

Hoja 4: Análisis sintáctico ascendente

LALR(1) y LR(1)

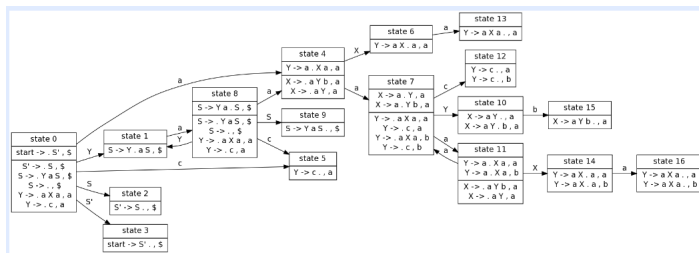
Ejercicio 1 Comprueba si la siguiente gramática es LALR(1) o LR(1):

$S' \rightarrow S$

$S \rightarrow YaS \mid \epsilon$

$X \rightarrow aYb \mid aY$

$Y \rightarrow aXa \mid c$



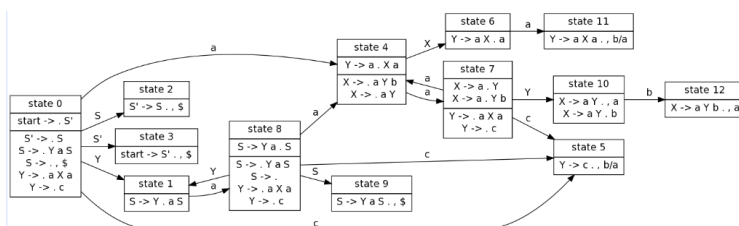
Grammar

$S' \rightarrow S$
 $S \rightarrow YaS$
 $| \epsilon$
 $X \rightarrow aYb$
 $| aY$
 $Y \rightarrow aXa$
 $| c$

LR(1) Table

	S	c	a	b	S'	S	Y	X
0	$r(S \rightarrow \epsilon)$	s5	s4		s3	s2	s1	
1		s8						
2	$r(S' \rightarrow S)$							
3	acc							
4		s7					s6	
5			$r(Y \rightarrow c)$					
6			s13					
7		s12	s11				s10	
8	$r(S \rightarrow \epsilon)$	s5	s4		s9	s1		
9	$r(S \rightarrow YaS)$							
10			$r(X \rightarrow aY)$	s15				
11		s7					s14	
12			$r(Y \rightarrow c)$	$r(Y \rightarrow c)$				
13			$r(Y \rightarrow aXa)$					
14		s16						
15		$r(X \rightarrow aYb)$						
16		$r(Y \rightarrow aXa)$	$r(Y \rightarrow aXa)$					

It is LR(1).



Grammar

$S' \rightarrow S$
 $S \rightarrow YaS$
 $| \epsilon$
 $X \rightarrow aYb$
 $| aY$
 $Y \rightarrow aXa$
 $| c$

LALR(1) Table

	S	c	a	b	S'	S	Y	X
0	$r(S \rightarrow \epsilon)$	s5	s4		s3	s2	s1	
1		s8						
2	$r(S' \rightarrow S)$							
3	acc							
4		s7					s6	
5			$r(Y \rightarrow c)$	$r(Y \rightarrow c)$				
6			s11					
7		s5	s4				s10	
8		s5	s4		s9	s1		
9	$r(S \rightarrow YaS)$							
10			$r(X \rightarrow aY)$	s12				
11			$r(Y \rightarrow aXa)$	$r(Y \rightarrow aXa)$				
12			$r(X \rightarrow aYb)$					

It is LALR(1).

En caso de serlo, utiliza el analizador más sencillo para analizar la palabra ca.

