

Project 2

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September 14th, 2023

Let an FSA, M be defined as follows:

$$Q = \{q_1, q_2, q_3\}$$

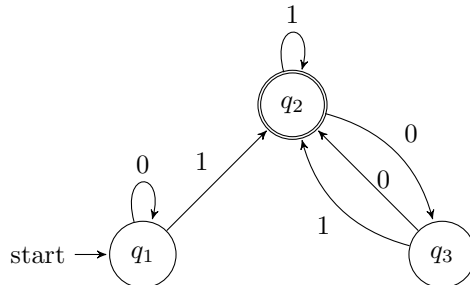
$$\Sigma = 0, 1$$

$$F = q_2$$

$$q_s = q_1$$

$$\delta = \begin{array}{c|cc} & 0 & 1 \\ \hline q_1 & q_1 & q_2 \\ q_2 & q_3 & q_2 \\ q_3 & q_2 & q_2 \end{array}$$

1 Draw M using nodes and arcs.



2 Characterize $L(M)$ in words, the more formal the better.

The language $L(M)$ can be characterized as any string built from the characters $\{0, 1\}$ containing at least one 1, and ending with either a 1 or an even number of 0s.

$$L(M) = \{s \mid s \text{ ends with a 1 or 00}\}$$

The formal description of a DFA M_1 is:

$$Q = \{q_1, q_2, q_3, q_4, q_5\}$$

$$\Sigma = \{u, d\}$$

δ : is described in the table below

$$q_s = q_3$$

$$F = \{q_3\}$$

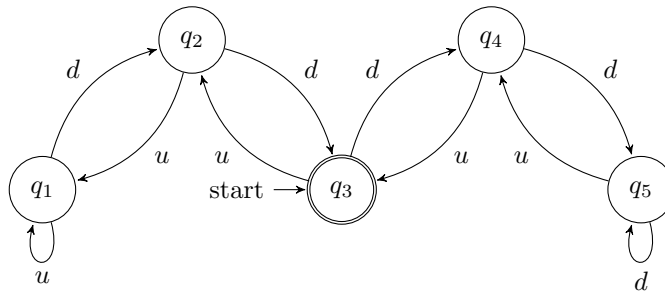
Here is δ :

	u	d
q_1	q_1	q_2
q_2	q_1	q_3
q_3	q_2	q_4
q_4	q_3	q_5
q_5	q_4	q_5

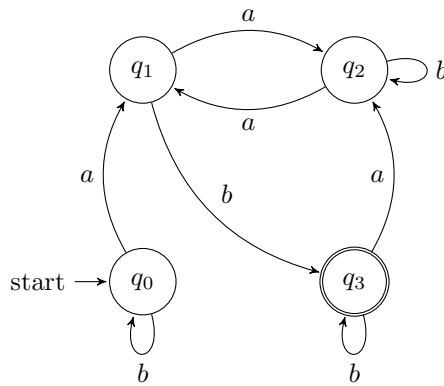
3 Why is F a set, whereas q_s is not?

F is a set because it is all the accept states where as q_s is the start state and in an FSA there is only one start stat but there can be multiple accept states.

4 Give the state diagram of M_1

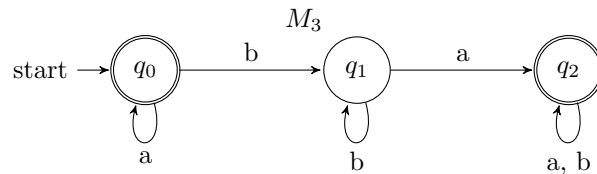


- 5 Suppose we have a machine, M_2 , an DFA, whose alphabet is $\{a, b\}$. Suppose further that $L(M_2) = \{w \mid w \text{ has an odd number of the symbol } a \text{ and ends with the symbol } b\}$. Give the state diagram of M_2



- 6 Suppose we have a machine, M_3 , a DFA, whose alphabet is $\{a, b\}$. Suppose further that $L(M_3) = \{w \mid w \text{ is not in } a^*b^*\}$. $L(M_3)$ is the complement of a simpler language. Construct the DFA for the simpler language, then use it to give the state diagram of $L(M_3)$.

$M_3 : \Sigma = a, b$
 $L(M_3) = \{w \mid w \text{ is not in } a^*b^*\}$
 $L(M_{3_0}) = \{w \mid w \text{ is in } a^*b^*\} \rightarrow \{a, b, ab, abb, aabb, \dots\}$



- 7 Suppose we have a machine, M_4 , a DFA, whose alphabet is $\{0, 1\}$. Suppose further that $L(M_4) = \{w \mid w \text{ contains an even number of 0s or contains exactly two 1s}\}$. Give the state diagram for M_4

$M_4 : \Sigma = \{0, 1\}$

$L(M_4) = \{w \mid w \text{ contains even \# of 0s of exactly 2 1s} \}$

$\{w \mid w \text{ contains even \# of 0s of exactly 2 1s} \} = \{00, 11, 00011, 0110, 11001, \dots\}$

