LECTURE 03

Language & Power of Alphabet

Md. Sozib Hossain
Lecturer, CSE, RUET
sozib.hossain@cse.ruet.ac.bd

EXAMPLE OF LANGUAGES

1. All binary number that contain n number of 0's followed by n number of 1's for some n >= 0.

2. All binary number that contain equal number of 0's and 1's.

3. All prime binary number.

4. All string that contains "aba" as sub string over the alphabet Σ = {a, b, c, d}.

5. All identifier(variable name & function name) in C programming Language.

6. All Comment(Single line or Multi-line) in C programming Language.

7. All integer number in C programming Language.

8. All float number in C programming Language.

TYPES OF LANGUAGES

Language is a set of strings that is accepted by a **model of computation**.

There are several types of language that's are accepted by different model of computation.

1. Regular Language – accepted by Finite Automata.
2. Context Free Language – accepted by Push Down Automata.
3. Context Sensitive Language – accepted by Linear Bounded Automata.
4. Recursively Enumerable Language – accepted by Turing Machine.

POWER OF ALPHABET

It is expressed by Σ^k which represent the set of strings of length k each of those symbols are of Σ.

Example-
 If $\Sigma=\{0,1\}$,
Then $\Sigma^0=\{\varepsilon\}$ which means a empty set.
$\Sigma^1=\{0,1\}$
$\Sigma^2=\{00,01,10,11\}$
$\Sigma^3=\{000,001,010,011,100,101,110,111\}$
$\Sigma^*=\Sigma^+ + \varepsilon$

POWER OF ALPHABET

<u>KLEEN CLOSURE</u>

Strings of all possible lengths over $\sum$ including ε.

$$\Sigma^* = \Sigma^0 + \Sigma^1 + \Sigma^2 + \Sigma^3 + \dots$$

If $\Sigma = \{0,1\}$

Then $\Sigma^* = \{\varepsilon, 0, 1, 00, 01, 10, 11, \dots\}$

<u>POSITIVE CLOSURE</u>

Strings of all possible lengths over $\sum$ excluding ε.

$\Sigma^+ = \Sigma^1 + \Sigma^2 + \Sigma^3 + \Sigma^4 + \dots$

If $\Sigma = \{0, 1\}$

Then $\Sigma^+ = \{0, 1, 00, 01, 10, 11, \dots\}$

POWER OF ALPHABET

- If $\Sigma = \{0,1\}$ then
  $$\Sigma^+ - (\Sigma^4 + \Sigma^5 + \Sigma^6 \ldots + \Sigma^\infty) = ?$$

- If $\Sigma = \{a,b\}$ then
  $$\Sigma^* - (\Sigma^1 + \Sigma^2 + \Sigma^4 + \Sigma^5 + \Sigma^6 \ldots + \Sigma^\infty) = ?$$

- If $\Sigma = \{a,b,c\}$ then
  $$\Sigma^* - (\Sigma^0 + \Sigma^1 + \Sigma^3 + \Sigma^4 + \Sigma^5 + \Sigma^6 \ldots + \Sigma^\infty) = ?$$

- If $\Sigma = \{a,b,c\}$ then
  $$\Sigma^* - \Sigma^+ = ?$$