# PUSH DOWN AUTOMATA (PDA)

Bir PDA 7'li olarak tanımlanır.

$P = \langle Q, \Sigma, T, \delta, q_0, z_0, F \rangle$

$Q$ : Sonlu sayıda durum içeren durumlar kümesi

$\Sigma$ : Sonlu sayıda simgelerden oluşan giriş alfabesi

$T$ : Sonlu sayıda simgelerden oluşan stack alfabesi

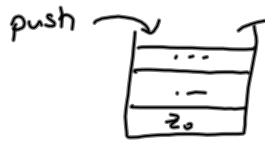
$q_0$ : Başlangıç durumu ($q_0 \in Q$)

$F$ : Son durumlar kümesi

$z_0$ : Stack başlangıç sembolü ($z_0 \in T$)

$\delta$ : $Q \times \Sigma \cup [\lambda] \times T \rightarrow Q \times T$

PDA hafıza birimi olarak stack kullanır.



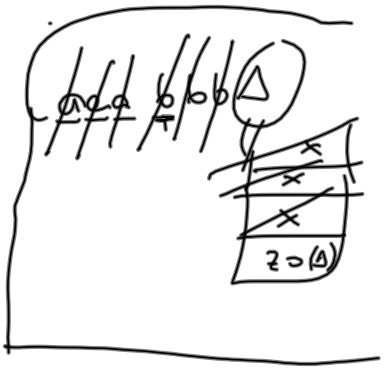

LIFO (Last In First Out)

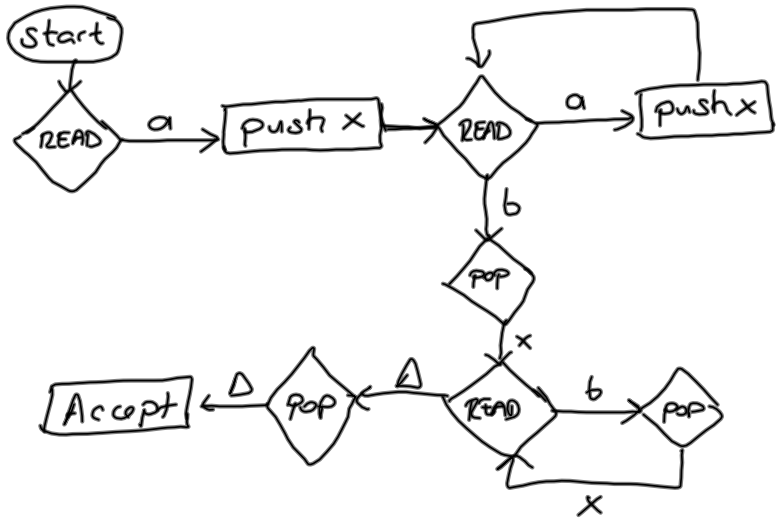
ÖRN: $L_1(G) = \{ a^n b^n \mid n \geq 1 \}$

$L_1(G) = \{ ab, aabb, aaabbb, \ldots \}$

$S \rightarrow aSb \mid ab$

$a^n$ (push) $b^n$ (pop)



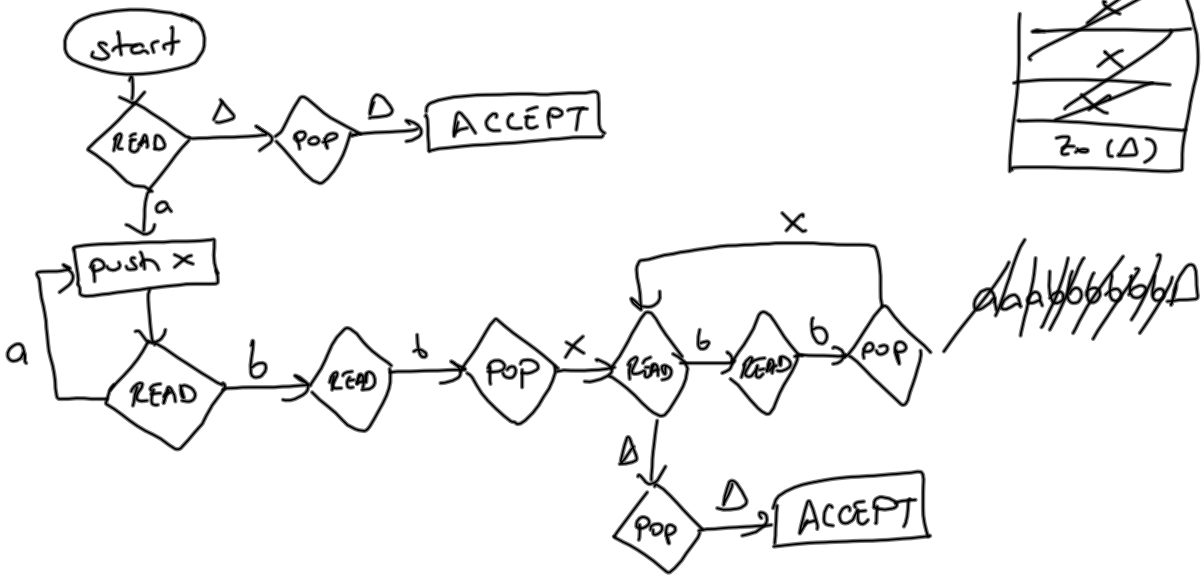
| State | Stack | Input |
|---|---|---|
| start | Δ | aabb Δ |
| READ | Δ | a abb Δ |
| push | x Δ | a abb Δ |
| READ | x Δ | a a bb Δ |
| push | x x Δ | a a bb Δ |
| READ | x x Δ | aa b b Δ |
| pop | x Δ | aa b b Δ |
| READ | x Δ | aab b Δ |
| pop | Δ | aa bb Δ |
| READ | Δ | aabb Δ |
| pop | — | aabb Δ |
| ACCEPT ✓ | | |

