20222 CET058-CMP Proj2a

Entrega: 6 de outubro

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1. Simulador de Autômato de Pilha

- Implementar, na linguagem C, um simulador de um autômato pilha que reconhece a linguagem gerada por uma gramática livre de contexto, de acordo ao pseudocódigo fornecido em aula. O simulador deve gerar a árvore (n-ária) de análise sintática codificada em um vetor de inteiros

2. Árvore n-aria em vetor

- Binária: esq(i) = 2i+1,   dir(i) = 2i+2,
- Ternária :

  esq(i) = 3i+1, esq(i) = 3i+2, dir(i) = 3i+3,
- Quaternária:

$d1(i) = 4i+1$, $d2(i) = 4i+2$, $d3(i) = 4i+3$, $d4(i) = 4i+4$,

- Penta-ária

$d1(i) = 5i+1$, $d2(i) = 5i+2$, $d3(i) = 5i+3$, $d4(i) = 5i+4$, $d5(i) = 5i+5$

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

3. Gramática LL[1]

- p_1: $S \rightarrow aSb$
- p_2: $S \rightarrow c$
- $G = (\{ S \}, \{ a, b, c \},)$
- $L(G) = \{ a^n c b^n : n \geq 1 \}$
- **Derivação de a^3cb^3:**
- $\mathrm{S} \Rightarrow_{p_1} aSb \Rightarrow_{p_1} a^2Sb^2 \Rightarrow_{p_1} a^3Sb^3 \Rightarrow_{p_2} a^3cb^3$.
- $\mathrm{S} \Rightarrow_{p_1.p_1.p_1.p_2} a^3cb^3$.

4. Autômato de Pilha

- δ_0: ε, ε, *S*, // push(*S*)
- δ_1: ε, *S*, *aSb* // $p_1: S \rightarrow aSb$
- δ_2: ε, *S*, *c* // $p_2: S \rightarrow c$
- δ_3: *a*, *a*, ε δ_4: *b*, *b*, ε δ_5: *c*, *c*, ε
- $G = (\{ S \}, \{ a, b, c \}, \{ a, b, c, S \}, \delta, q_0, \{ q_1 \})$
- $L(G) = \{ a^n c b^n : n \geq 1 \}$
- **Derivação de a^3cb^3**:
- $S \Rightarrow_{p_1} aSb \Rightarrow_{p_1} a^2Sb^2 \Rightarrow_{p_1} a^3Sb^3 \Rightarrow_{p_2} a^3cb^3$.
- $S \Rightarrow_{p_1.p_1.p_1.p_2} a^3cb^3$.

