

Week 9 Workshop

0. Constructing DFAs

For each of the following, construct a DFA for the specified language.

(a) Strings of a 's and b 's with odd length ($\Sigma = \{a, b\}$).

(b) Strings with an even number of a 's ($\Sigma = \{a, b\}$).

(c) Strings with an odd number of b 's ($\Sigma = \{a, b\}$).

(d) Strings with an even number of a 's or an odd number of b 's ($\Sigma = \{a, b\}$).

1. Constructing DFAs 2

Using the alphabet $\Sigma = \{0, 1, 2, 3, 4, 5\}$, define the language L as follows. If x is a string from Σ^* with characters x_0, \dots, x_n , then $x \in L$ iff: for every i between 0 and n , if x_i is an odd digit, then $x_k > x_i$ for every $k > i$. For example, if one of the digits is a 3, every digit after it must be a 4 or higher.

(a) List 3 strings in L and 3 strings from Σ^* not in L .

(b) Construct a regular expression for the language L .

(c) Construct a CFG for the language L .

(d) Construct a DFA for the language L .

2. NFAs 1

(a) Construct an NFA for the language "all binary strings ending in either 011 or 110".

(b) Construct an equivalent DFA for the same language.

3. NFAs 2

- (a) Construct an NFA for the language "all strings from the alphabet $\Sigma = \{0, 1, 2\}$ containing only 0's and 1's, and at most one 1".
For instance, the strings 0000, 0010, 1000, 0, 1, and ϵ should be accepted. The strings 0101, 2, 000020, 102000, 011, should be rejected.

- (b) Construct an NFA for the language "all binary strings that have a 1 as one of the last three digits".