Automata 1/2

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Online lecture

Deterministic automata

Definition:

A ***finite automaton*** is a 5-tuple $(Q, \Sigma, \delta, q_0, F)$, where

1. Q is a finite set called the ***states***,

2. Σ is a finite set called the ***alphabet***,

3. $\delta: Q \times \Sigma \longrightarrow Q$ is the ***transition function***,

4. $q_0 \in Q$ is the ***start state***, and

5. $F \subseteq Q$ is the ***set of accept states***.

Deterministic automata

Ex:

States: q_1, q_2, q_3

Alphabet: {0, 1}

Start states: q_1

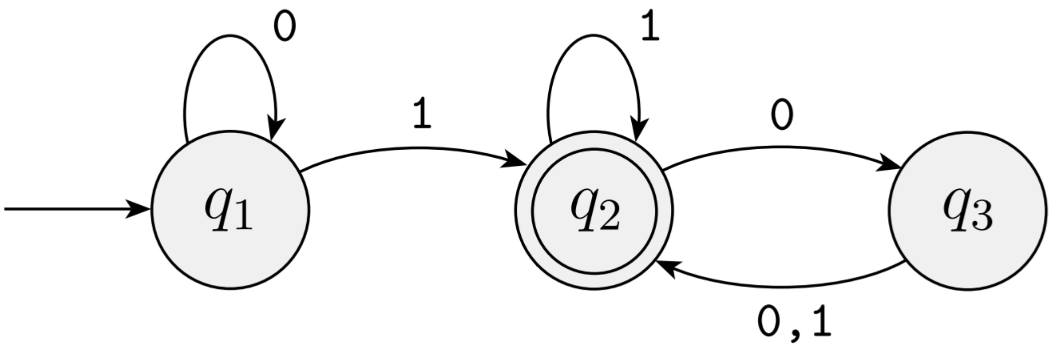
Accept states: q_2

Transition:

$\delta(q_1, 0) = q_1$ $\delta(q_1, 1) = q_2$

$\delta(q_2, 0) = q_3$ $\delta(q_2, 1) = q_2$

$\delta(q_3, 0) = q_2$ $\delta(q_3, 1) = q_2$



A deterministic finite automaton.
It does not accept, e.g., 010 but 0101

Non-deterministic automata

Definition:

A ***nondeterministic finite automaton*** is a 5-tuple $(Q, \Sigma, \delta, q_0, F)$, where

1. Q is a finite set of states,
2. Σ is a finite alphabet,
3. $\delta\colon Q \times \Sigma_\varepsilon \longrightarrow \mathcal{P}(Q)$ is the transition function,
4. $q_0 \in Q$ is the start state, and
5. $F \subseteq Q$ is the set of accept states.

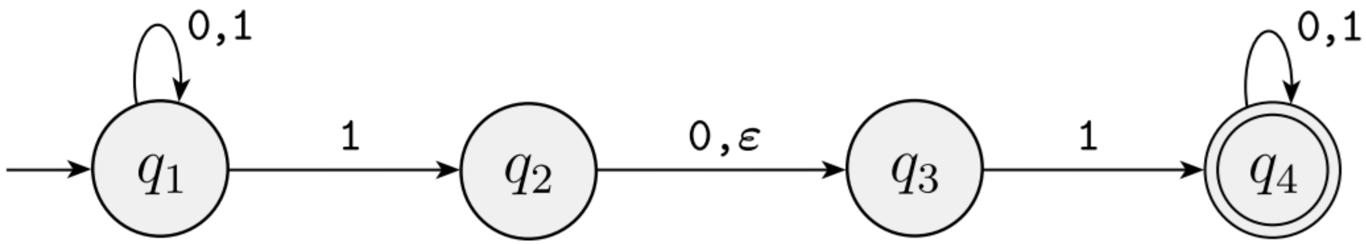
$\boxed{\Sigma \cup \{\varepsilon\}}$

ε: empty string

$\mathcal{P}(Q)$:the collection of all subsets of Q

Non-deterministic automata

Ex:



A non-deterministic finite automaton.
It does not accept 010 but 011 and 0101