CS310

Nondeterministic Finite Automata

Sections:1.2 page 47

September 8, 2014

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?

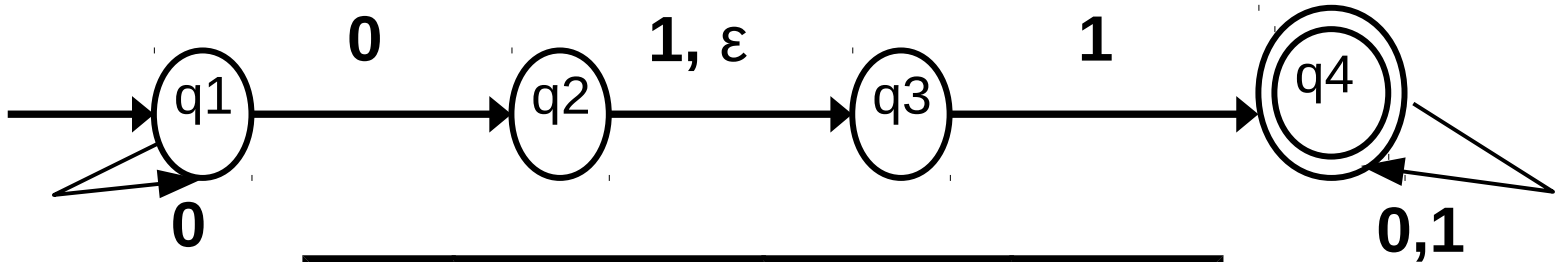
Equivalent DFA takes 8 states. Why 8?

Formal Definition of NFA

- 5 tuple (Q,Σ, δ , q_0,F)

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

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



	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:

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

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

  $\{w \mid w$ even # 0s OR exactly two 1s$\}$

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

Practice

- Construct a NFA with three states

  0*1*0*0

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