LiveBefore(k) = (LiveAfter(k) - W(k)) \cup R(k)$$

$\uparrow$  written variables       $\uparrow$  read variables

$W: X_{inst} \rightarrow set(vars)$        $W: X_{arg} \rightarrow set(vars)$

$W(popg a) = W(a)$        $W(\%r) = \emptyset$        $W(!v) = \{v\}$

$R(popg a) = \emptyset$        $W(\$n) = \emptyset$

$W(addg src, dst) = W(dst)$

$R(addg src, dst) = R(src) \cup R(dst)$

liveness: Block  $\rightarrow$  Block

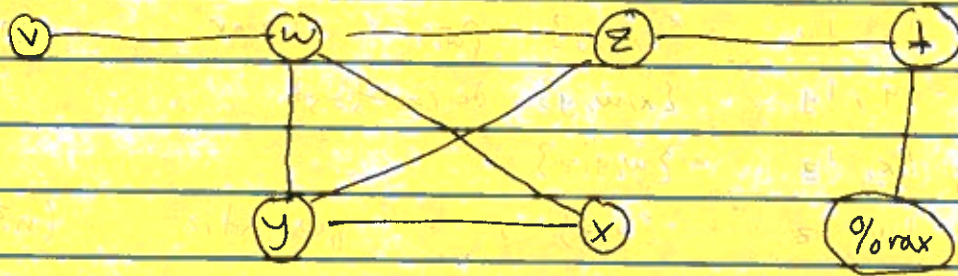
liveness (block I is) = block I [liveness  $\rightarrow$  liveness(is)] is

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When does variable  $x$  interfere with variable  $y$ ?

iff  $\exists k. \text{LiveAfter}(k) \ni \{x, y\}$

$V$  and  $(V, V)$  — I am a graph!  
nodes  $\rightarrow$  edges



If  $I_k$  is arithmetic like  $(\text{add } s \ d)$  <sup>could register OR var</sup>  
 $\forall v \in \text{LiveAfter}(k)$ , we add  $(d, v)$  to  $I$   
unless  $v = d$

If  $I_k$  is a move  $(\text{mov } s \ d)$  <sup>add</sup>  
 $\forall v \in \text{LiveAfter}(k)$ , we add  $(d, v)$  to  $I$   <sup>$(s, d)$  to  $M$</sup>   
unless  $v = d$  or  $v = s$

If  $I_k$  treats any registers special, then add  $(r, v)$  to  $I$  for all  $v \in \text{LiveAfter}(k)$   
callg treats caller-saved regs special  
and %rax  $\rightarrow$

rax rdx rcx rsi rdi r8-r11

move-brasing if  $(\text{mov } s \ d)$  is in program  
prefer  $\text{reg}(s) = \text{reg}(d)$

