Equivalence of NFA and DFA

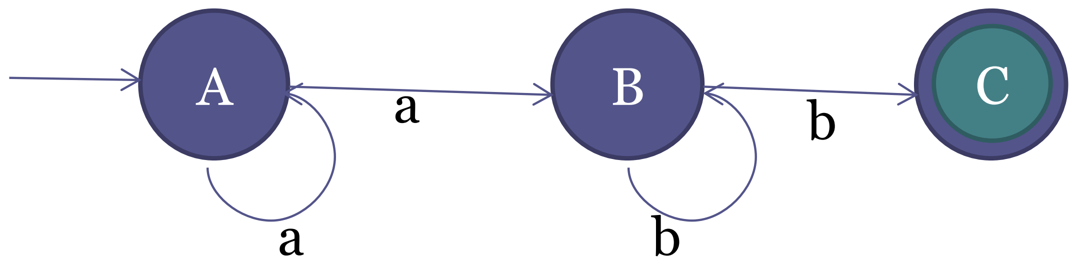
- NFA is equivalent to DFA
- Both NFA and DFA accepts regular language
- **Language accepting power / computation power of NFA and DFA is same**
- How?
- 1. DFA is NFA we know
- Convert NFA to DFA

NFA to DFA Conversion

- Theorem
- If L is a set accepted by an NFA M then L can be accepted by a DFA M'.
- **Proof by construction – Subset Construction Method**
- Given NFA $M=(Q,\sum,\delta,q_0,F)$
- Construct DFA $M'=(Q',\sum,\delta',q_0',F')$
- $Q'=2^Q$
- $q_0'=[q_0]$
- F' corresponds to all subsets of Q having at least one final state of M
- δ': $\delta'([q1,q2,\ldots qk],a)=[\delta(q1,a) \cup \delta(q2,a) \ldots \delta(qk,a)]$

NFA to DFA Conversion

State Transition Diagram



δ’: δ’([q1,q2,…qk],a)=[δ(q1,a)Uδ(q2,a)… δ(qk,a)]

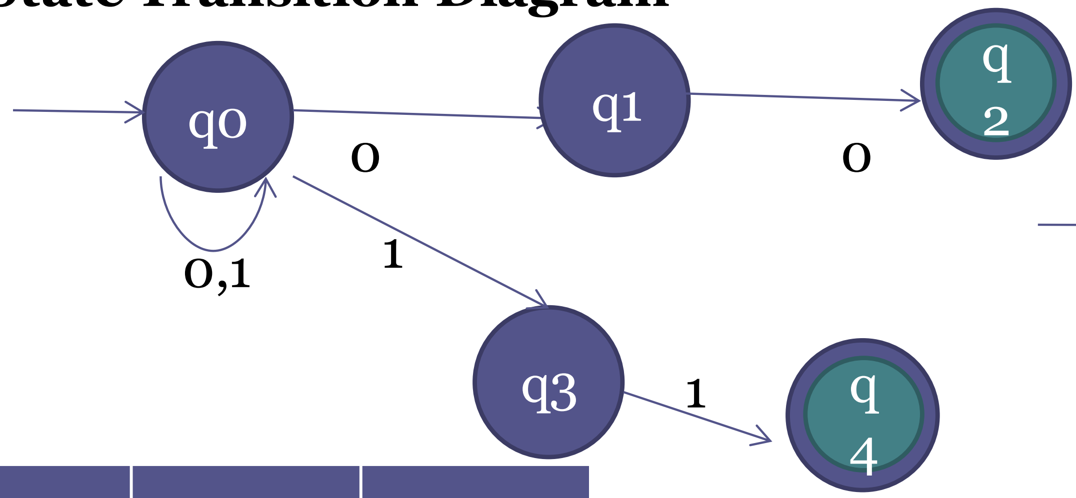
State Transition Table

δ	a	b
A	{A.B}	Φ
B	Φ	{B,C}
C	Φ	Φ

δ'	a	b
[A]	[A.B]	Φ
[A,B]	[A,B]	[B,C]
[B,C]	Φ	[B,C]
Φ	Φ	Φ

NFA to DFA Conversion

State Transition Diagram



δ	0	1
q0	{q0,q1}	{q0,q3}
q1	{q2}	Φ
q2	Φ	Φ
q3	Φ	{q4}
q4	Φ	Φ

δ'	0	1
q0	q0q1	q0q3
q0q1	q0q1q2	q0q3
q0q3	q0q1	q0q3q4
q0q1q2	q0q1q2	q0q3
q0q3q4	q0q1	q0q3q4