5. Exemplo GLC2AP

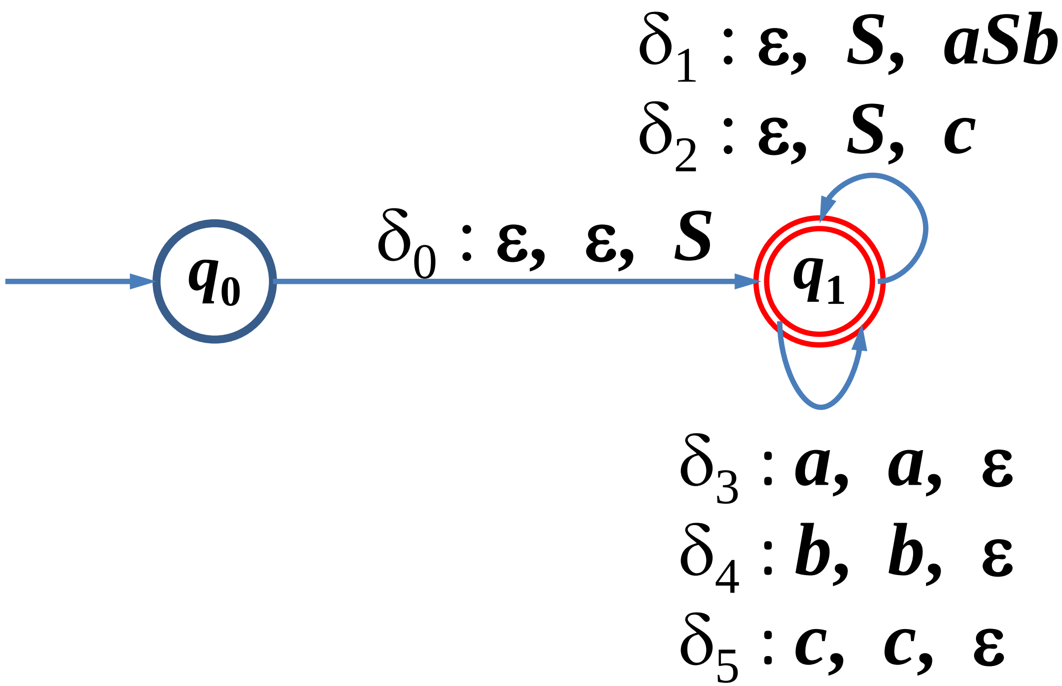
$$\boldsymbol{GLC} = (\{\ S\ \},\{\ a, b, c\ \}, P = \{\ S \rightarrow aSb \mid c\ \}, S\ )$$

$p_1 = S \rightarrow aSb$
$p_2 = S \rightarrow c$

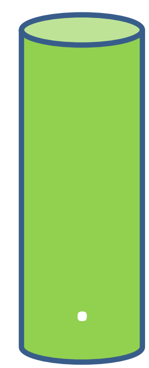
- $\boldsymbol{AP} = (Q, \Sigma, \Gamma, \delta, q_0, F\ )$
  - $Q = \{\ q_0, q_1\ \}$
  - $\Gamma = V$
  - $\delta_0 : \delta(q_0, \varepsilon, \varepsilon) = (S, q_1)$,
  - $\delta_1 : \delta(q_1, \varepsilon, S) = (aSb, q_1)$; for $p_1 = S \rightarrow aSb \in P$,
  - $\delta_2 : \delta(q_1, \varepsilon, S) = (c, q_1)$; for $p_2 = S \rightarrow c \in P$,
  - $\delta_3 : \delta(q_1, a, a) = (\varepsilon, q_1)$; for $a \in \Sigma$,
  - $\delta_4 : \delta(q_1, b, b) = (\varepsilon, q_1)$; for $b \in \Sigma$,
  - $\delta_5 : \delta(q_1, c, c) = (\varepsilon, q_1)$; for $c \in \Sigma$,
  - $F = \{\ q_1\ \}$.

