

# CS321 - Homework 2

October 15, 2013

## Section 2.2

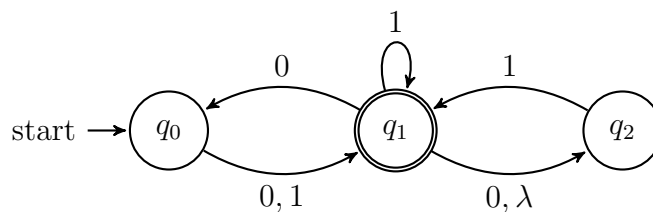
**6** For the nfa in Figure 2.9, find  $\delta^*(q_0, 1010)$  and  $\delta^*(q_1, 00)$ .

**7** Design an NFA with no more than five states for the set  
 $\{abab^n : n \geq 0\} \cup \{aba^n : n \geq 0\}$ .

**10(a)** Find an NFA with three states that accepts the language

$$L = \{a^n : n \geq 1\} \cup \{b^m a^k : m \geq 0, k \geq 0\}.$$

**12** Which of the strings 00, 01001, 10010, 000, 0000 are accepted by the following nfa?



**14** Let  $L$  be the language accepted by the nfa in Figure 2.8. Find an nfa that accepts  $L \cup \{a^5\}$ .

**18** Consider the following modification of Definition 2.6. An nfa with multiple initial states is defined by the quintuple

$$M = (Q, \Sigma, \delta, Q_0, F),$$

where  $Q_0 \subseteq Q$  is a set of possible initial states. The language accepted by such an automaton is defined as

$$L(M) = \{w : \delta^*(q_0, w) \text{ contains } q_f, \text{ for any } q_0 \in Q_0, q_f \in F\}.$$

Show that for every ufa with multiple initial states there exists an nfa with a single initial state that accepts the same language.

## Section 2.3

- 6 Is it true that for every nfa  $M = (Q, \Sigma, \delta, q_0, F)$  the complement of  $L(M)$  is equal to the set  $\{w \in \Sigma^*, \delta^*(q_0, w) \cap (Q - F) \neq \emptyset\}$ ? If so, prove it; if not, give a counterexample.