Automata & Formal Languages

Homework 4 – Non-Deterministic Finite Automata

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1. (a) Figure 1 shows an NFA without ε transitions or multiple start states which identifies the language $\{\varepsilon\}$.

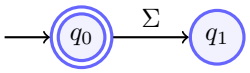

Figure 1: NFA for question 1a

(b) Figure 2 shows an NFA which accepts the language of words over {a,b} that end in "abb".

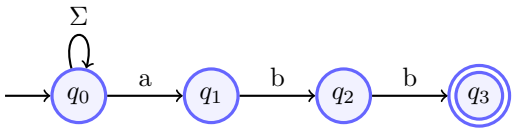

Figure 2: NFA for question 1b

(c) Figure 3 shows an NFA which accepts the language of words over $\Sigma = \{a, b\}$ that contain "aa" or that have an odd number of "b"s.

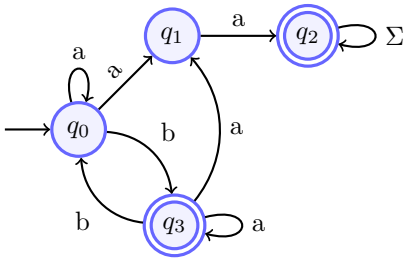

Figure 3: NFA for question 1c

2. Figure 4 shows a conversion of the NFA in figure 3 into a DFA. Table 1 shows a table which we can use to aid us in the construction of the DFA.

New label	Current state	Transition on a	Transition on b
r_0	$\{q_0\}$	$\{q_0, q_1\}$	$\{q_3\}$
r_1	$\{q_0, q_1\}$	$\{q_0, q_1, q_2\}$	$\{q_3\}$
r_2	$\{q_3\}$	$\{q_1, q_3\}$	$\{q_0\}$
r_3	$\{q_0, q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_2, q_3\}$
r_4	$\{q_1, q_3\}$	$\{q_1, q_2, q_3\}$	$\{q_0\}$
r_5	$\{q_2, q_3\}$	$\{q_1, q_2, q_3\}$	$\{q_0, q_2\}$
r_6	$\{q_1, q_2, q_3\}$	$\{q_1, q_2, q_3\}$	$\{q_0, q_2\}$
r_7	$\{q_0, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_2, q_3\}$

Table 1: A table to translate the NFA in figure 3 to the DFA in figure 4

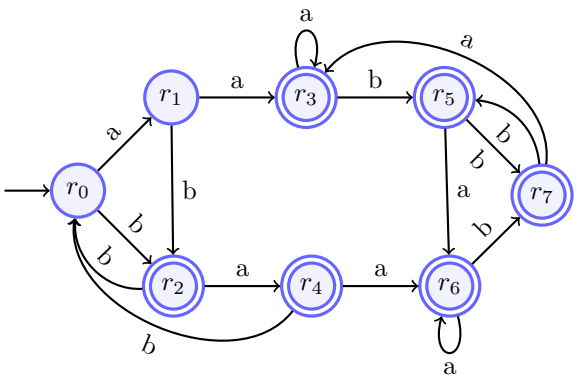

Figure 4: A DFA equivalent to the automata in figure 3