

1. VERY BUSY EXPRESSION

	Very Busy Expression
Domain	Insieme delle espressioni
Direction	backward: $in[b] = fb(out[b])$ $out[b] = \bigwedge in[succ(b)]$
Transfer function	$fb = Genb \cup (out[b] - kill[b])$
Meet Operation (^)	\cap
Boundary Condition	$IN[exit] = \emptyset$
Initial interior points	$IN[b] = \emptyset$

	1° Iterazione	
	IN[B]	OUT[B]
BB8	\emptyset	\emptyset
BB7	$\{a-b\}$	\emptyset
BB6	\emptyset	$\{a-b\}$
BB5	$\{b-a\}$	\emptyset
BB4	$\{a-b\}$	\emptyset
BB3	$\{b-a\}, \{a-b\}$	$\{a-b\}$
BB2	$\{b-a\}$	$\{b-a\}$
BB1	$\{b-a\}$	$\{b-a\}$

Aggiungo anche una tabella con i Kill e le Gen dei vari basic block

	Gen[]	Kill[]
BB1	\emptyset	\emptyset
BB2	\emptyset	\emptyset
BB3	$\{b-a\}$	\emptyset
BB4	$\{a-b\}$	\emptyset
BB5	$\{b-a\}$	\emptyset
BB6	\emptyset	$\{a-b\}$
BB7	$\{a-b\}$	\emptyset
BB8	\emptyset	\emptyset

2. DOMINATOR ANALYSIS

	Dominator Analysis
Domain	Insieme di basic block
Direction	Forward: $out[b] = fb(in[b])$ $in[b] = \bigwedge out[pred(b)]$
Transfer function	$fb = Gen_b \cup (out[b])$
Meet Operation (^)	\cap
Boundary Condition	$OUT(entry) = entry$
Initial interior points	$OUT[b] = b$

	1° Iterazione	
	IN[B]	OUT[B]
BBA	\emptyset	A
BBB	A	A,B
BBC	A	A,C
BBD	A,C	A,C,D
BBE	A,C	A,C,E
BBF	A,C,D,E	A,C,F
BBG	A,C,F,B	A,G

3. Constant Propagation

	Constant Propagation
Domain	Insieme di coppie [variabile, valore], dove variabile = $Z \cup \{N\}$ $N(\text{null})$ = valore indeterminabile
Direction	Forward: $\text{out}[b] = \text{fb}(\text{in}[b])$ $\text{in}[b] = \bigwedge \text{out}[\text{pred}(b)]$
Transfer function	Per ogni BB, la fb aggiorna lo stato s [variabile, valore]: 1) Assegnamento diretto: $x = c \rightarrow s' = s[x, c]$ 2) Assegnamento con expr: Se tutti gli operandi di expr sono costanti in s, calcola expr ed aggiorna s, altrimenti $s[x, N]$ 3) Ridefinizioni non costanti: $k++$, $k--$ allora $s[x, N]$
Meet Operation (^)	Intersezione punto a punto (\cap): Se due valori differiscono, la variabile diventa
Boundary Condition	$\text{IN}[\text{entry}] = \emptyset$

Initial interior points	OUT[b] = T (Tutte le variabili iniziali non costanti)
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	1° Iterazione	
	IN[B]	OUT[B]
BB1	\emptyset	\emptyset
BB2	\emptyset	$\langle k, 2 \rangle$
BB3	$\langle k, 2 \rangle$	$\langle k, 2 \rangle$
BB4	$\langle k, 2 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle$
BB5	$\langle k, 2 \rangle, \langle a, 4 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle, \langle x, 5 \rangle$
BB6	$\langle k, 2 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle$
BB7	$\langle k, 2 \rangle, \langle a, 4 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle$
BB8	$\langle k, 2 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle x, 5 \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$
BB9	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$
BB10	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$
BB11	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$

	2° Iterazione	
	IN[B]	OUT[B]
BB1	\emptyset	\emptyset
BB2	\emptyset	$\langle k, 2 \rangle$
BB3	$\langle k, 2 \rangle$	$\langle k, 2 \rangle$
BB4	$\langle k, 2 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle$
BB5	$\langle k, 2 \rangle, \langle a, 4 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle, \langle x, 5 \rangle$
BB6	$\langle k, 2 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle$
BB7	$\langle k, 2 \rangle, \langle a, 4 \rangle$	$\langle k, 2 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle$
BB8	$\langle k, 2 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle x, 5 \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$
BB9	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$
BB10	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle, \langle b, 2 \rangle$
BB11	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, N \rangle, \langle b, 2 \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle b, 2 \rangle$
BB12	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle b, 2 \rangle$	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle b, 2 \rangle, \langle y, 8 \rangle$
BB13	$\langle k, 4 \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle b, 2 \rangle, \langle y, 8 \rangle$	$\langle k, N \rangle, \langle a, 4 \rangle, \langle x, 8 \rangle, \langle b, 2 \rangle, \langle y, 8 \rangle$