Computability

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Define formally a finite automaton and the language accepted by a finite automaton. Describe a language over the alphabet $\{a, b\}$ that can be accepted by a finite automaton. Explain and justify your answer.

A Finite Automaton

$(Q, \Sigma, q_0, A, \delta)$
Q is a finite set of *states*;
Σ is a finite *input alphabet*;
$q_0 \in Q$ is the *initial* state;
$A \subseteq Q$ is the set of *accepting* states;
$\delta : Q \times \Sigma \to Q$ is the *transition* function.
For $q \in Q$ and $\sigma \in \Sigma$ then $\delta(q, \sigma)$ denotes the state transition from q on input σ.

Extended Transition Function δ^*

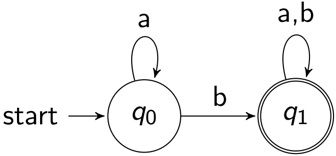
$$\delta^* : Q \times \Sigma^* \to Q$$
$$\delta^*(q, y\sigma) = \delta(\delta^*(q, y), \sigma)$$

Language accepted by a NFA

$$L(M) = \{x \in \Sigma^* \,|(\,\delta^*(q_0, x)) \in A\}$$

Example

The language over $\{a, b\}$ containing at least 1 b.



Example

$M = (Q, \Sigma, q_0, A, \delta)$
$Q = \{q_0, q_1\}$;
$\Sigma = \{a, b\}$;
$A = \{q_1\}$ and $A \subseteq Q$;

δ is given by the table:

q	$\delta(q, a)$	$\delta(q, b)$
q_0	q_0	q_1
q_1	q_1	q_1

The End