Language and Grammer

2.1 Language

language: set of sentence.
sentence: set of word, grammer.
word: set of alphabet.

Alphabet

T - set of word. ex) set of ab: aaababaa.
set of 01: 01011101101.

T^* - Any sentence that can be made into a set of word.

T^+ - T^* minus ϵ only.

Therefore, Language is a subset of the T^* set.

String

ω - string.

Length

$|\omega|$ - length of string.

Empty string

ϵ or λ

Language is generally composed of infinite sentence $\Rightarrow$ unable to list all thus we can't list all, we need a method to describe it

sol1) Syntax(Grammer): Production rule - production perspective

sol2) Recognizer: Automata - perspective of recognizing truth or false of a sentence.

Concatenation

String u, String v

$u \cdot v$ - combine.

$u\epsilon = u = \epsilon u$

$\forall\, u, v \in T^*, uv \in T^*$ - If u,v is configured as 01, uv is also configured as 01.

a^n: string with n a's ex) $a^0 = \epsilon$

ω^R: reverse string

L: language

Product $LL^{'} = \{xy | x \in L\, and\, y \in L^{'}\}$

Power $L^0 = \{\epsilon\}$

$L^n = LL^{n-1}\ (n \geq 1)$

L^*: $L^0 \cup L^1 \cup L^2 \cup L^3 \cdots \cup L^n \cdots = U_{i=0}^{\infty} L^i$

L^+: $L^n - L^0$

2.2 Grammer

V_t: terminal - alphabet.

V_n: nonterminal - Grammatical symbols for describing constraints that do not constitute actual sentences (usually use uppercase)

$V = V_n \cap V_t$

Definition of grammer
$G = (V_n, V_t, P, S)$

example
G = ({S, A}, {a, b}, P, S)
P(set of production rule): S $\rightarrow aAS$ $S \rightarrow a$
A $\rightarrow SbA$ $A \rightarrow ba$ $A \rightarrow SS$

conclusion
$S \rightarrow aAS|a$
$A \rightarrow SbA|ba|SS$