NFA vs DFA

DFAs can generate any regular language.

what about NFAs?

Any DFA counts as an NFA,

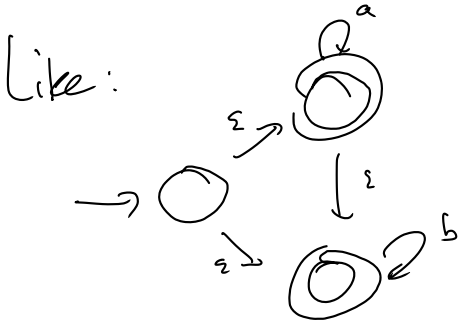
so any regular language can be generated by a NFA

Can NFAs do any nonregular languages?

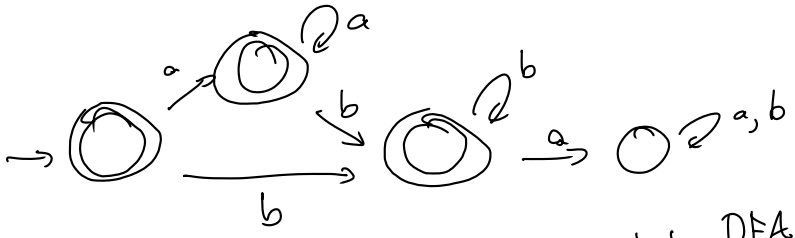
NO

there is a procedure to convert any NFA into an equivalent DFA.

Like:



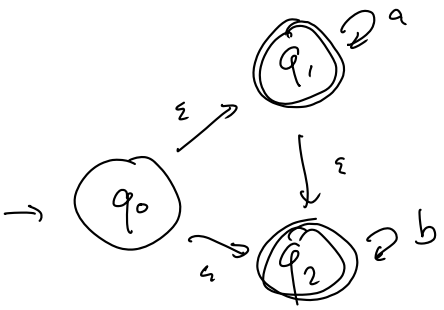
accepts: $\{ a^n b^m \mid n,m \in \mathbb{N} \}$



an equivalent DFA.

The subset construction

each state in our DFA will be a subset of states from the NFA.

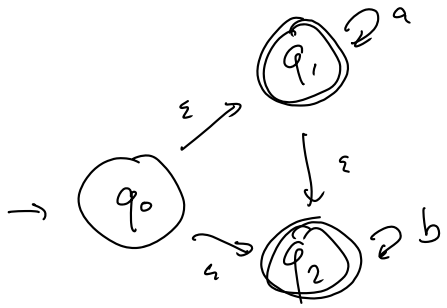


The NFA

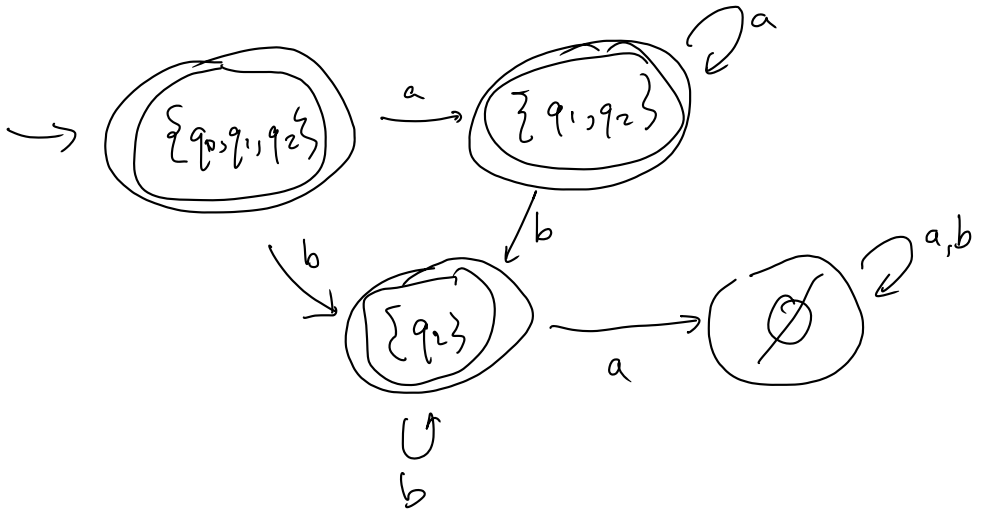
Our DFA states look like $\{q_0, q_1\}$ or $\{q_0, q_1, q_2\}$

(we'll get 2^3 subsets,)
not all are reachable.

The starting state in the subset machine is the set of: the DFA start state, together with any others which can reach by ε's.



Our starting state is $\{q_0, q_1, q_2\}$



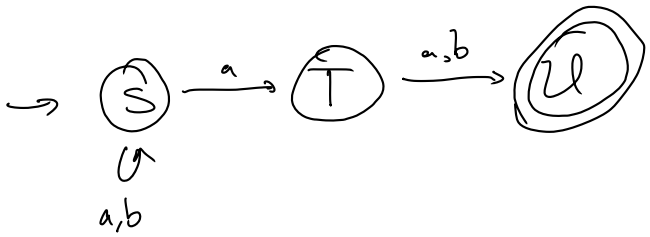
For each arrow, we find all possible states reachable from our current subset using the appropriate letter, possibly with ε's.

The accepting states are any subsets containing original NFA accepting states.

An n-element set has 2^n possible subsets.

$S = \{a, b, c\}$

$\emptyset$	$\{a, b\}$
$\{a\}$	$\{a, c\}$
$\{b\}$	$\{b, c\}$
$\{c\}$	$\{a, b, c\}$



Let's make an equivalent DFA.