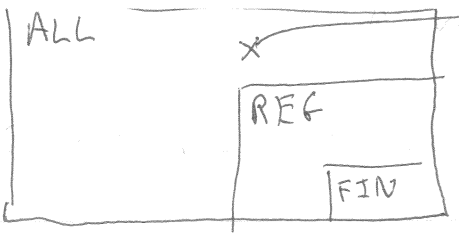
)-1



TODO

REG = languages of DFAs

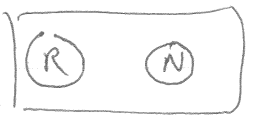
??? = languages of NFAs
NFA

TRUTH

Not Same

Not the case because DFA ⊆ NFA trivially

feels more expressive, feels easier
⇒ better



Not the case "3rd trimend"

Equivalence of DFAs & NFAs

$\overline{DFA} = \overline{NFA}$

$\Rightarrow \overline{DFA} \subseteq \overline{NFA} \wedge \overline{NFA} \subseteq \overline{DFA}$

$\Rightarrow (\forall d \in DFA.\ L(d) \in \overline{NFA}) \wedge (\forall n \in NFA.\ L(n) \in \overline{DFA})$

$\Rightarrow (\forall d \in DFA.\ \nexists n \in NFA.\ L(d) = L(n)) \wedge (\forall n \in NFA.\ \exists d \in DFA.\ L(n) = L(d))$

$\Rightarrow$ ("A compiler from DFA to NFA exists" $\wedge$ "A compile from NFA to DFA exists") $\Rightarrow$ A function from $\forall x$ to $\forall y$

$\Rightarrow$ "There is a disassembler" "There is a compiler"

$X = Y$
$\Rightarrow X \subseteq Y \wedge Y \subseteq X$

$A \subseteq B$
$\Rightarrow \forall a \in A.\ a \in B$

$x \in DFA$
$\Rightarrow \exists d \in DFA.\ L(d) = x$

5-4/

Decompiler : DFA → NFA

in: $d = (Q, \Sigma, q_0, \delta: Q \times \Sigma \to Q, F \subseteq Q)$

out: $n = (Q', \Sigma, q_0', \delta': Q' \times \Sigma \to P(Q'), F' \subseteq Q')$

$Q' = Q$

$q_0' = q_0$

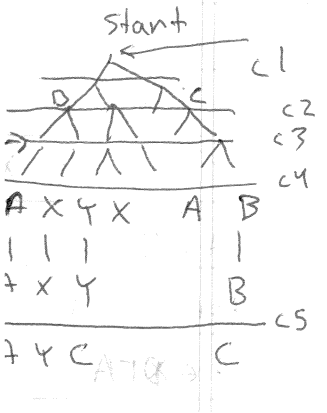
$F' = F$

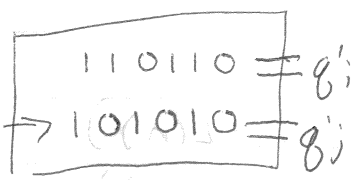
$\delta' = \quad \delta'(q_i, a) = \{ \delta(q_i, a) \}$

Compiler: NFA → DFA

in: $n = (Q, \Sigma, q_0, \delta: Q \times \Sigma \to P(Q), F \subseteq Q)$

out: $d = (Q', \Sigma, q_0', \delta': Q' \times \Sigma \to Q', F' \subseteq Q')$





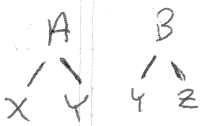
$Q' =$ bit vector of Q states $= P(Q)$

$q_0' = \{ q_0 \}$

suppose $Q = \{A, B\}$ $q_0 = A$ $F = \{B\}$

$Q' = \{ \emptyset, \{A\}, \{B\}, \{A, B\} \}$

$q_0' = \{A\}$



$F' =$ ~~$F \times Q$~~ wrong type

$\{ q_i' \in Q' \mid q_i' \cap F \neq \emptyset \}$

$F' = \{ \{B\}, \{A, B\} \}$

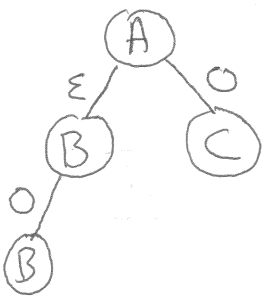
$\delta'(q_i', a) = q_j'$ ($q_i' \in Q'$, $q_j' \in Q'$)

