Sets and Relations

Some sets and relations bs was done.

Keywords

- Image of a function
- Codomain of a function
- range of a function
- Reflexive relation
  - > (a,a) ϵ R
- Symmetric relation
  - > if (b,a) ϵ R when (a,b) ϵ R
- Antisymmetric relation
  - > if (b,a) ϵ R when (a,b) does not belong to R
- Inverse of binary relation
  - > { (b,a) : (a,b) ϵ R }
- Partial Order Relation
  - Relation is Reflexive,Antisymmetric and Transitive
  - Example: x >= y
- Total Order Relations
  - A partial order relation is a total order relation **for all a,b whenever a,b ϵ A either (a,b) ϵ R or (b,a) ϵ R**

Languages

Languages consist of a set of symbols.

> The words in a language can be defined as a powerset of alphabet. This is incorrect, since a powerset does not contain repeated elements.

Alphabet

> Finite set of symbols.

String

> Finite sequence of symbols from the alphabet.

010101010000 is a string over the binary alphabet {0,1}

> The set of all strings including the empyty string, over an alphabet Σ is denoted by Σ*.

Σ* is a set of finite strings.

Null(empty) string is denoted by 'e'.

if the string 'tiger' is named as w.

- |w| = |tiger| = 5
- w(1) = t and so on and so forth

Concatenation

> For two strings x and y, concatenation is x ○ y [x (deg) y].

Example:

- tiger ○ cub = tigercub
- w ○ e = e ○ w = w

Substring

> A string v is a substring of w iff there are strings x and y such that w = xvy

Both x,y could be e.

An empty string is substring of any string.

Suffix : wv, v is suffix.

prefix : vw, v is suffix.

For string w and each natural number i, the string w^i is w^0 = e and w^2 = w ○ w

A language is any set of strings over an alphabet Σ that is any subset of Σ*

Hence Σ*, Σ (String length = 1) and ϕ are also languages.

Set operations over languages

We can apply union, intersection, difference over languages, since languages are sets of strings.

Another important operation which can be performed is concatenation.

Concatenation of two languages L_1 and L_2 results in L.

Where L = L_1 ○ L_2 = $L_1 L_2$

Where L = {w ϵ Σ* : w = xy for some x ϵ L_1 and y ϵ L_2}