Exercises week 2

Formal languages, grammars, and machines

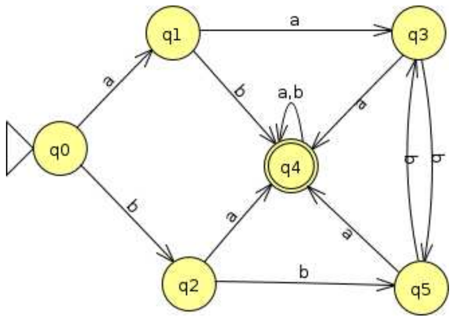
26 april, 2012

2. Regular languages, Finite Automata

2.1.

Let a DFA M be given by

Describe the words accepted by M.



2.2. Let $e = a^*(baa^*)^*b?$, where $b? = (b \cup \lambda)$, and $L = L(e)$.
(i) Show that $baab \in L$ by writing out the definition of $L(e)$.
(ii) Show that $abba \notin L$ by writing out the definition of $L(e)$.

2.3. Let M be the deterministic finite automaton (DFA) given by

$$\langle Q, \Sigma, \delta, q_0, F \rangle$$

with $\Sigma = \{a, b, c\}$, $Q = \{q_0, q_A, q_B, q_C\}$, δ given by the table

δ	q_0	q_A	q_B	q_C
a	q_A	q_0	q_C	q_B
b	q_B	q_C	q_0	q_A
c	q_C	q_B	q_A	q_0

and $F = \{q_0\}$.
(i) Make a state transition diagram for M.
(ii) Determine for the following words whether they belong to $L(M)$: $abba, baab, bac, cac$.
(iii) Define a non-deterministic finite automaton (NFA) M' modifying M by changing δ into the following δ'.

δ'	q_0	q_A	q_B	q_C
a	$\{q_B, q_C\}$	$\emptyset$	$\{q_0, q_C\}$	$\{q_0, q_B\}$
b	$\{q_A, q_C\}$	$\{q_0, q_C\}$	$\emptyset$	$\{q_0, q_A\}$
c	$\{q_A, q_B\}$	$\{q_0, q_B\}$	$\{q_0, q_A\}$	$\emptyset$

(iv) Determine for the following words whether they belong to $L(M')$: $abba, baab, bac, cac$.

2.3*. (i) Show $L(M) \neq L(M')$ with M, M' as in Exercise 2.
(ii) Construct a FDA M'' with $L(M) = L(M'')$.