1.] Levenshteinova udaljenost

$S = acbcdb$, $T = cabdb$

m\n	∅	c	a	b	d	b
		0	1	2	3	4	5
∅	0	0 →1	2	3	4	5
a	1	1	1	2	3	4
c	2	1	2	2	3	4
b	3	2	2	2	3	3
c	4	*3	3	3	3	4
d	5	4	4	4	3	4
b	6	5	5	4	4	3

vremenska složenost	prostorna
$O(m,n)$	$O(m,n)$, $O(\min(m,n))$

```
a c b c d b
_ c a b d b
  1 2 3
```

* Ako je okomito ili vodoravno → +1, čak i ako su jednaki znakovi

1. ca_b_db
   _acbcdb

2. _cabdb
   acbcdb

---

pristup sintaksičkom raspoznavanju na temelju parsiranja

PR: babaa

W₁:
S→AB
A→AbB | a
B→bC | a
C→a | b

W₂:
S→AB
A→AaB | b
B→aC | b
C→a | b

W₁
CNF:
S→AB
A→ADB | a
B→DC | a
C→a | b
D→b

- - - - - -

S→AB
A→EB | a
E→AD
B→DC | a
C→a | b
D→b

babaa ∉ W₁

5	∅				
4	∅	S			
3	∅	S,A	∅		
2	B	E	B	S	
1	C,D	A,B,C	C,D	A,B,C	A,B,C

b a b a a

ba: (b)(a)
(C,D)(A,B,C)
B→DC

ab: (a)(b)
(A,B,C)(C,D)
E→AD

aa: (a)(a)
(A,B,C)(A,B,C)
S→AB

bab: (b)(ab)
(C,D)(E) /
(ba)(b)
(B)(C,D) /

aba: (a)(ba)
(A,B,C)(B)   S→AB
(ab)(a)
(E)(A,B,C)   A→EB

baa: (b)(aa)
$\quad$ (C,D)(S) /

$\quad$ (ba)(a)
$\quad$ (B)(A,B,C) /
—

baba: (b)(aba)
$\quad$ (C,D)(S,A) /

$\quad$ (ba)(ba)
$\quad$ (B)(B) /

$\quad$ (bab)(a)
$\quad$ (Ø)(A,B,c) /

abaa: (a)(baa)
$\quad$ Ø /

$\quad$ (ab)(aa)
$\quad$ (E)(S) /

$\quad$ (aba)(a)
$\quad$ (S,N)(A,B,c) $\quad$ $S \to AB$
—

babaa: (b)(abaa)
$\quad$ (C,D)(S) /

$\quad$ (ba)(baa) /

$\quad$ (bab)(aa) /

$\quad$ (baba)(a) /

W_2⌉

5	S				
4	E	Ø			
3	S,A	Ø	S		
2	E	B	E	B	
1	ABC	C,D	ABC	C,D	C,D

$\quad$ b $\quad$ a $\quad$ b $\quad$ a $\quad$ a $\quad$ $\in W_2$
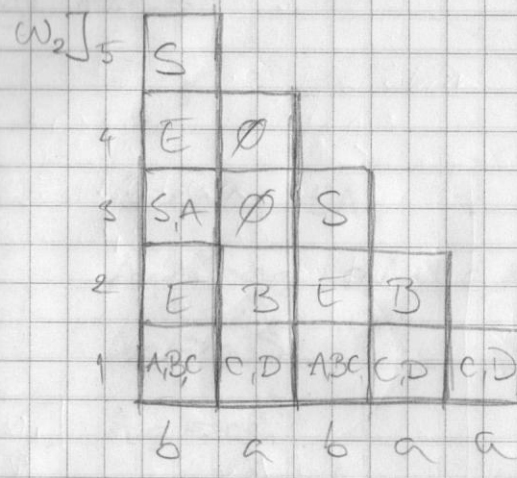
$S \to AB$
$A \to EB | b$
$E \to AD$
$B \to DC | b$
$D \to a$
$C \to a | b$

UČENJE GRAMATIKE NA TEMELJU SKUPA UZORAKA

PR:
```
c c a c a b
c c a b c c
  c a b a b
  c a a c c
    c a c c
      b c c
      c a b
```

① korak
$S \to cA_1 | bA_5$
$A_1 \to cA_2 | aA_6 | aA_5$
$A_2 \to aA_3$
$A_3 \to cA_4 | bA_5$
$A_4 \to ab$
$A_5 \to cc$
$A_6 \to bA_4 | aA_5 | b$

