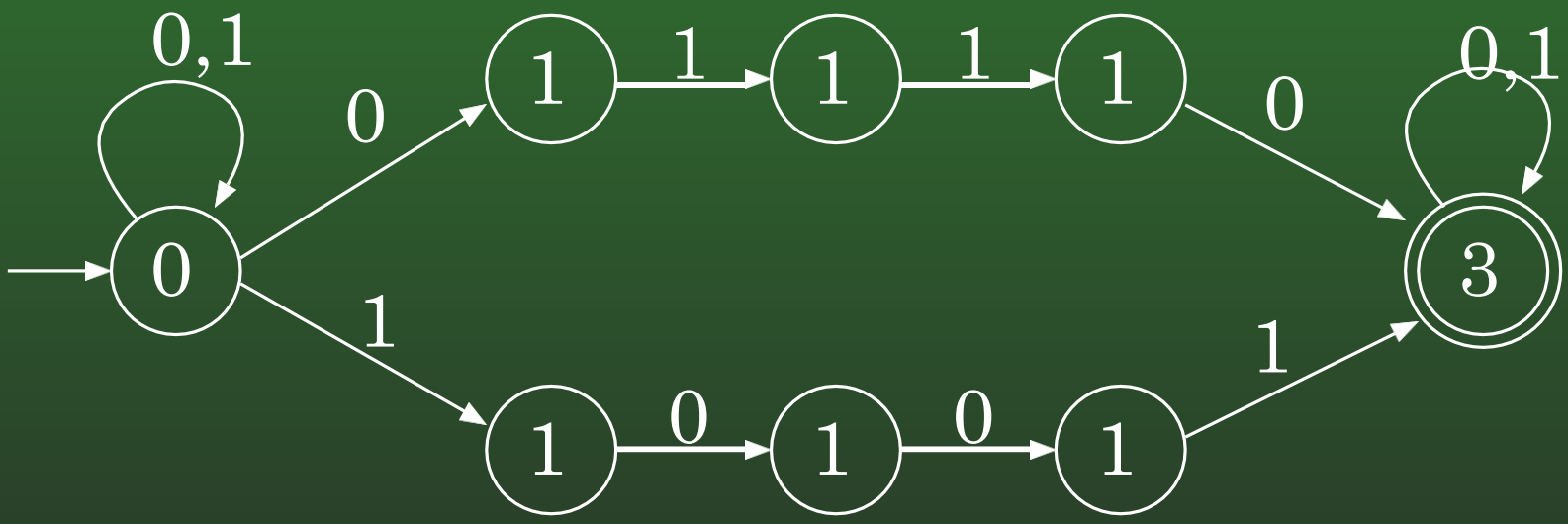
Deterministic Finite Automata vs. Non-Deterministic Finite Automata

NFA

Create an NFA for:

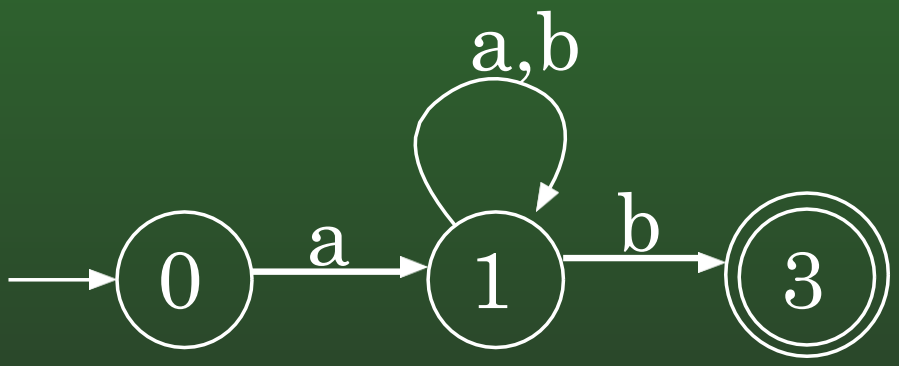
- All strings over {0, 1} that contian 0110 or 1001