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File Input Test Convert Help

Editor Build SLR(1) Parse SLR(1) Parsing

Table Text Size

	a	b	c	\$	S	X	Y
0	s3		s4	r2	1		2
1				acc			
2	s5						
3	s7					6	
4	r6	r6					
5	s3		s4	r2	8		2
6	s9						
7	s3		s4				10
8				r1			
9	r5	r5					
10	r4	s11					
11	r3						

Start Step Noninverted Tree

Input: ca
Input Remaining: \$
Stack: S0

LHS	RHS
S'	→ S
S	→ YaS
S	→ λ
X	→ aYb
X	→ aY
Y	→ aXa
Y	→ c

String accepted

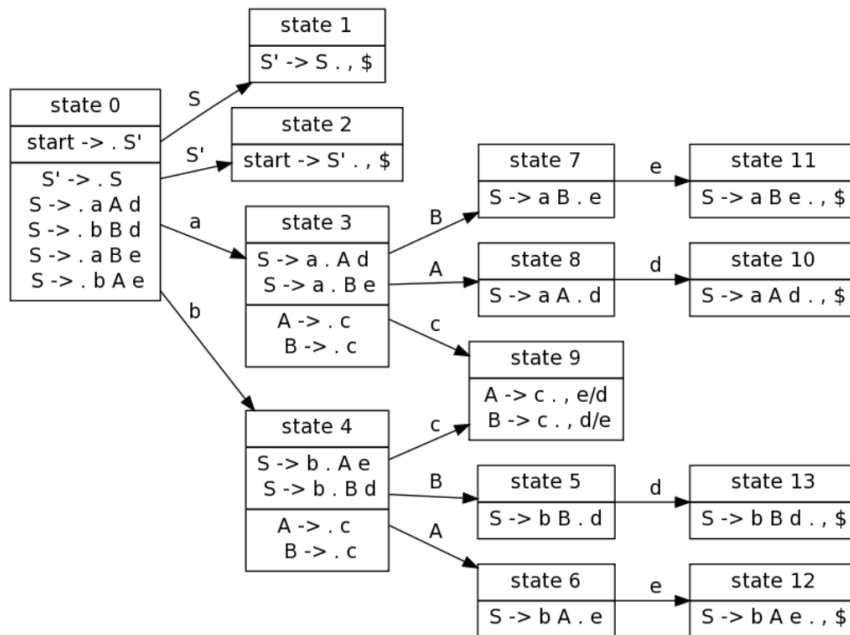
Ejercicio 2 Comprueba si la siguiente gramática es LALR(1) o LR(1):

