Automata Exercises

Tasks for 4.11.2014

Task 1 Construct a DFA for the language

$$L = \{w \in \{0,1\}^* \mid w \text{ begins with a 1 and ends with a 0}\}.$$

Task 2 Construct a DFA for the language

$$L = \{w \in \{a,b,c\}^* \mid \text{ the number of } a\text{'s and } b\text{'s in } w \text{ is divisible by 3}\}.$$

Task 3 Construct a DFA for the language

$$L = \{w \in \{a,b\}^* \mid w \text{ has at least three } a\text{'s and at least two } b\text{'s}\}.$$

Note that this language is an intersection of two languages.

Task 4 Construct an NFA for the language given by the regular expression

$$(a \cup b)^* aabab$$

Task 5 Construct a DFA for the language from Task 6.

Task 6 Let L be the language of all strings over $\{0,1\}$ that do not contain a pair of 1's that are separated by an odd number of symbols. Give the state diagram of a DFA with 5 states that recognizes L.

Task 7 Let L be a regular language, $L \subseteq \Sigma^*$. Show that the reversed language of L defined as

$$L^R = \{w \in \Sigma^* \mid w^R \in L\}$$

where reversed words are defined inductively by

$$\varepsilon^R = \varepsilon, (ua)^R = au^R \text{ for } a \in \Sigma, u \in \Sigma^*$$

is regular as well.

Hint: From an automaton for L, construct an automaton for L^R.

Task 8 Construct an NFA for the language given by the regular expression

$$(baa^*)(baa^*)^*(abb^*)$$

Task 9 Construct a DFA for the language from Task 8.