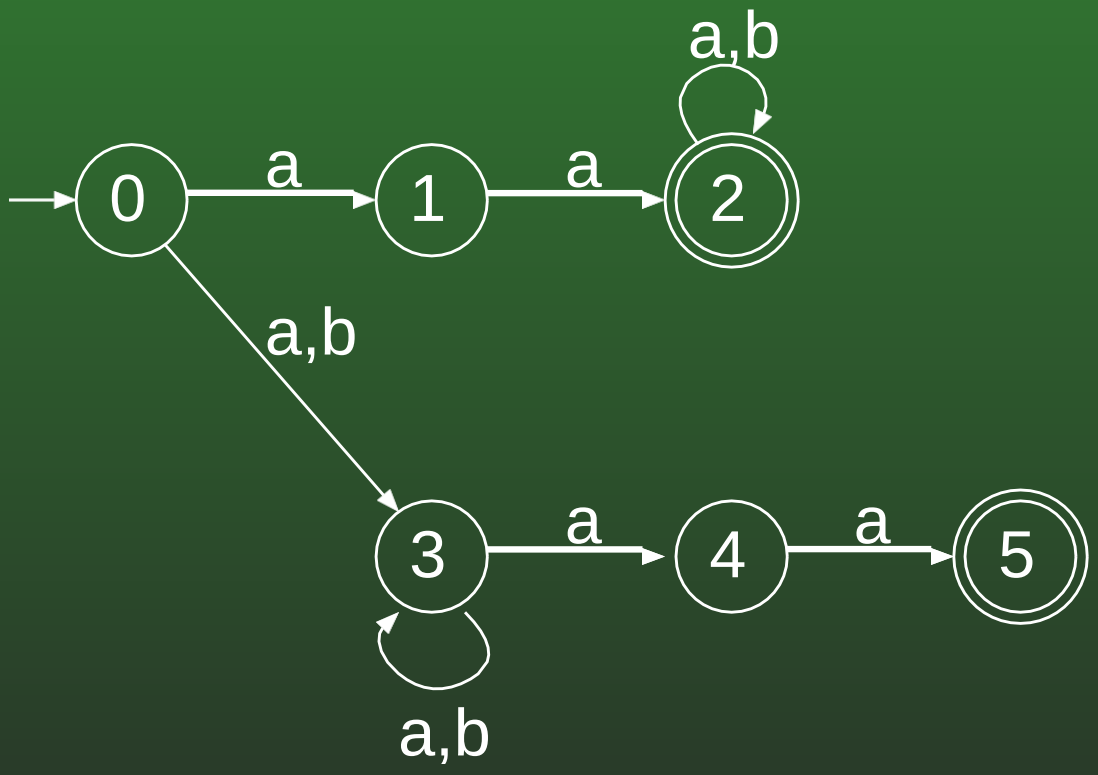
NFA

Create an NFA for:

