ICCS310: Assignment 3

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1: NFA vs. DFA Expressiveness

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(1) For every $k \geq 1$, there is an NFA with $k+1$ states that recognizes C_k.

Proof: Suppose

(2) If M is a DFA that correctly recognizes C_k, then M has at least 2^k states.

Proof:

2: Regular or Not

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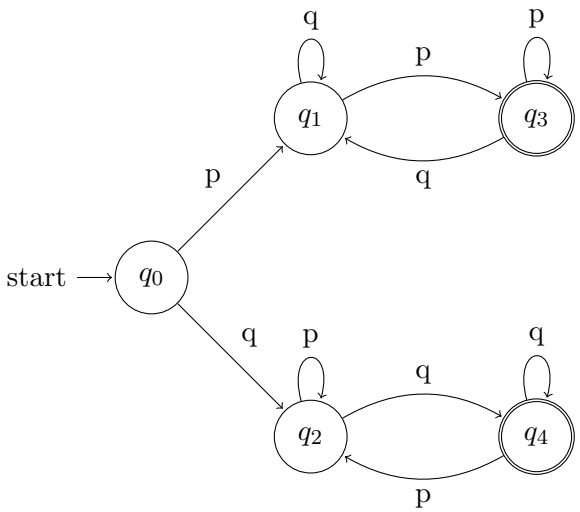
(1) $L_1 = \{xyx^R | x, y \in \Sigma^*, x \neq \varepsilon\}$

Proof:



S_0 represents the state where first character is not known.
S_1 represents the state where first character is p.
S_2 represents the state where first character is q.
S_3 represents the state where last character is p, accepted.
S_4 represents the state where last character is q, accepted.

The idea is that we do not care what is the given y, we only care what character starts first and that character must be the ending character since the reverse of px is xp and qx is xq where $x \in \Sigma^*$.

(2) $L_2 = \{xyx^R | x \in \Sigma^*, x \neq \varepsilon\}$

Proof:

3: Nonregular

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(1) $L = \{10^{n^2} | n \geq 0\}$

Proof:

(2) $E = \{0^i x | i \geq 0\, x \in \{0,1\}^*, \text{and } |x| \leq i\}$

Proof:

4: HackerRank Challenge

My username is Possawat2017. All problems solved.