②. korak

$A_r \to a_1 a_2$

$A_n \to a_1 A_n$

$A_m \to a_2$

$A_4 \to a5$

$A_1 \to a A_6$

$A_6 \to S$

$S \to cA_1 \mid bA_5$

$A_1 \to cA_2 \mid a A_6 \mid a A_5$

$A_2 \to a A_3$

$A_3 \to cA_1 \mid bA_5$

$A_5 \to cc$

$A_6 \to bA_1 \mid aA_5 \mid b$

$A_1 \to a A_6 \to ab A_1$

---

③. korak

$S \equiv A_3$

$S \to cA_1 \mid bA_5$

$A_1 \to cA_2 \mid aA_6 \mid aA_3$

$A_2 \to aS$

$A_5 \to cc$

$A_6 \to bA_1 \mid aA_5 \mid b$

$A_1 \to (aA_1$

GRUPIRANJE

PR: MINMAX

$x_1 = [0, 0]$

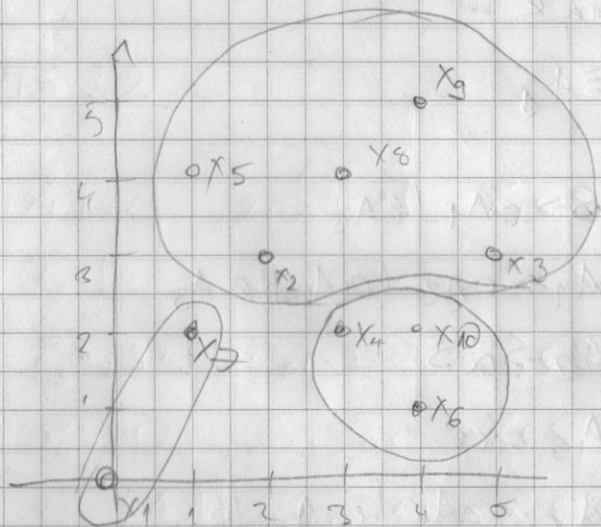$x_2 = [2, 3]$

$x_3 = [5, 3]$

$x_4 = [3, 2]$

$x_5 = [1, 4]$

$x_6 = [4, 1]$

$x_7 = [1, 2]$

$x_8 = [3, 4]$

$x_9 = [4, 5]$

$x_{10} = [4, 2]$

$c = 0.5$

$z_1 = x_1$

D	2	3	4	5	6	7	8	9	10
D(1,j)	$\sqrt{13}$	$\sqrt{34}$	$\sqrt{13}$	$\sqrt{17}$	$\sqrt{17}$	$\sqrt{5}$	$\sqrt{25}$	$\sqrt{41}$	$\sqrt{20}$
D(2,j)	$\sqrt{8}$	$\sqrt{5}$	$\sqrt{10}$	$\sqrt{10}$	$\sqrt{16}$	$\sqrt{18}$	$\sqrt{2}$	0	$\sqrt{9}$
D(3,j)	$\sqrt{8}$	$\sqrt{5}$	$\sqrt{2}$	$\sqrt{18}$	0	$\sqrt{10}$	$\sqrt{10}$	/	$\sqrt{1}$

$z_2 = x_9$

$t = c \cdot ||z_1 - z_2|| = 3.2$

$\sqrt{10} < t \rightarrow$ imamo 3 grupe

$z_3 = x_6$

$S_1 = \{x_1, x_7\}$

$S_2 = \{x_9, x_2, x_3, x_5, x_8\}$

$S_3 = \{x_6, x_4, x_{10}\}$

$x_1 = [4,2]$

$x_2 = [4,5]$

$x_3 = [3,4]$

$x_4 = [1,2]$

$x_5 = [4,1]$

$x_6 = [1,4]$

$x_7 = [3,2]$

$x_8 = [5,3]$

$x_9 = [2,3]$

$x_{10} = [0,0]$

$T = 3,2$

① $\vec{x_1} = [4,2]$, $z_1 = [4,2]$ $\vec{x_1} \in S_1$

② $\vec{x_2} = [4,5]$, $D_{21} = 3 < T \Rightarrow \vec{x_2} \in S_1$

③ $\vec{x_3} = [3,4]$, $D_{31} = \sqrt{5} < T \Rightarrow \vec{x_3} \in S_1$

④ $\vec{x_4} = [1,2]$, $D_{41} = 3 < T \Rightarrow \vec{x_4} \in S_1$

⑤ $\vec{x_5} = [4,1]$, $D_{51} = 1 < T \Rightarrow \vec{x_5} \in S_1$

⑥ $\vec{x_6} = [1,4]$, $D_{61} = \sqrt{3} > T \Rightarrow$

$\vec{z_2} = \vec{x_6} = [1,4] \Rightarrow \vec{x_6} \in S_2$

⑦ $\vec{x_7} = [3,2]$ $\underset{min}{D_{71} = 1 < T}$, $D_{72} = \sqrt{8} < T$

$\vec{x_7} \in S_1$

⑧ $\vec{x_8} = [5,3]$ $D_{81} = \underline{2 < T}$, $D_{82} = \sqrt{17} > T$

$\vec{x_8} \in S_1$

⑨ $\vec{x_9} = [2,3]$ $D_{91} = \sqrt{5}$, $D_{92} = \sqrt{2}$

$\vec{x_9} \in S_2$

⑩ $\vec{x_{10}} = [0,0]$ $D_{101} = \sqrt{20} > T$, $D_{102} \sqrt{17} > T$

$\vec{z_3} = \vec{x_{10}} = [0,0]$

$\vec{x_{10}} \in S_3$

$S_1 = \{ \vec{x_1}, \vec{x_2}, \vec{x_3}, \vec{x_4}, \vec{x_5}, \vec{x_7}, \vec{x_8} \}$

$S_2 = \{ \vec{x_6}, \vec{x_9} \}$

$S_3 = \{ \vec{x_{10}} \}$