- All strings over {a, b} that start with a and end with b

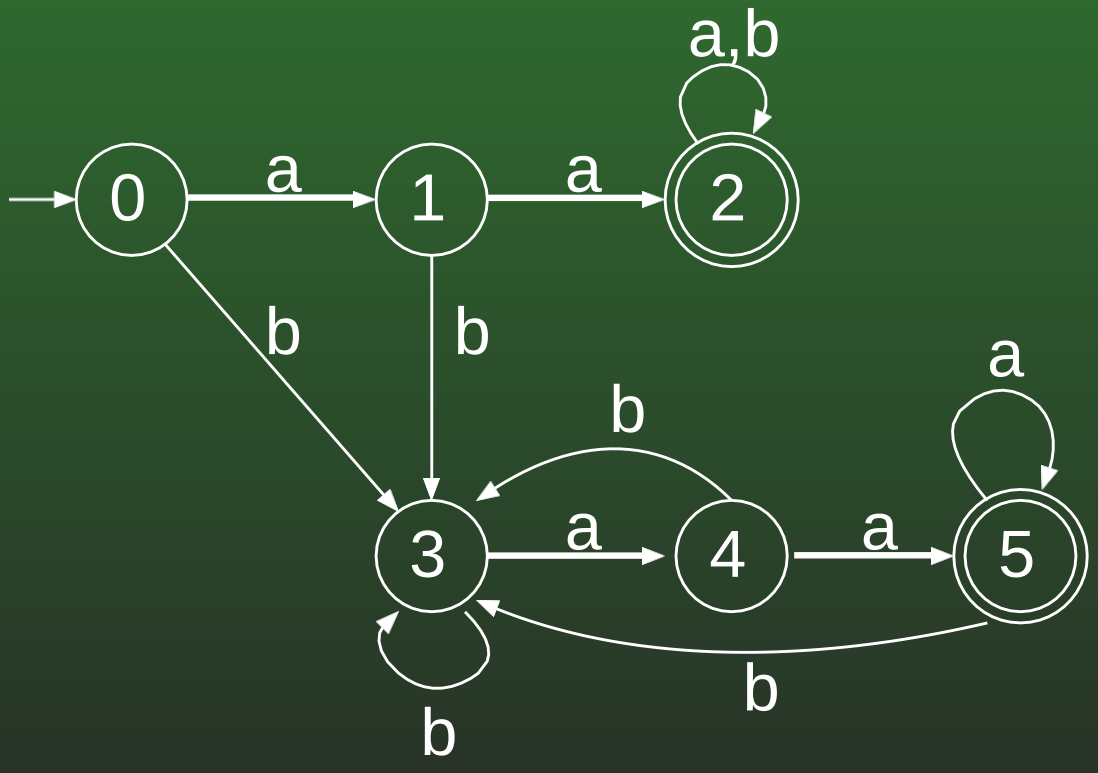


- All strings over {a,b} that begin or end with aa



NFA → DFA

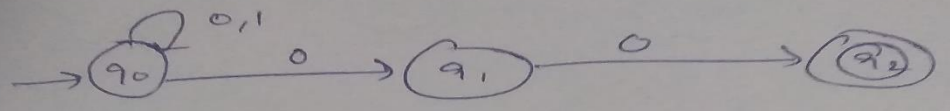
- Can we create a DFA for the same langauge?
- All strings over {a,b} that begin or end with aa



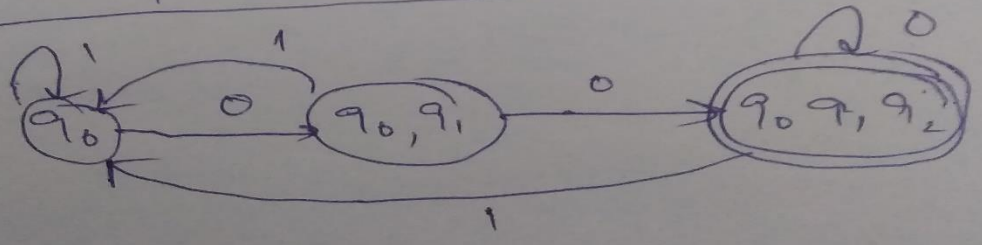
L_{NFA} vs L_{DFA}

- What is the relationship between L_{NFA} and L_{DFA}?
  - $L_{DFA} \subseteq L_{NFA} \wedge L_{NFA} \subseteq L_{NFA} (L_{NFA} = L_{DFA})$
- Given any NFA M, we *can* create a DFA M' such that $L[M] = L[M']$

Create a NFA over $\Sigma\{0,1\}$ that accep
all strings ends with '00' and conve

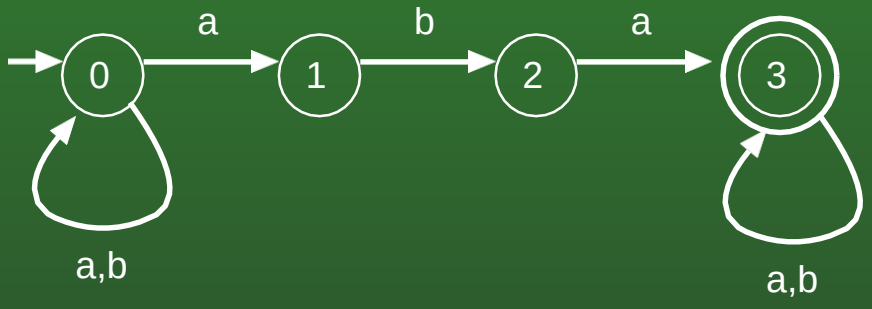


	0	1
q_0	$[q_0 q_1]$	$[q_0]$
$[q_0 q_1]$	$[q_0 q_1 q_2]$	$[q_0]$
$[q_0 q_1 q_2]$	$[q_0 q_1 q_2]$	$[q_0]$



