Finite Automata Theory and Formal Languages
TMV027/DIT321

Regular Expressions

Exercise 3

In these exercises, book sections, exercise numbers and pages refer to those in the third edition of the course book.

General hint: In some cases it may be easier to first compute a NFA, and then compute the regular expression from this NFA.

Basic exercises

1. Let $\Sigma = \{a, b\}$.
   (a) Give one regular expression for the set of words containing an even number of a's and one for the set of words containing an odd number of a's.
   (b) Give one regular expression for strings with even length and one for strings whose length is a multiple of 3.
   (c) Give a regular expression for the strings that do not contain the substring aa.
2. Use both methods explained in class (elimination of states and system of linear equations) to compute the regular expression for the automata in exercises 3.2.1 and 3.2.2.
3. Do exercise 3.2.4.

Additional exercises

1. Simplify each of the following regular expressions:
   $\epsilon + ab + abab(ab)^*$
   $aa(b^* + a) + a(ab^* + aa)$
   $a(a + b)^* + aa(a + b)^* + aaa(a + b)^*$
2. Do exercises 3.1.1, 3.1.2, 3.1.4 and 3.1.5.
3. Do exercises 3.2.3, 3.2.5 and 3.2.6.
4. Do exercises 3.4.1, 3.4.2 and 3.4.3.