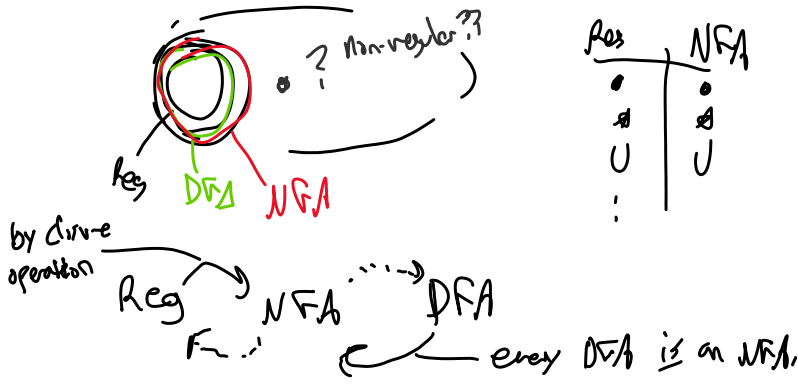


Equivalence of NFA, DFA, Reg.



NFA \rightarrow DFA

Every NFA N corresponds to some DFA D ,
 $L(N) = L(D)$.

DFA: Q ← single states
 NFA: $Q_s \subset P(Q)$ ← powerset of states
 all possible subsets.

$|P(Q)| = 2^{|Q|}$ small finite.

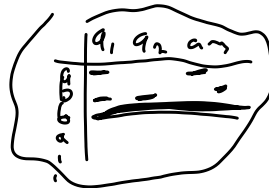
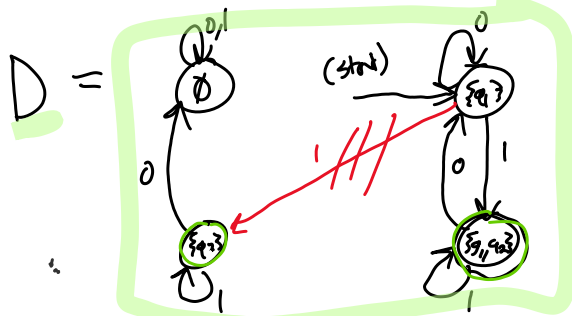
$N = (Q, \delta, s, A)$ Subset Construction

$D = (Q', \dots$

$Q' = P(Q)$



$Q' = \{ \emptyset, \{q_1\}, \{q_2\}, \{q_1, q_2\} \} = P(Q)$



A account for ϵ -transitions
 (add ϵ -reachability)

$\delta'(Q_s, a) = \bigcup \{ \delta(q, a) \mid q \in Q_s \}$

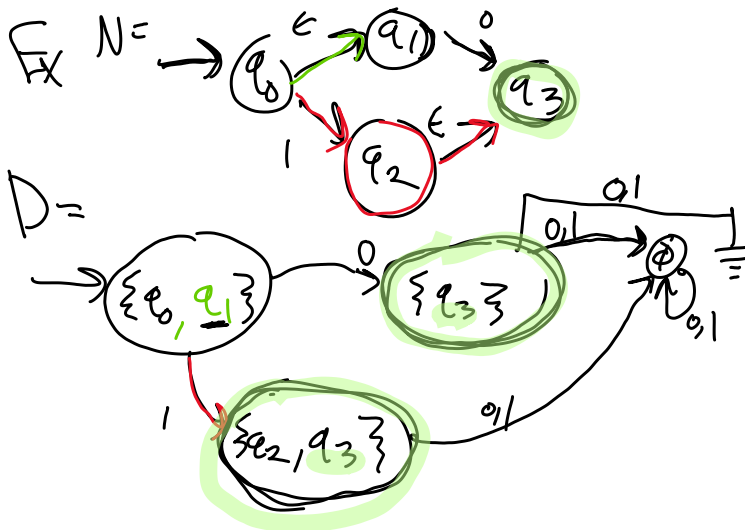
Thm: $\delta^{A'}(q, x) = \bigcup_{q \in Q_s} \left(\delta^A(q, x) \right)$

$S' = \{ S \}$

$A' = \{ q \in Q' \mid q \in A \text{ ~~for all?~~ for some? } \}$

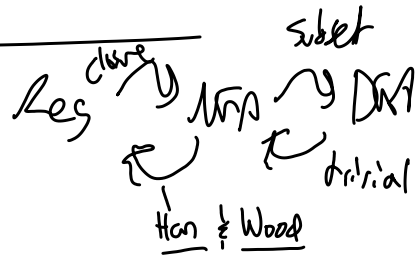
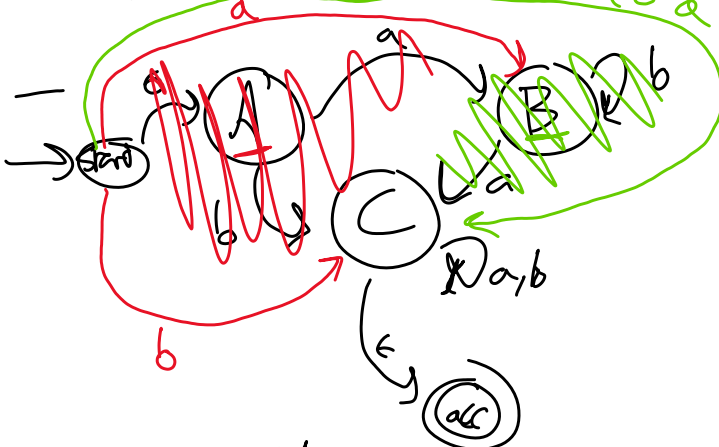
Incremental Construction.

- Only build states reachable from start state
- "on demand" subset construction.



Ham & Wood

- Hybrid NFA / regex



1. Gridiron

2. Remove states (at advice).

The image shows a handwritten mathematical expression $(a+b)(a+b)$ in black ink. Above the expression, there is a red scribble that appears to be a crossed-out $(a+b)$. The entire expression is underlined with a green line. To the right of the expression, there is a green checkmark.