aaabb Δ

ÖRN: $L_2(G) = \{a^n b^{2n}, n \geq 0\}$ $S \to aSbb \mid \lambda$

$L_2(G) = \{\lambda, abb, aabbbb, \ldots\}$

$a^n b^{2n}$ $\underbrace{a^n}_{\text{push}} \underbrace{(bb)^n}_{\text{pop}}$ $\underbrace{a^n}_{\text{push x2}} \underbrace{b^{2n}}_{\text{pop}}$ $\lambda\Delta$



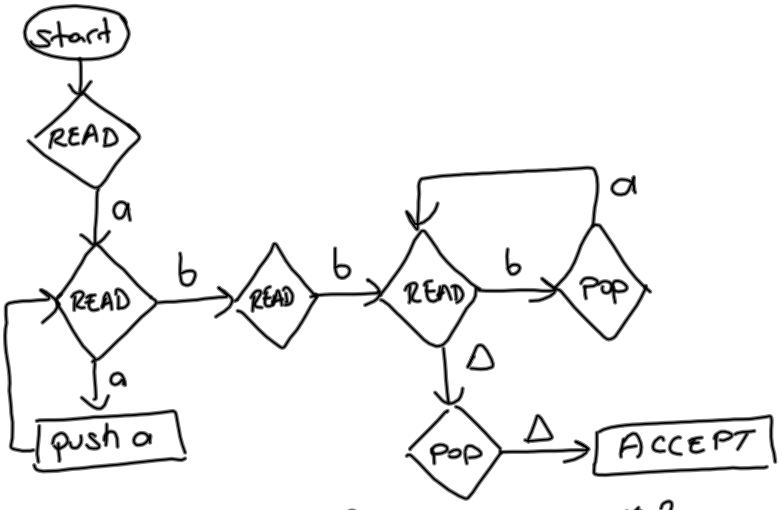
ÖRN. $L_3(G) = \{ a^{n+1} b^{n+2} , n \geq 0 \}$

$L_3(G) = \{ abb, aabbb, aaabbbb, \ldots \}$

$\underbrace{a}_{\text{read}} \underbrace{a^n}_{\text{push}} \underbrace{bb}_{\text{read}} \underbrace{b^n}_{\text{pop}}$

I) $S \to aSb \mid abb$

II) $S \to aAbb$
$A \to aAb \mid \lambda$

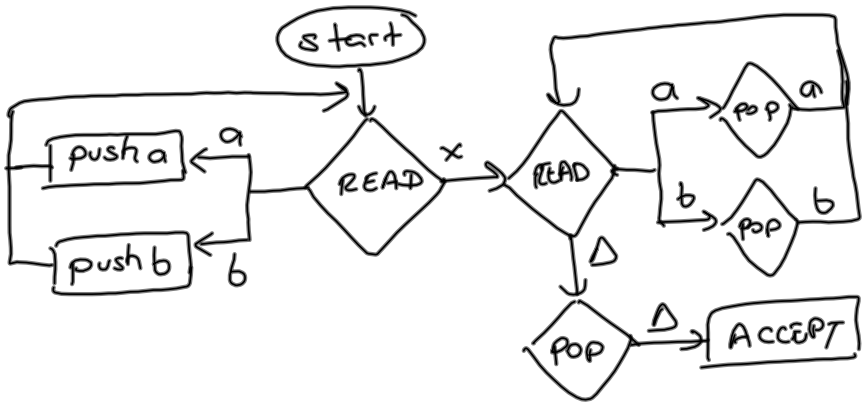


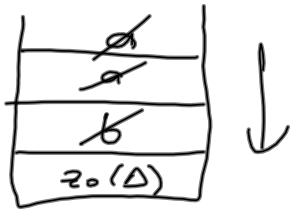

ÖRN: $L_4(G) = \{ w x w^R \mid w \in (a+b)^* \}$

$L_4(G) = \{ abxba, baaxaab, bxb, aaabxbaaa, \ldots \}$

$S \to aSa \mid bSb \mid x$

$baax \underbrace{aab}_{\to} \Delta$



ÖRN: $L_5(G) = \{ a^i b^j c^k , j = i+k , i>0 , k>0 \}$

$L_5(G) = \{ abbc, aabbbc, aabbbbbccc, \ldots \}$

$a^i b^i b^k c^k$

$a^i b^i b^k c^k$

push pop push pop

(x) (x) (y) (y)

$S \to AB$

$A \to aAb \mid ab$

$B \to bBc \mid bc$