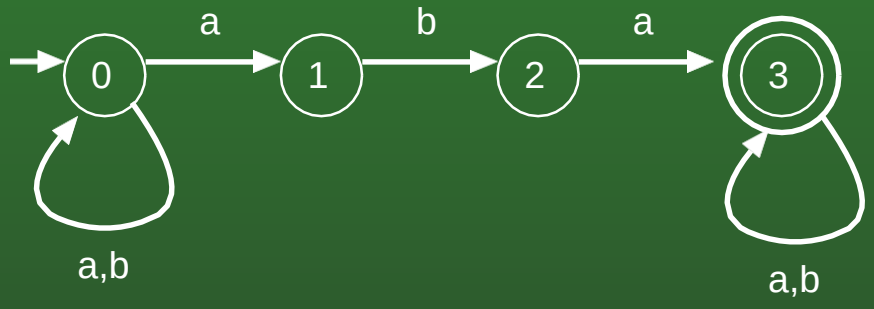
NFA → DFA

- NFA for all strings over {a,b} containing aba

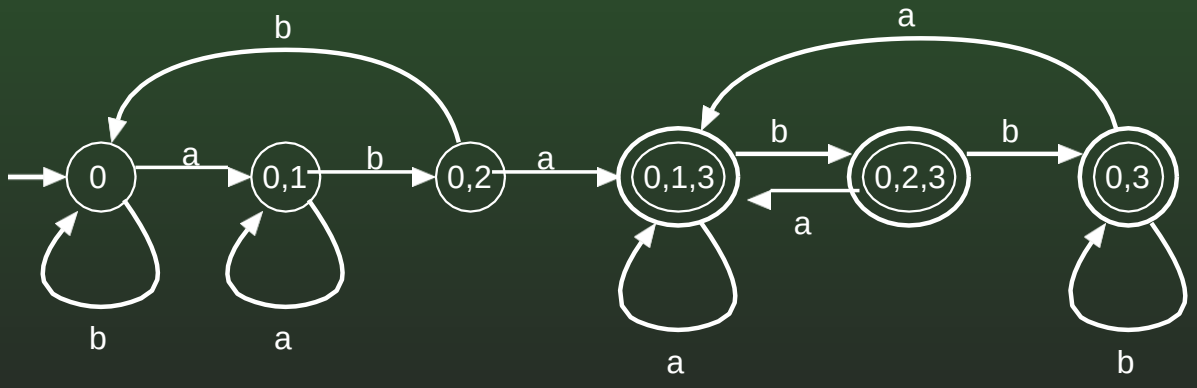


NFA → DFA

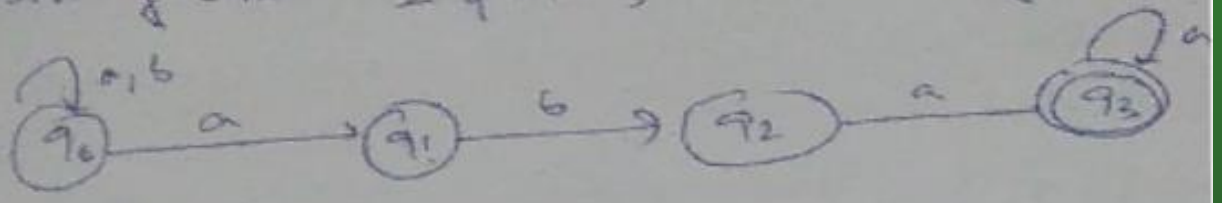
- NFA for all strings over {a,b} containing aba



- Build Equivalent DFA



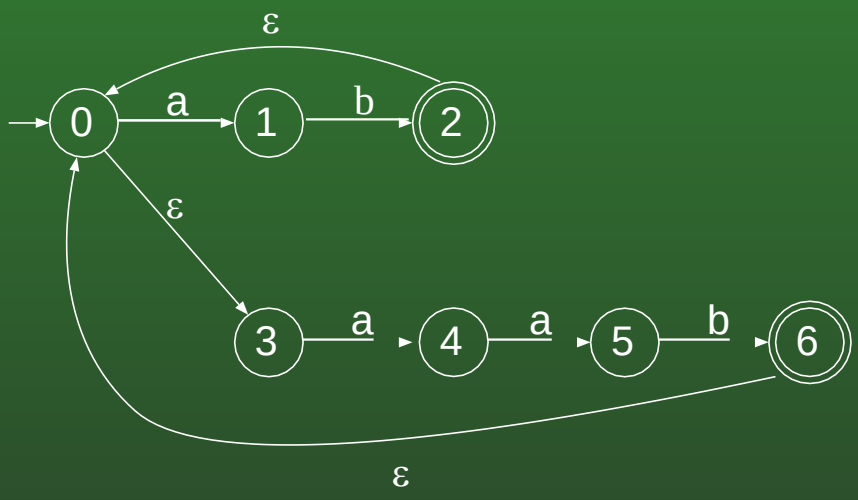
Create DFA that accepts all string over $\Sigma = \{a, b\}$ with substring 'aba'



