3.1.2
Formal definition of DFA

Formal Tuple Notation

Definition

A deterministic finite automata (DFA) $M = (Q, \Sigma, \delta, s, A)$ is a five tuple where

- Q is a finite set whose elements are called states,
- Σ is a finite set called the input alphabet,
- $\delta : Q \times \Sigma \rightarrow Q$ is the transition function,
- $s \in Q$ is the start state,
- $A \subseteq Q$ is the set of accepting/final states.

Common alternate notation: q_0 for start state, F for final states.

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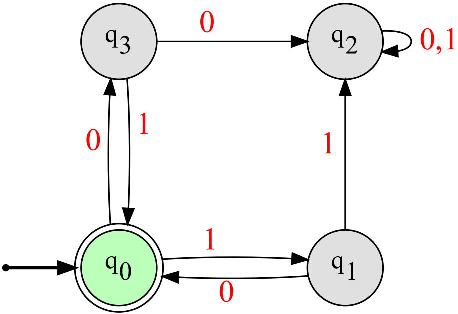
DFA Notation

$$M = \Big(\overbrace{Q}^{\text{set of all states}}, \underbrace{\Sigma}_{\text{alphabet}}, \overbrace{\delta}^{\text{transition func}}, \underbrace{s}_{\text{start state}}, \overbrace{A}^{\text{set of all accept states}} \Big)$$

Example



- $Q = \{q_0, q_1, q_1, q_3\}$
- $\Sigma = \{0, 1\}$
- δ
- $s = q_0$
- $A = \{q_0\}$

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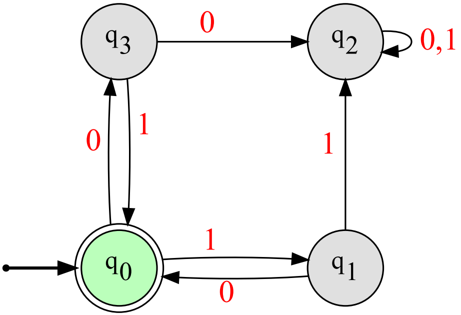

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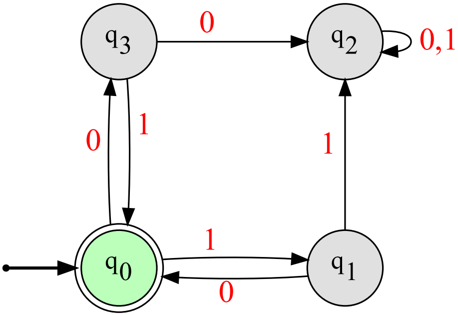

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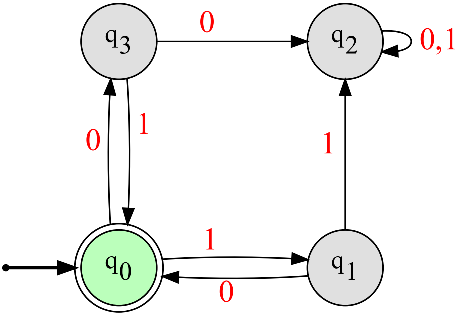

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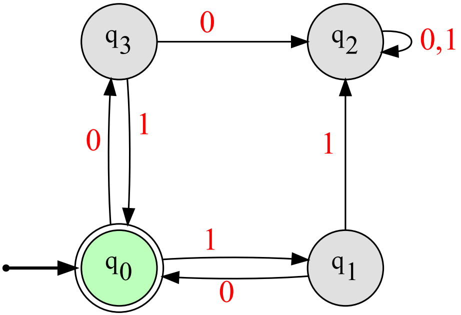

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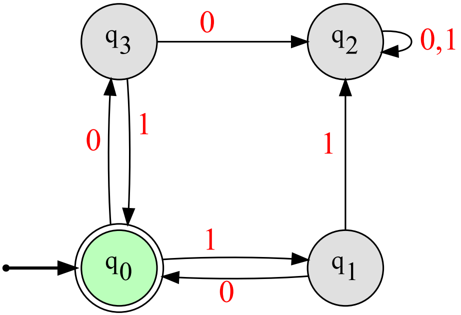

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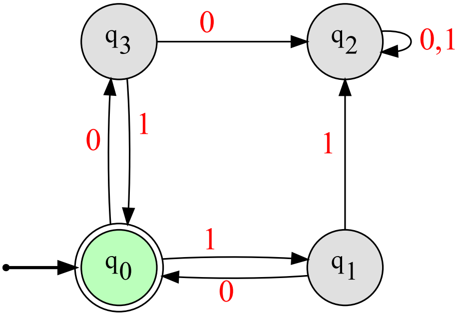

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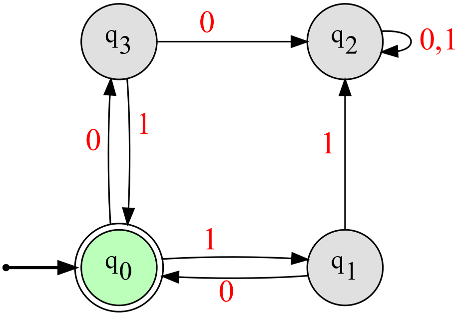

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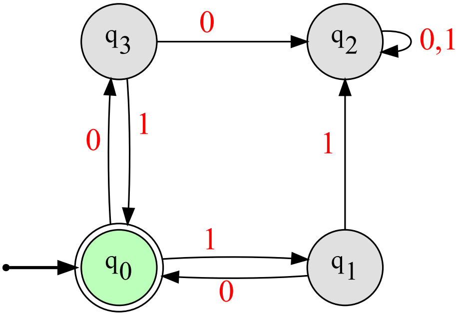

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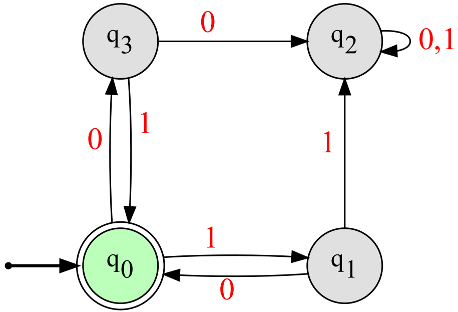
Example: The transition function



δ :

state q	input c	result $\delta(q, c)$
Q	Σ	Σ
q_0	0	q_3
q_0	1	q_1
q_1	0	q_0
q_1	1	q_2
q_2	0	q_2
q_2	1	q_2
q_3	0	q_2
q_3	1	q_0

THE END

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(for now)