6. Simulação $L(AP) = \{\ a^n c b^n :\ n \geq 1\ \}$

$$p_1 = S \rightarrow aSb$$
$$p_2 = S \rightarrow c$$



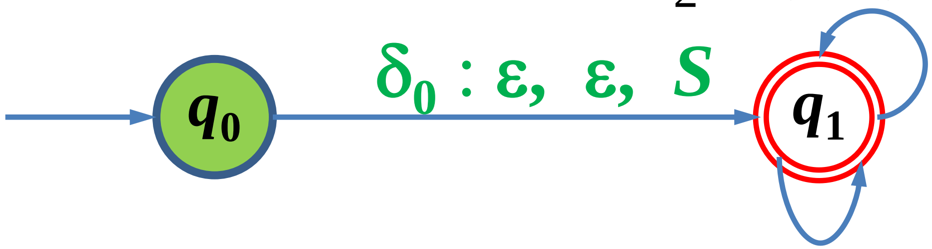
.aacbb



$$L(AP) = \{\ a^n c b^n : n \geq 1\ \}$$

$\delta_1 : \varepsilon,\ S,\ aSb$

$\delta_2 : \varepsilon,\ S,\ c$



$\delta_3 : a,\ a,\ \varepsilon$

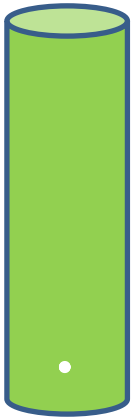
$\delta_4 : b,\ b,\ \varepsilon$

$\delta_5 : c,\ c,\ \varepsilon$

$p_1 = S \rightarrow aSb$

$p_2 = S \rightarrow c$

.aacbb

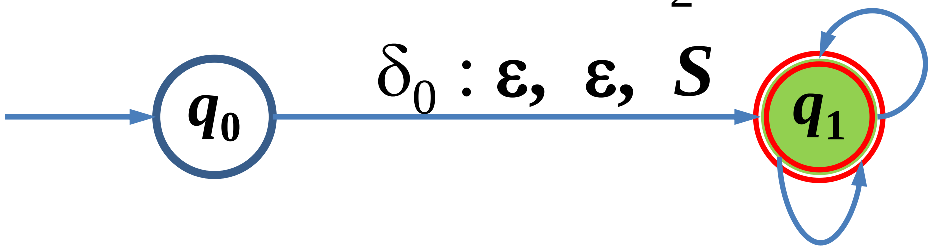


$$L(AP) = \{\ a^n c b^n : n \geq 1\ \}$$

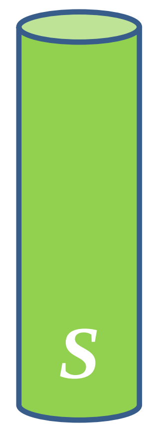
$p_1 = S \rightarrow aSb$
$p_2 = S \rightarrow c$

$\delta_1 : \varepsilon,\ S,\ aSb$
$\delta_2 : \varepsilon,\ S,\ c$

$\delta_0 : \varepsilon,\ \varepsilon,\ S$



$\delta_3 : a,\ a,\ \varepsilon$
$\delta_4 : b,\ b,\ \varepsilon$
$\delta_5 : c,\ c,\ \varepsilon$



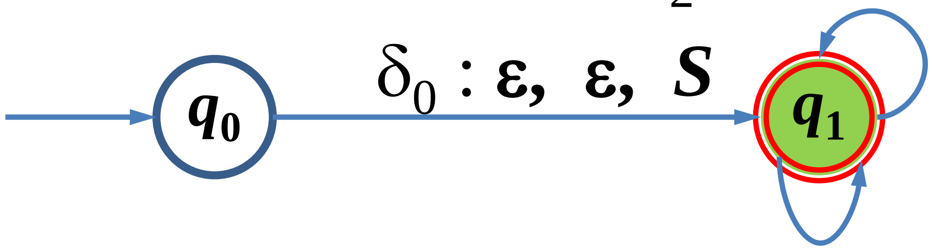
.aacbb

$\boldsymbol{L(AP)} = \{\ a^n c b^n : \ n \geq 1\ \}$

$$\delta_1 : \varepsilon,\ S,\ aSb$$
$$\delta_2 : \varepsilon,\ S,\ c$$

$$p_1 = S \to aSb$$
$$p_2 = S \to c$$

$$\delta_0 : \varepsilon,\ \varepsilon,\ S$$



$$\delta_3 : a,\ a,\ \varepsilon$$
$$\delta_4 : b,\ b,\ \varepsilon$$
$$\delta_5 : c,\ c,\ \varepsilon$$

