
NFA/DFA Practice

Sept 12, 2014

Practice, DFA or NFA

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

- $\{ w \mid w \text{ contains an odd number of 0s and an even number of 1s} \}$
 - Provide a description of what each state represents
- $\{ w \mid w \text{ does not contain the substring } 01 \}$
 - Provide a description of what each state represents
- $\{ w \mid w \text{ ends with a different symbol than } w \text{ begins with} \}$
 - Provide a description of what each state represents

Practice, DFA or NFA

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

- $\{ w \mid w \text{ contains (both 00 and 11) or (neither 00 and 11)} \}$
 - Provide a description of what each state represents
- $\{ w \mid w \text{ contains either 01 or contains 10} \}$
 - Provide a description of what each state represents
- $\{ w \mid w \text{ ends with a different symbol than } w \text{ begins with } \}$
 - Provide a description of what each state represents

From Sipser, page 88

1.32 Let

$$\Sigma_3 = \left\{ \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \dots, \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \right\}.$$

Σ_3 contains all size 3 columns of 0s and 1s. A string of symbols in Σ_3 gives three rows of 0s and 1s. Consider each row to be a binary number and let

$$B = \{w \in \Sigma_3^* \mid \text{the bottom row of } w \text{ is the sum of the top two rows}\}.$$

For example,

$$\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \in B, \quad \text{but} \quad \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \notin B.$$

Show that B is regular. (Hint: Working with $B^{\mathcal{R}}$ is easier. You may assume the result claimed in Problem 1.31.)