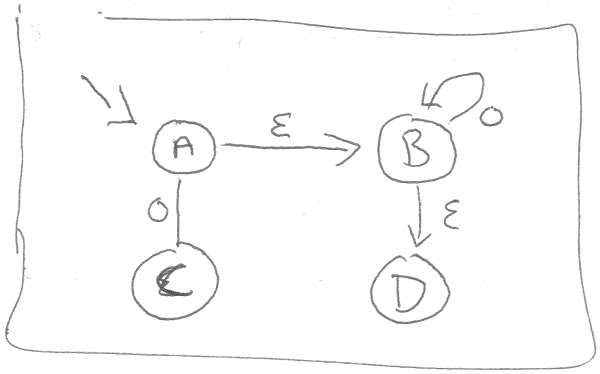
$\bigcup_{q_u \in q_i'} \delta(q_u, a)$

calculus $\sum_{i=0}^{n} i+2$

2-5

$q'_0 = \{q_0\}$





$E_0 : P(Q) \to P(Q)$ $\quad E(\{A\}) \neq \{A, B\}$

$E_0(q'_i) = \bigcup_{q_u \in q'_i} \delta(q_u, \varepsilon)$ $\quad = ABD$

$E : P(Q) \to P(Q)$ $\quad f(x) = x^2 + x$

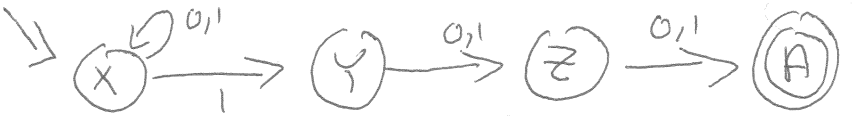
$E(q'_i) = \text{lfp of } E_0(q'_i)$ $\quad f(x) = x$

least fixed-point

real $q'_0 = E(\{q_0\})$

real $\delta'(q'_i, a) = E(\text{fake } \delta(q'_i, a))$

5-4)


0,1
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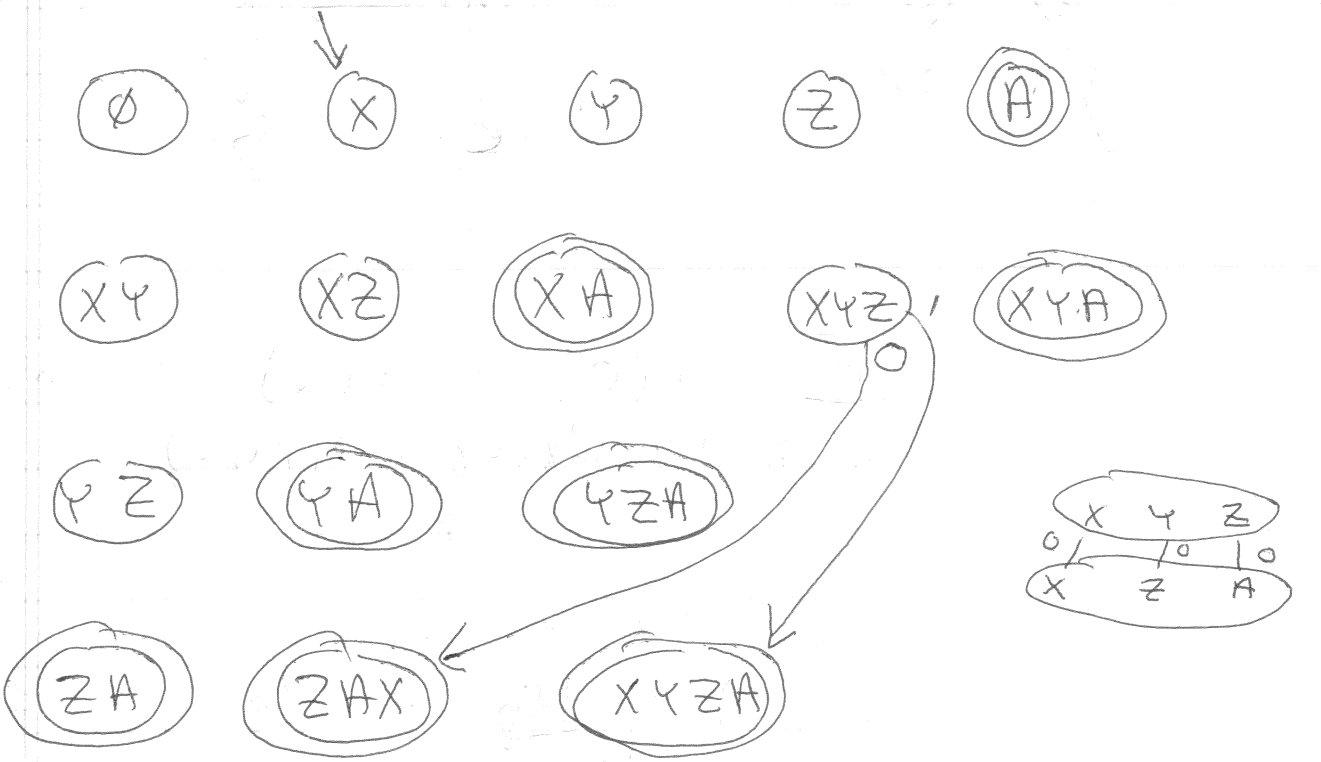
X
Y
Z
A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