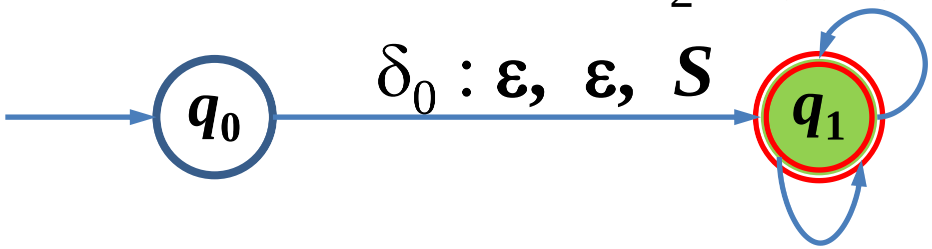
.aacbb

$$L(AP) = \{\ a^n c b^n :\ n \geq 1\ \}$$

$p_1 = S \rightarrow aSb$
$p_2 = S \rightarrow c$

$\delta_1 : \varepsilon,\ S,\ aSb$
$\delta_2 : \varepsilon,\ S,\ c$

$\delta_0 : \varepsilon,\ \varepsilon,\ S$

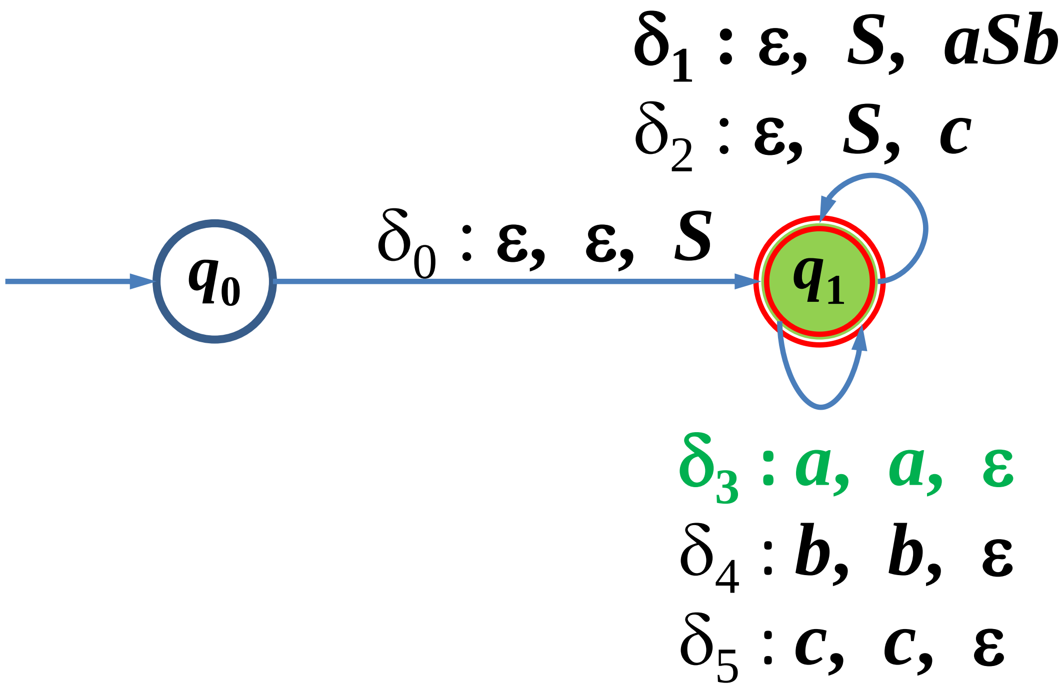


$\delta_3 : a,\ a,\ \varepsilon$
$\delta_4 : b,\ b,\ \varepsilon$
$\delta_5 : c,\ c,\ \varepsilon$

