Computability

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Regular languages

Define the class of regular languages. Is the complement of a regular language regular? Is the intersection between to regular languages a regular language?

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 $\mathcal{R}$,

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

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

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

Combining FAs

Suppose we have two FAs:
$M_1 = (Q_1, \Sigma, q_1, A_1, \delta_1)$
$M_2 = (Q_2, \Sigma, q_2, A_2, \delta_2)$

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Let M be a FA too:
$M = (Q, \Sigma, q, A, \delta)$

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Let M be a FA too:
$M = (Q, \Sigma, q, A, \delta)$

$Q = Q_1 \times Q_2$
$q_0 = (q_1, q2)$
$\delta((p, q), \sigma) = (\delta_1(p, \sigma), \delta_2(q, \sigma)))$

Combining FAs

$p \in Q_1$, $q \in Q_2$

$L_1 \cup L_2$: $A = \{(p, q) | p \in A_1 \text{ or } q \in A_2\}$

$L_1 \cap L_2$: $A = \{(p, q) | p \in A_1 \text{ and } q \in A_2\}$

$L_1 - L_2$: $A = \{(p, q) | p \in A_1 \text{ and } q \notin A_2\}$

The End