

Exercises for FLL, Fall 2017, sheet 3

Return Thu Oct 19, in class

Exercise 1. Is the language $L = \{w \in \{0, 1\}^* \mid w \text{ contains an equal number of 0's and 1's}\}$ regular? Prove your answer.

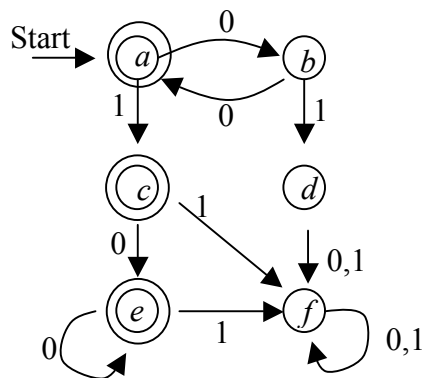
Exercise 1a [a little more tricky, optional]. Prove that the language $L = \{0^n \mid n = pq \text{ for two primes } p, q\}$ is not regular.

Exercise 2. Prove or disprove the following conjecture:

Let M be some regular language over $\Sigma = \{0, 1\}$. Define $L_{|M|} = \{0^n \in \{0\}^* \mid n = |v| \text{ for some word } v \in M\}$. Then $L_{|M|}$ is regular.

Note: this is easy to solve using the tool of language homomorphisms. It is also possible to solve this problem without homomorphisms, also not difficult.

Exercise 3. Minimize the DFA shown in the figure by using the table filling method. Deliverables: the filling table, the set of states of the minimal DFA, and a graph representation of the minimal DFA.



New states: $\{a\}$, $\{b\}$, $\{c,d\}$, $\{e,f\}$

Exercise 4. Let L be a regular language specified by a DFA, NFA, ϵ -NFA, or regexp. Show that it is decidable whether $L = \Sigma^k$ for some $k > 0$.