

FU08 - Automata and Languages

Exercise 3

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Question 1: Answer the following question

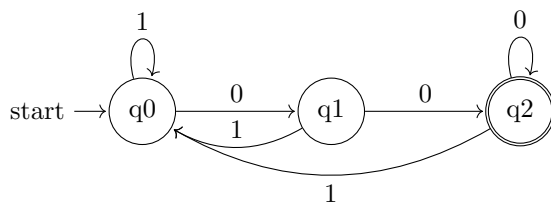
Give DFAs accepting the following languages
(Over the alphabet $\{0,1\}$):

- The language of all strings ending in 00.
- The language of all strings with three consecutive 0's.

Solution:

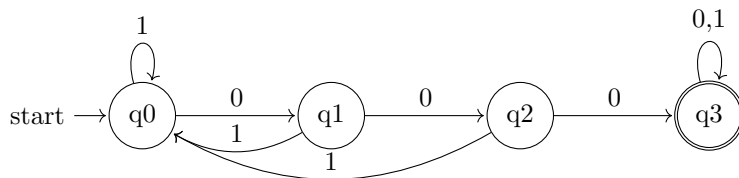
a. State definition:

- q_0 : The string does not contain anything, waiting for input.
- q_1 : The string ends in 0.
- q_2 : The string ends in 00. $q_2 \in \mathbb{F}$



b. State definition:

- q_0 : The string does not contain anything, waiting for input.
- q_1 : The string contains 0.
- q_2 : The string contains 00 (consecutively).
- q_3 : The string contains 000 (consecutively). $q_3 \in \mathbb{F}$



Question 2: Answer the following question

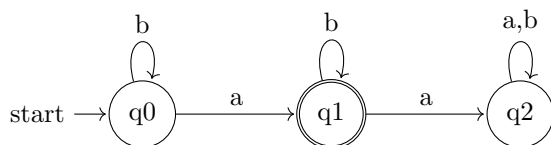
For $\Sigma = \{a, b\}$, construct DFAs accepting the following languages:

- The language of all strings with exactly one a.
- The language of all strings with at least one a.
- The language of all strings with no more than three a's.

Solution:

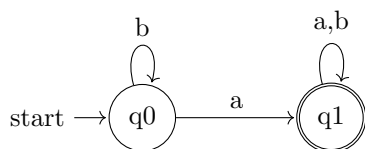
a. State definition:

- q_0 : The string does not contain anything, waiting for input.
- q_1 : The string contains exactly one a. $q_1 \in \mathbb{F}$
- q_2 : The string contains more than one a.



b. State definition:

- q_0 : The string does not contain anything, waiting for input.
- q_1 : The string contains 0. $q_1 \in \mathbb{F}$



c. State definition:

- q_0 : The string does not contain anything, waiting for input. $q_0 \in \mathbb{F}$
- q_1 : The string contains one a. $q_1 \in \mathbb{F}$
- q_2 : The string contains two a's. $q_2 \in \mathbb{F}$
- q_3 : The string contains three a's. $q_3 \in \mathbb{F}$
- q_4 : The string contains more than three a's.

