THEORY OF AUTOMATA

&

FORMAL LANGUAGES

HANDOUTS 03

Department of Information Technology
Hazara University, Mansehra

Recursive definition of languages

The following three steps are used in recursive definition

1. Some basic words are specified in the language.
2. Rules for constructing more words are defined in the language.
3. No strings except those constructed in above, are allowed to be in the language.

Examples

Defining language of INTEGER

Step 1: 1 is in **INTEGER**.

Step 2: If x is in **INTEGER** then x+1 and x-1 are also in **INTEGER**.

Step 3: No strings except those constructed in above, are allowed to be in **INTEGER**.

Defining language of EVEN

Step 1: 2 is in **EVEN**.

Step 2: If x is in **EVEN** then x+2 and x-2 are also in **EVEN**.

Step 3: No strings except those constructed in above, are allowed to be in **EVEN**.

Defining the language factorial

Step 1: As 0!=1, so 1 is in **factorial**.

Step 2: n!=n*(n-1)! is in **factorial**.

Step 3: No strings except those constructed in above, are allowed to be in **factorial**.

Defining the language PALINDROME, defined over Σ = {a,b}

Step 1: a and b are in **PALINDROME**

Step 2: if x is palindrome, then s(x)Rev(s) and xx will also be palindrome, where s belongs to Σ^*

Step 3: No strings except those constructed in above, are allowed to be in palindrome

Defining the language {$a^n b^n$ }, n=1,2,3,… , of strings defined over Σ={a,b}

Step 1: ab is in {$\mathbf{a^n b^n}$}

Step 2: if x is in {$\mathbf{a^n b^n}$}, then axb is in {$\mathbf{a^n b^n}$}

Step 3: No strings except those constructed in above, are allowed to be in {$\mathbf{a^n b^n}$}

Defining the language L, of strings ending in a , defined over Σ={a,b}

Step 1: a is in L

Step 2: if x is in L then s(x) is also in **L,** where s belongs to Σ^*

Step 3: No strings except those constructed in above, are allowed to be in **L**

Defining the language L, of strings beginning and ending in same letters , defined over Σ={a, b}

Step 1: a and b are in L

Step 2: (a)s(a) and (b)s(b) are also in **L,** where s belongs to Σ^*

Step 3: No strings except those constructed in above, are allowed to be in **L**

Defining the language L, of strings containing aa or bb , defined over Σ={a, b}

Step 1: aa and bb are in L

Step 2: s(aa)s and s(bb)s are also in **L,** where s belongs to Σ^*

Step 3: No strings except those constructed in above, are allowed to be in **L**

Defining the language L, of strings containing exactly one a, defined over Σ={a, b}

Step 1: a is in L

Step 2: s(a)s is also in **L,** where s belongs to b*

Step 3: No strings except those constructed in above, are allowed to be in **L**