

Abstract Interpretation

- Cousot & Cousot '77

- Floyd

① input i ;
② $j := 0$
③ while ($i > 0$) {
 ④ $i--$;
 ⑤ $j++$;
}

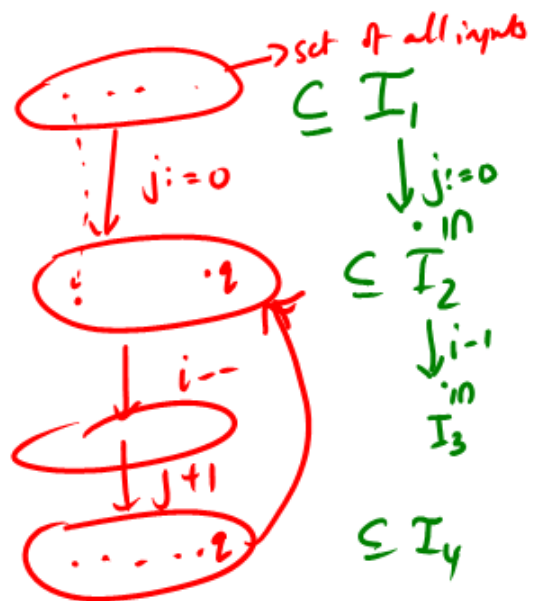
$i=10, j=1, pc=2$
↓ $j:=0$
 $i=10; j=0, pc=3$
↓ $i>0$
 $i=10; j=10; pc=4$
↓ $i--$
⋮
⋮
⋮

```

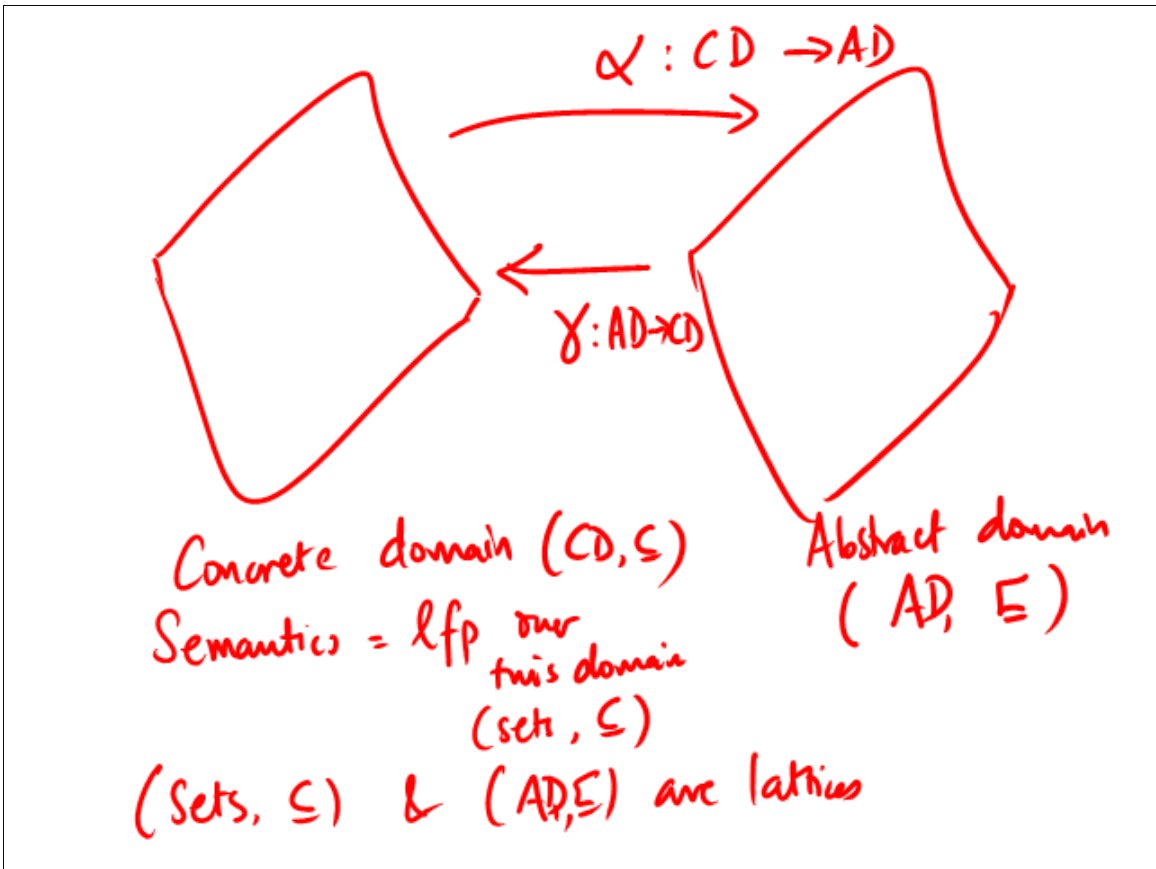
input i;
j := 0
while (i > 0) {
    i--;
    j++;
}

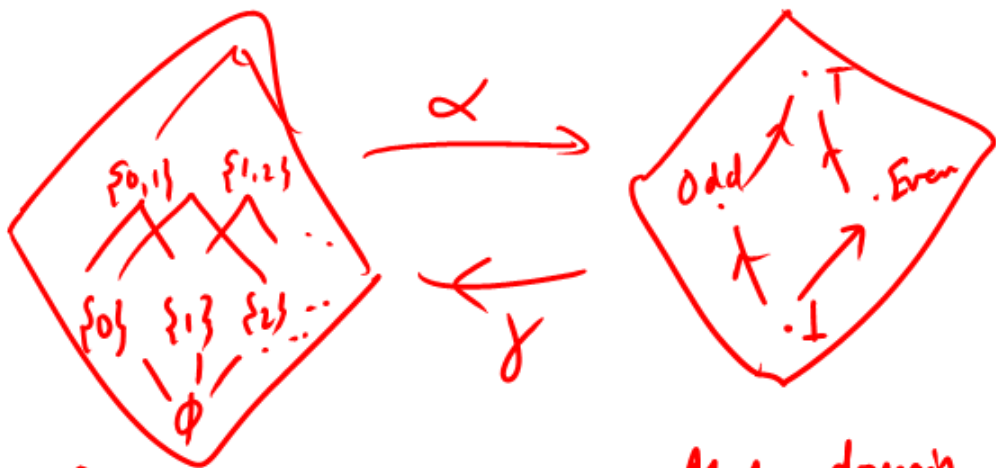
```

