Computability

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Regular expression

Define formally a regular expression and the language generated by a regular language. Give an example of a regular expression and sketch how to construct a finite automaton accepting the same language as generated by the regular expression.

Regular Languages

If Σ is an alphabet, then the set of regular languages is defined as: $\mathcal{R}$:

1. $\emptyset \in \mathcal{R}$
2. For every $a \in \Sigma$, $\{a\} \in \mathcal{R}$
3. For any L_1 and L_2 in $\mathcal{R}$,

$$L_1 \cup L_2 \in \mathcal{R}$$

$$L_1 L_2 \in \mathcal{R}$$

$$L_1^* \in \mathcal{R}$$

Regular Expression

Regular Launguage	**Regular Expression**
$\emptyset$	$\emptyset$
$\{\Lambda\}$	Λ
$\{a\}\{a\}$, $\{aa\}$	aa
$\{a\} \cup \{a\}$, $\{a, a\}$	$a + a$
$\{a\}^*$, $a, aa, \ldots$	a^*
$\{a, b\}^*$	$(a + b)^*$

Language accepted by a FA

Let $M = (Q, \Sigma, q_0, A, \delta)$, and let $x \in \Sigma^*$.

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

M accepts L if $L = L(M)$.

Examples

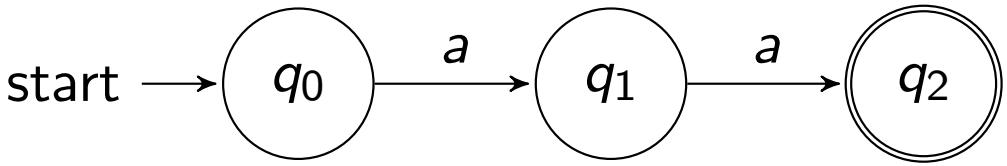

Figure: aa

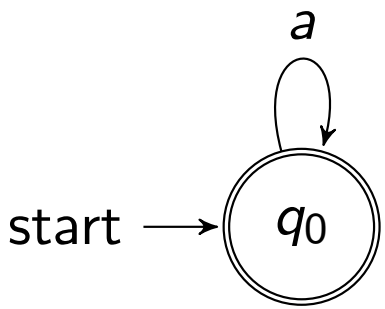

Figure: a^*

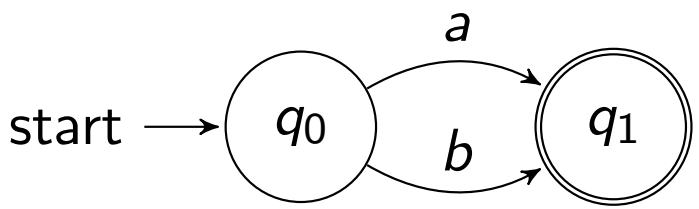

Figure: $a + b$

Examples

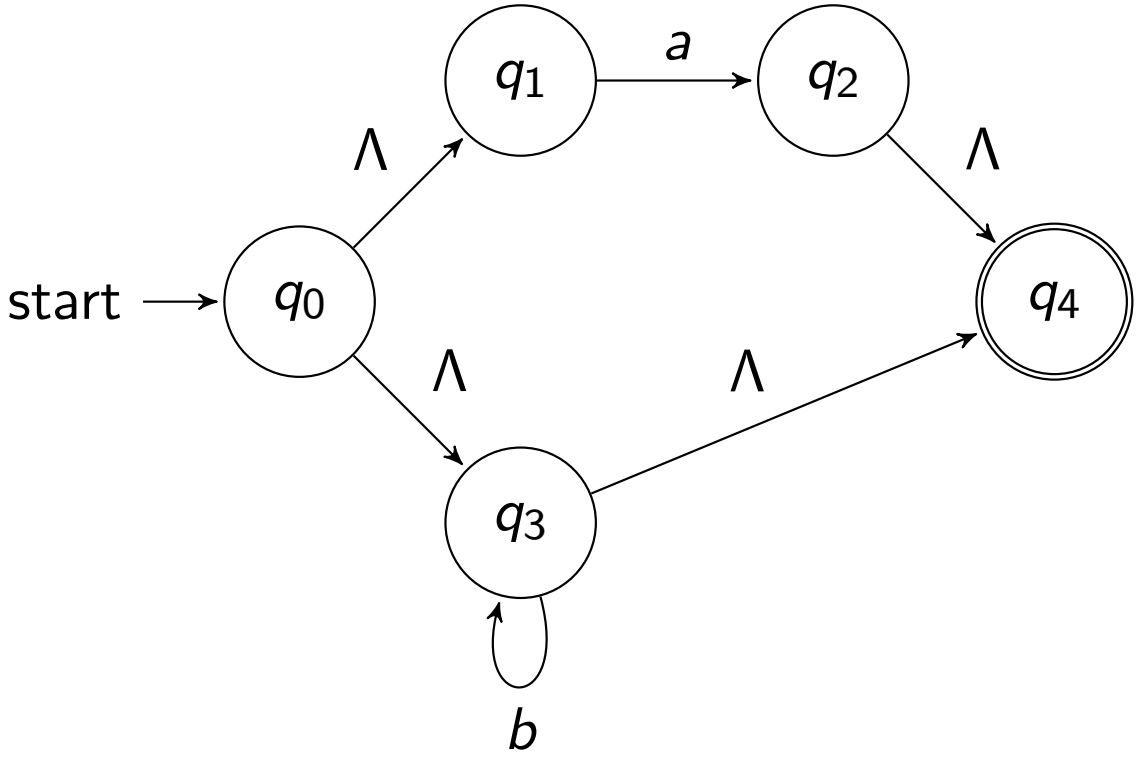

Figure: $a + b^*$

The End