a.acbb

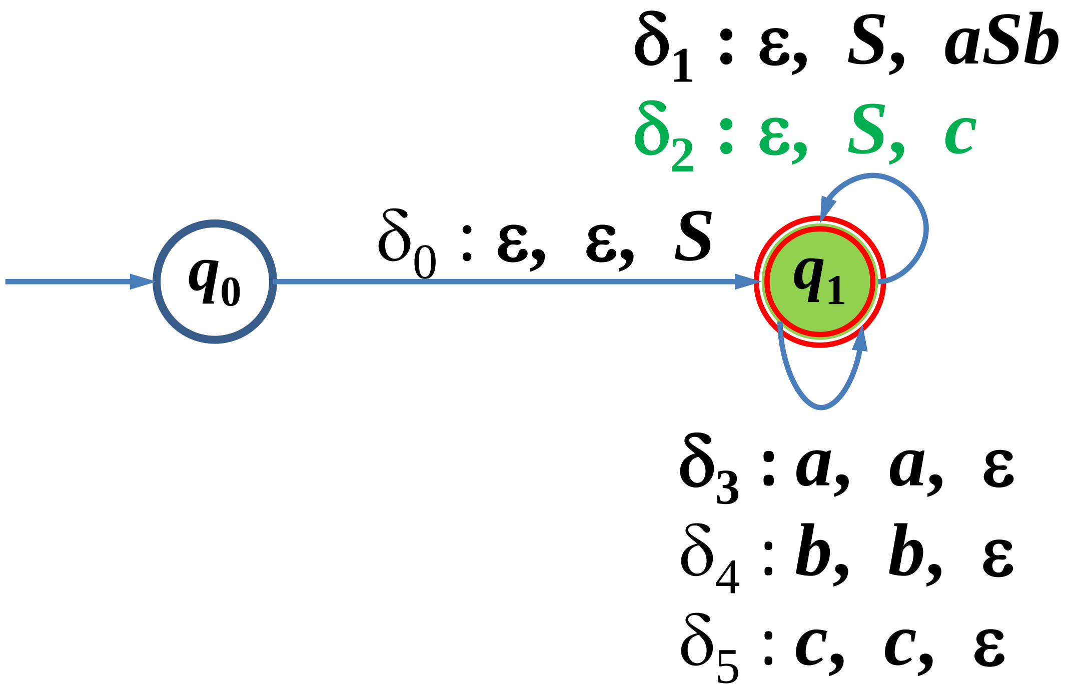
$L(AP) = \{\ a^n c b^n : n \geq 1\ \}$

$p_1 = S \rightarrow aSb$
$p_2 = S \rightarrow c$



a.acbb

$$L(AP) = \{\ a^n c b^n : \ n \geq 1\ \}$$



$p_1 = S \rightarrow aSb$
$p_2 = S \rightarrow c$

aa.cbb

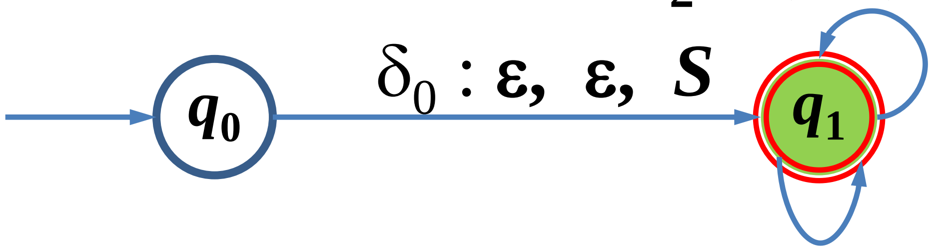
$$L(AP) = \{\ a^n c b^n :\ n \geq 1\ \}$$