Domain: Sets
 Joining: Union



Since ops are monotonic
 lfp exist (Tarski)

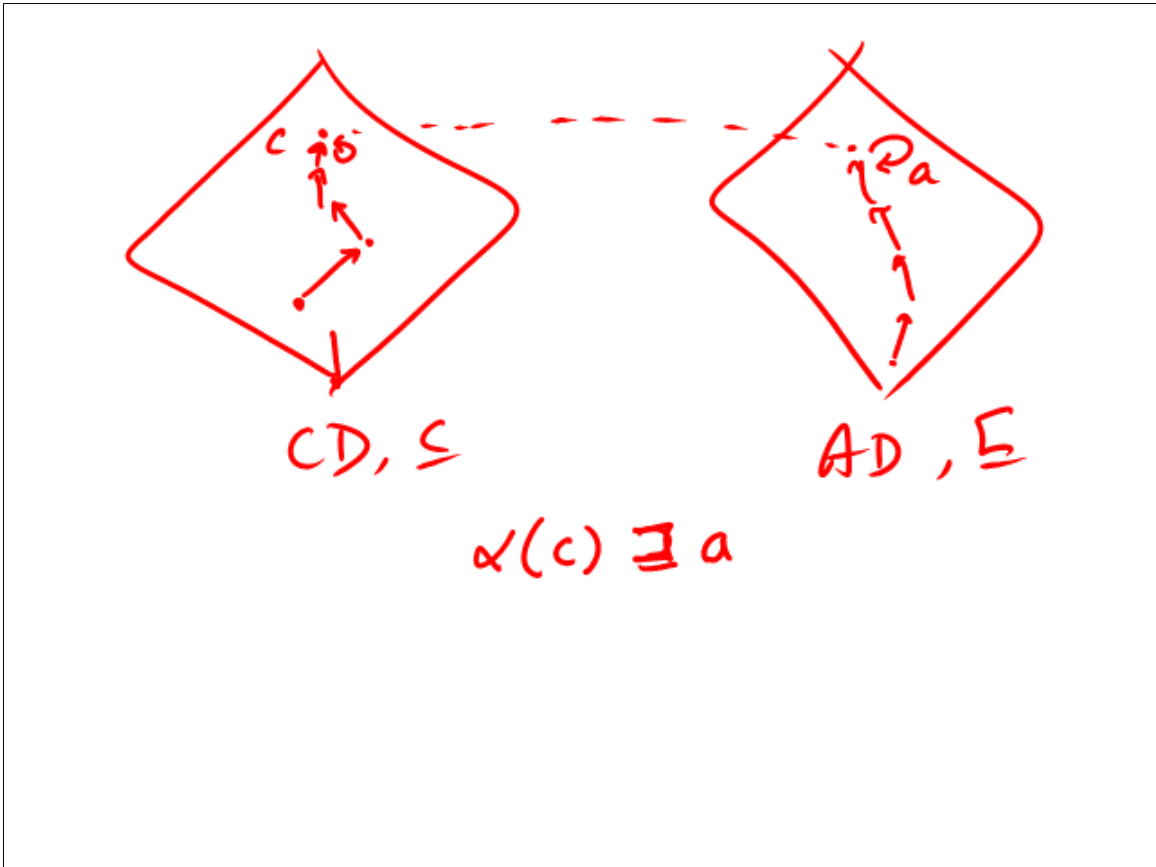


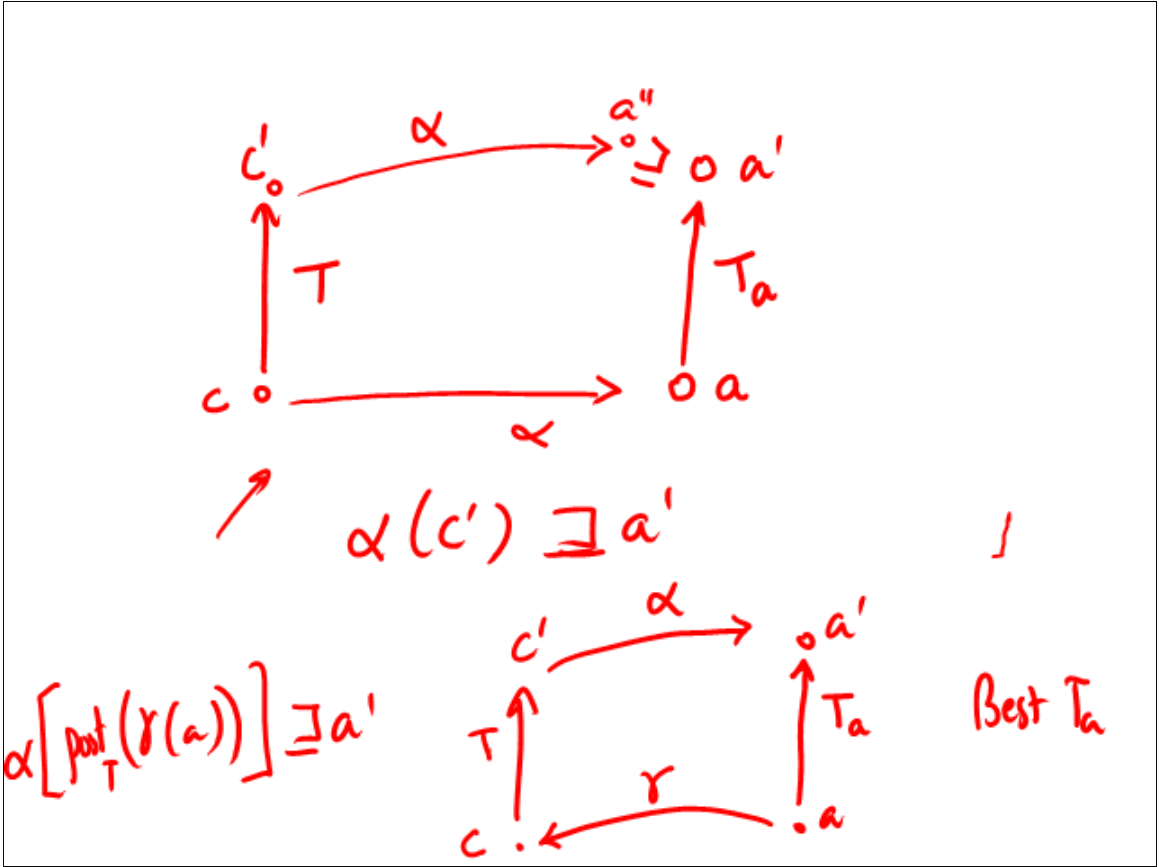


Program over an
integer var v .

Abstr domain

$$\left. \begin{array}{l}
 C \subseteq C' \Rightarrow \alpha(C) \sqsubseteq \alpha(C') \\
 a \sqsubseteq a' \Rightarrow \gamma(a) \subseteq \gamma(a') \\
 \gamma(\alpha(C)) \supseteq C \\
 \alpha(\gamma(a)) = a
 \end{array} \right\} \text{Galois connections}$$





Abstract

Interpretation:

CD lattice, AD lattice

- Galois connection: (α, γ)

between CD and AD

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