Intro + dfa

Tuesday, September 3, 2024 11:54 AM

Σ = [alphabet] non-empty finite set of Symbols
ex. $\Sigma = \{a, b\}$

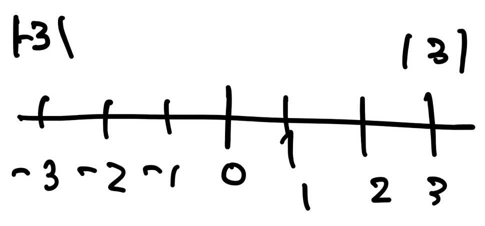
w or s = symbols from Σ concatenated [string]
ex. s = aabb

wv = [concatenation] of two strings
ex. w = aabb v = ba
wv = aabbba

not necessarily true $wv \neq vw$

w^R = [w reversed], each symbol is in reverse order
ex. w = aabb
w^R = bbaa

$|w|$ = [length] (# of) symbols of w.
ex. w = aabb
$|w| = 4$



λ = lambda = [empty string] - string w/ no symbols
$|\lambda| = 0$
$\lambda w = w\lambda = w$

w^n = [repeat] string n times
ex. w = aba
w^1 = aba
w^2 = abaaba
$w^0 = \lambda$

Σ^* = [set] of strings from concatenating zero or more symbols from Σ.
ex. $\Sigma = \{a, b\}$
$\Sigma^* = \{\lambda, a, b, aa, ab, ba, bb, aaa, \dots\}$

$\Sigma^+ = \Sigma^* - \{\lambda\}$.

~~$\Sigma^* - \lambda$~~

recap: Σ = always finite set
Σ^* = always infinite set
Σ^+ = always infinite set
$w \in \Sigma^*$ = finite in length

L = [language] = set of strings from Σ^*

ex. $L_1 = \{a, aa, aaa, aaaa\}$ $\therefore$ L_1 = finit language
$L_2 = \{\lambda, a, aa, aaa, aaaa, \dots\}$ $\therefore$ L_2 = infinite language

$L' = \Sigma^* - L$
ex. $\Sigma = \{a, b\} \Rightarrow \Sigma^* = \{\lambda, a, b, aa, ab, ba, bb, aaa, \dots\}$
$L_1 = \{\lambda, a, aa, aaa, aaaa, \dots\}$
$L_1' = \{b, bb, bbb, ab, ba, aba, \dots\}$

$L^R = \{w^R : w \in L\}$ all [strings reversed]
ex. L = {ab, bba, aba}
L^R = {ba, abb, aba}

aside:
L = {a, ab, ba, bb}
~~L^R = {bb, ba, ab, a}~~

$L_1L_2 = \{xy : x \in L_1, y \in L_2\}$ all [strings concatenated]

ex. L_1 = {a, aa, ab}
L_2 = {b, bb}

L_1L_2 = {ab, aab, abb, abb, aabb, abbb}
= {ab, aab, abb, aabb, abbb}

$L_1L_2 \neq L_2L_1$ not necessarily equal.

L^n = L concatenated w/ self n times
$L^1 = L$
$L^2 = L \cdot L$
$L^0 = \{\lambda\}$

$L^* = L^0 \cup L^1 \cup L^2 \cup L^3 \cup \dots$

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in general *

grammars: $G = (V, T, S, P)$
V = finite set of symbols [variables]
T = finite set of symbols [terminals] $\in \Sigma$
$S \in V$ = [start] symbol
P = finite set of [productions] or rules

finite acceptors: $M = (Q, \Sigma, \delta, q_0, F)$

Q = finite set of internal state(s)
Σ = alphabet
δ = finite set of transition fnc(s)
$\delta: Q \times \Sigma \to Q$

$q_0 \in Q$ = [initial] state
$F \subset Q$ = finite set of [final] state(s).

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dfa examples next time.