$\delta_1 : \varepsilon,\ S,\ aSb$

$\delta_2 : \varepsilon,\ S,\ c$

$p_1 = S \to aSb$

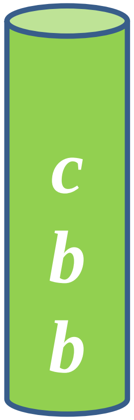
$p_2 = S \to c$



$\delta_3 : a,\ a,\ \varepsilon$

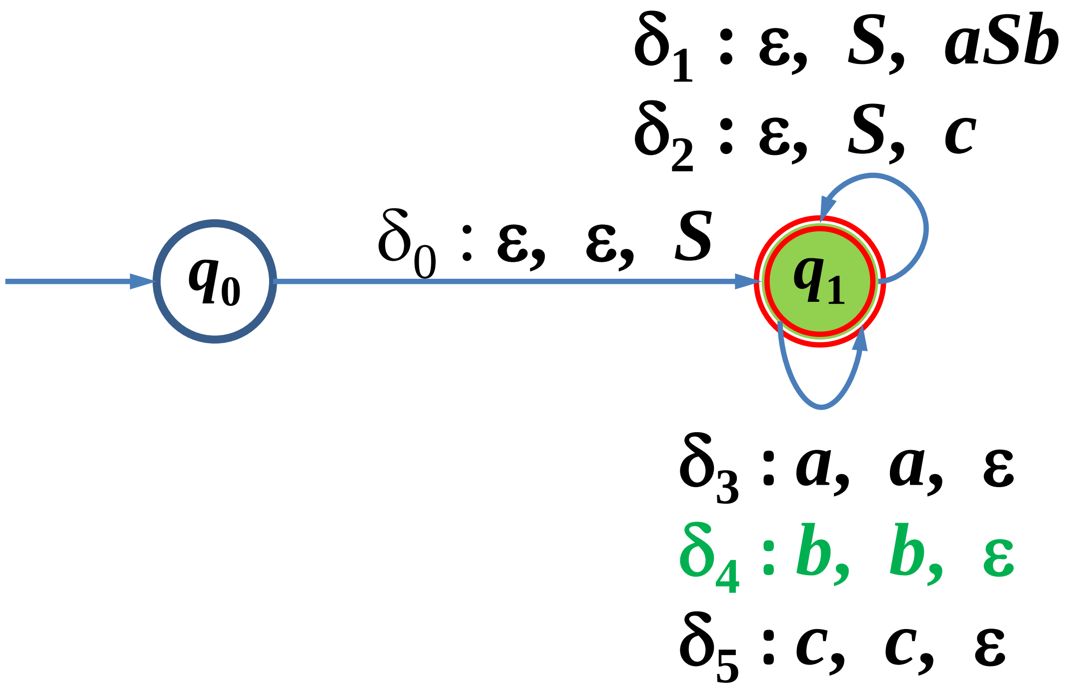
$\delta_4 : b,\ b,\ \varepsilon$

$\delta_5 : c,\ c,\ \varepsilon$



aa.cbb

$\boldsymbol{L(AP)} = \{\ a^n c b^n :\ n \geq 1\ \}$



$p_1 = S \to aSb$
$p_2 = S \to c$

aac.bb

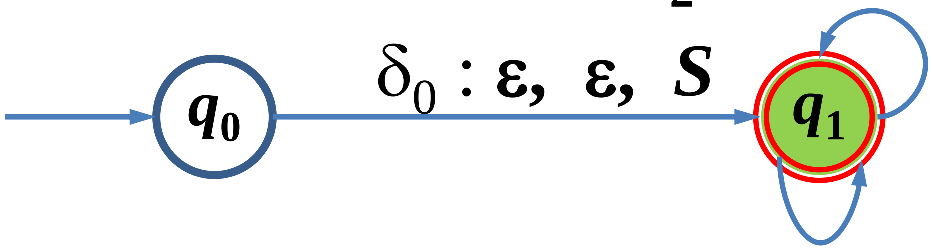
$$\boldsymbol{L(AP)} = \{\ a^n c b^n :\ n \geq 1\ \}$$