	a	b
q_0	q_0q_1	q_0
q_0q_1	q_0q_1	q_0q_2
q_0q_2	$q_0q_1q_3$	q_0
$q_0q_1q_3$	$q_0q_1q_3$	$q_0q_2q_3$
$q_0q_2q_3$	$q_0q_1q_3$	q_0q_3
q_0q_3	$q_0q_1q_3$	q_0q_3

NFA with ε

- What about - ε transitions?



$\delta : (Q \times \{\Sigma \cup \varepsilon\}) \rightarrow P(Q)$

Any FA with ε transitions is always NFA
DFA can never have ε transitions

Minimization of DFA

Example:

Fig 2.16

Solution:

Step 1:

First states are divided into final states group and non-final state group.

Step 2:

Now the i/p is applied on the states

Step 3:

Again group the similar states as another group.

Step 4:

Repeat step 2 and 3 until we get the similar group.

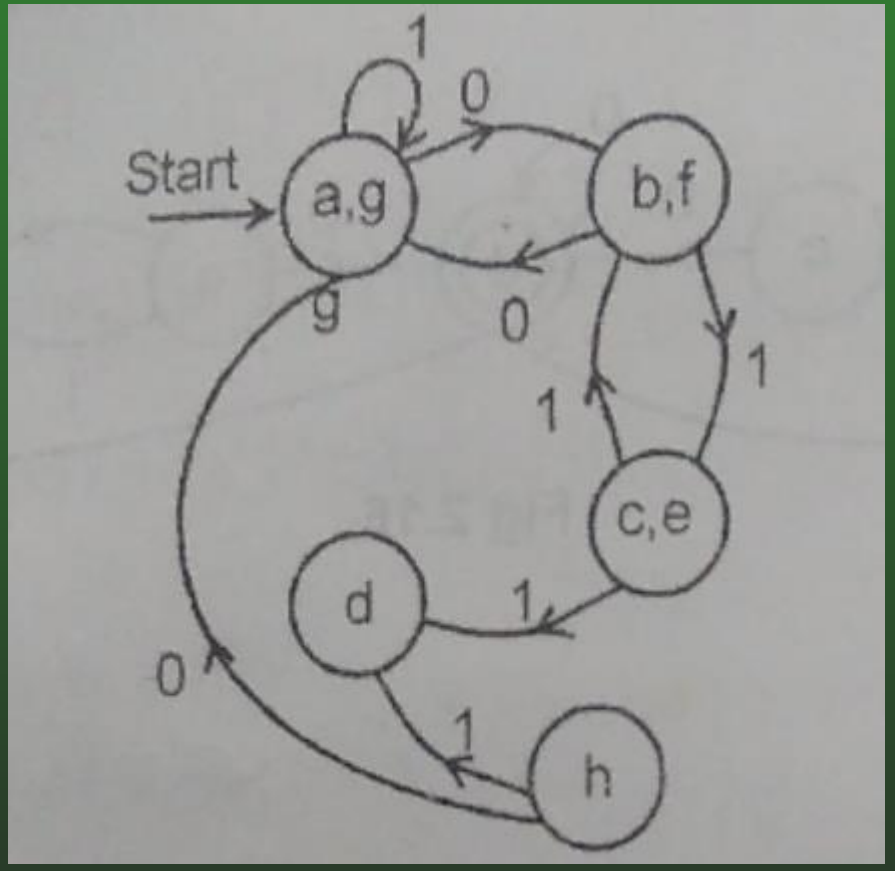
Step 1. G0 (a, b, c, d, e, f, g, h)

Step 2. G01 (a, b, c, e, f, g, h)
G02 (d)

Step 3. G011 (a, b, g, f)
G012 (c, e)
G02 (d) G013 (h)

Step 4. G0111 (a, g)
G0112 (b, f)
G012 (c, e)
G02 (d) G013 (h)

Step 5. G0111 (a, g)
G0112 (b, f)
G012 (c, e)
G02 (d) G013 (h)



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Step 3. G011 (a, b, g, f)
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