CS310

Nondeterministic Finite Automata

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Example (1.30)

- Accept string of at least length three that contains a 1 in the third from end

$$\Sigma = \{0,1\}; \Sigma^* 1(0 \cup 1)(0 \cup 1)$$

What makes this difficult for a DFA?

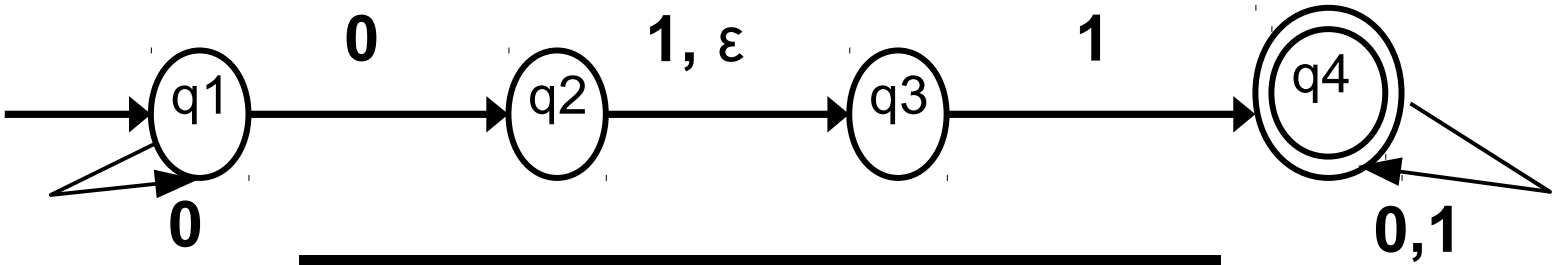
Equivalent DFA takes 8 states. Why 8?

Formal Definition of NFA

- 5 tuple (Q,Σ, δ , q_0,F)

$$\Sigma_\varepsilon = \Sigma \cup \{e\}$$

$$\delta : Q \times \Sigma_\varepsilon \to P(Q)$$



	0	1	ε
q1	{q1.q2}	ø	ø
q2	ø	{q3}	{q3}
q3	ø	{q4}	ø
	0	**1**	**ε**

Formal Definition of Computing for NFA

- Given a machine M= $(Q, \sum, \delta, q_0, F)$ and a string $w=w_1w_2\ldots w_n$ over $\sum$, then M ***accepts*** w

if there exists a sequence of states $r_0, r_1 \ldots r_n$ in Q such that:

- $r_0 = q_0$
- $\delta (r_i, w_{i+1}) = r_{i+1}$,i=0,…,n-1
- $r_n \epsilon F$

Practice

- Construct a NFA with three states that recognizes {w | w ends with two 0s}

$\Sigma = \{0,1\}$

Practice

- Construct a NFA with six states

  {w | w even # 0s OR exactly two 1s}

$\Sigma = \{0,1\}$

Practice

- Construct a NFA with three states

  0*1*0*0

$\Sigma = \{0,1\}$