$p_1 = S \rightarrow aSb$

$p_2 = S \rightarrow c$

$\delta_1 : \varepsilon,\ S,\ aSb$

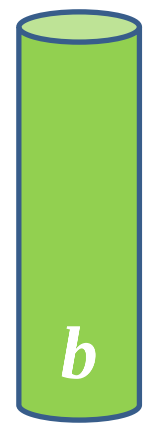
$\delta_2 : \varepsilon,\ S,\ c$



$\delta_3 : a,\ a,\ \varepsilon$

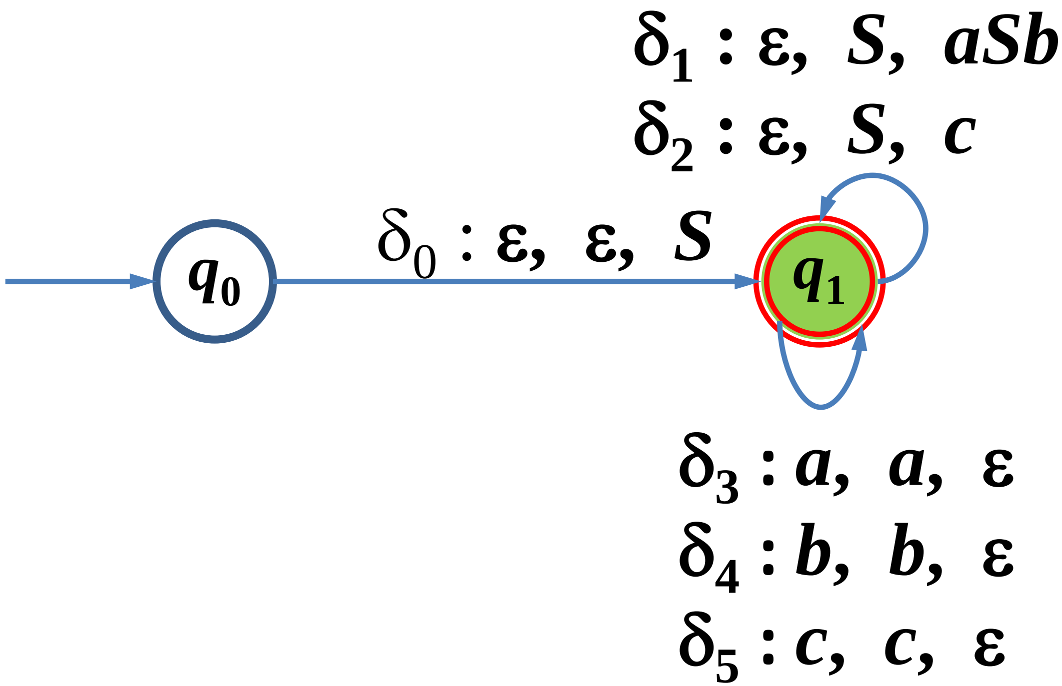
$\delta_4 : b,\ b,\ \varepsilon$

$\delta_5 : c,\ c,\ \varepsilon$



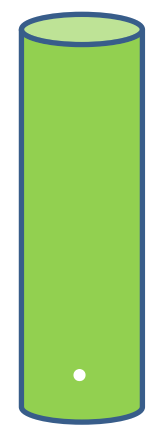
aacb.b

$\boldsymbol{L(AP)} = \{\ a^n c b^n :\ n \geq 1\ \}$



$p_1 = S \to aSb$
$p_2 = S \to c$

aacbb.



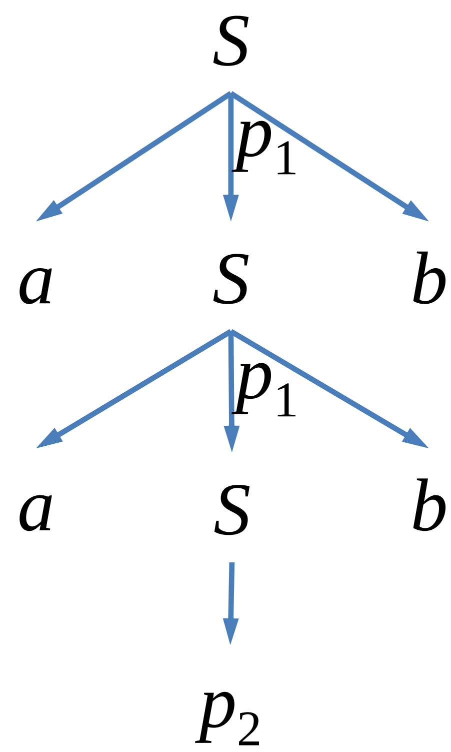
7. Tabela de Parsing *AP.Parsing*(*aaacbbb*)

i	q	$.w$	*Stack*	δ_i	p_i
0	q_0	$.aacbb$	$\varnothing$	δ_0	-
1	q_1	$.aacbb$	S	δ_1	p_1
2	q_1	$.aacbb$	aSb	δ_3	-
3	q_1	$a.acbb$	Sb	δ_1	p_1
4	q_1	$a.acbb$	$aSbb$	δ_2	p_2
5	q_1	$aa.cbb$	cbb	δ_5	-
6	q_1	$aac.bb$	bb	δ_4	-
7	q_1	$aacb.b$	b	δ_4	-
8	q_1	$aacbb.$	$\varnothing$	-	-

8. Árvore de Análise *AP.ADA*(*aabb*)

i	q	$.w$	*Stack*	δ_i	p_i
0	q_0	$.aacbb$	$\varnothing$	δ_0	-
1	q_1	$.aacbb$	S	δ_1	p_1
2	q_1	$.aacbb$	aSb	δ_3	-
3	q_1	$a.acbb$	Sb	δ_1	p_1
4	q_1	$a.acbb$	$aSbb$	δ_2	p_2
5	q_1	$aa.cbb$	cbb	δ_5	-
6	q_1	$aac.bb$	bb	δ_4	-
7	q_1	$aacb.b$	b	δ_4	-
8	q_1	$aacbb.$	$\varnothing$	-	-

$p_1 = S \rightarrow aSb$
$p_2 = S \rightarrow ab$



9. GLC ambígua

step	q_i	$.w$	Stack	t_i	p_i
0	q_0	$.aabb$	$\varnothing$	t_0	-
1	q_1	$.aabb$	S	t_3	p_3
2	q_1	$.aabb$	SB	t_2	p_2
3	q_1	$.aabb$	ASB	t_4	p_4
4	q_1	$a.abb$	SB	t_1	p_1
5	q_1	$a.abb$	ABB	t_4	p_4
6	q_1	$aa.bb$	BB	t_5	p_5
7	q_1	$aab.b$	B	t_5	p_5
8	q_1	$aabb.$	$\varnothing$	-	-

p_1 = **S -> AB**
p_2 = **S -> AS**
p_3 = **S -> SB**
p_4 = **A -> a**
p_5 = **B -> b**

10. GLC LL[1] para o projeto

- p_1: **S** $\rightarrow$ **M | G M | F G M**
- p_6: **M** $\rightarrow$ **m(){ C; r(E); }**
- p_7: **E** $\rightarrow$ **0 | 1 | x | y | (EXE)**
- p_{12}: **X** $\rightarrow$ **+ | - | * | /**
- p_{16}: **C** $\rightarrow$ **h=E | i=E | j=E | k=E | z=E | (EXE) | w(E){ C; } | f(E){ C; } | o(E; E; E){ C; }**

`F G M`

- p_4: `F` $\rightarrow$ `f(){ C; r(E); }`
- p_5: `G` $\rightarrow$ `g(){ C; r(E); }`
- p_6: `M` $\rightarrow$ `m(){ C; r(E); }`

p_6: `M` $\rightarrow$ `m(){ C; r(E); }`

p_6: `M` $\rightarrow$
```
main(){
        COMMAND;
        return(E);
      }
```

w(E){ C; }

```
while (EXPR) {
    COMMAND;
}
```

`f(E){ C; }`

```
if (EXPR){
    COMMAND;
}
```

o(E; E; E){ C; }

```
for (EXPR; EXPR; EXPR) {
    COMMAND;
}
```

11. Relatório

- O relatório deve conter:
  – Folha de rosto
  – Sumário
  – Link para download da implementação.
  – Saída para a execução.
  – Referências.