$S' \rightarrow S$

$S \rightarrow aAd \mid bBd \mid aBe \mid bAe$

$A \rightarrow c$

$B \rightarrow c$



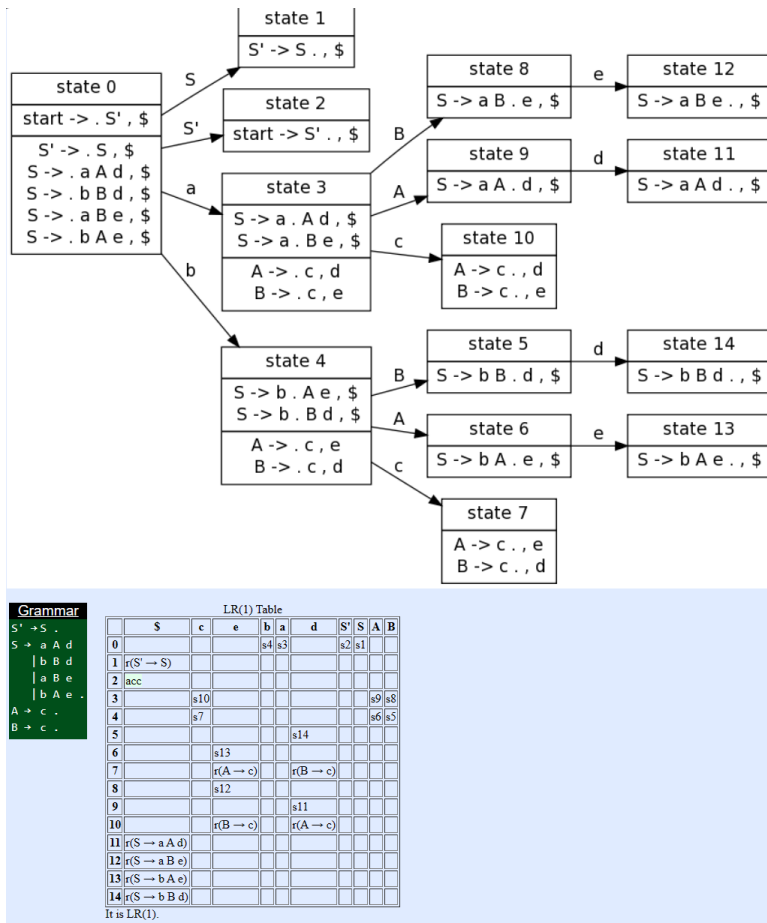
Grammar

$S' \rightarrow S$
 $S \rightarrow aAd$
 $S \rightarrow bBd$
 $S \rightarrow aBe$
 $S \rightarrow bAe$
 $A \rightarrow c$
 $B \rightarrow c$

	\$	c	e	b	a	d	S'	S	A	B
0				s4	s3		s2	s1		
1	r(S' → S)									
2	acc									
3		s9							s8	s7
4		s9							s6	s5
5						s13				
6			s12							
7			s11							
8						s10				
9			r(A → c)/r(B → c)			r(A → c)/r(B → c)				
10	r(S → aAd)									
11	r(S → aBe)									
12	r(S → bAe)									
13	r(S → bBd)									

It is not LALR(1) because:

- reduce/reduce conflict in state 9.



En caso de serlo, utiliza el analizador más sencillo para analizar la palabra acd.

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File Input Test Convert Help

Editor Build SLR(1) Parse SLR(1) Parsing

Table Text Size

	a	b	c	d	e	\$	A	B	S
0	s2	s3							1
1						acc			
2			s6				4	5	
3			s6				7	8	
4				s9					
5					s10				
6				r5	r5				
7					s11				
8				s12					
9						r1			
10						r3			
11						r4			

Start Step Noninverted Tree

Input acd

Input Remaining \$

Stack S0

LHS	RHS
S'	$\rightarrow S$
S	$\rightarrow aAd$
S	$\rightarrow bBd$
S	$\rightarrow aBe$
S	$\rightarrow bAe$
A	$\rightarrow c$
B	$\rightarrow c$

trying accepted

```

graph TD
    S((S)) --- a((a))
    S --- A((A))
    S --- d((d))
    A --- c((c))
  
```

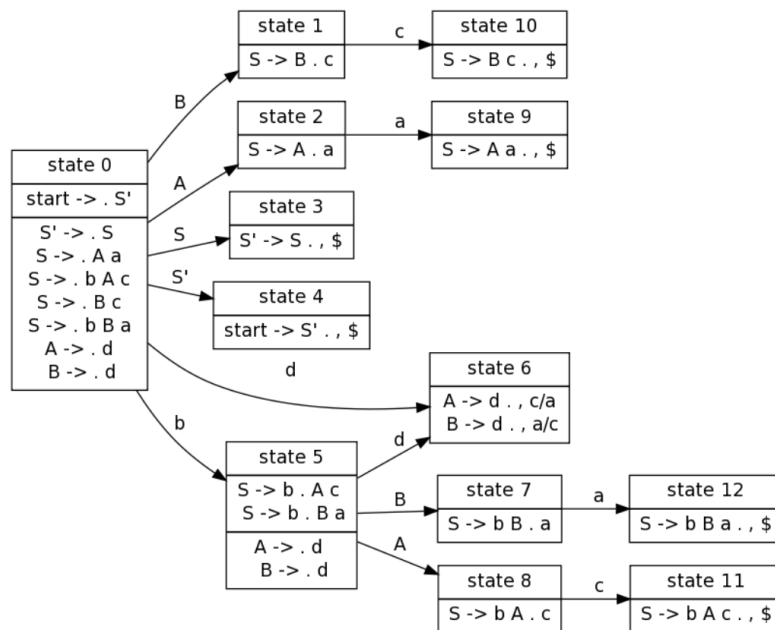
Ejercicio 3 Comprueba que la siguiente gramática es LR(1) pero no LALR(1):

$S' \rightarrow S$

$S \rightarrow Aa \mid bAc \mid Bc \mid bBa$

$A \rightarrow d$

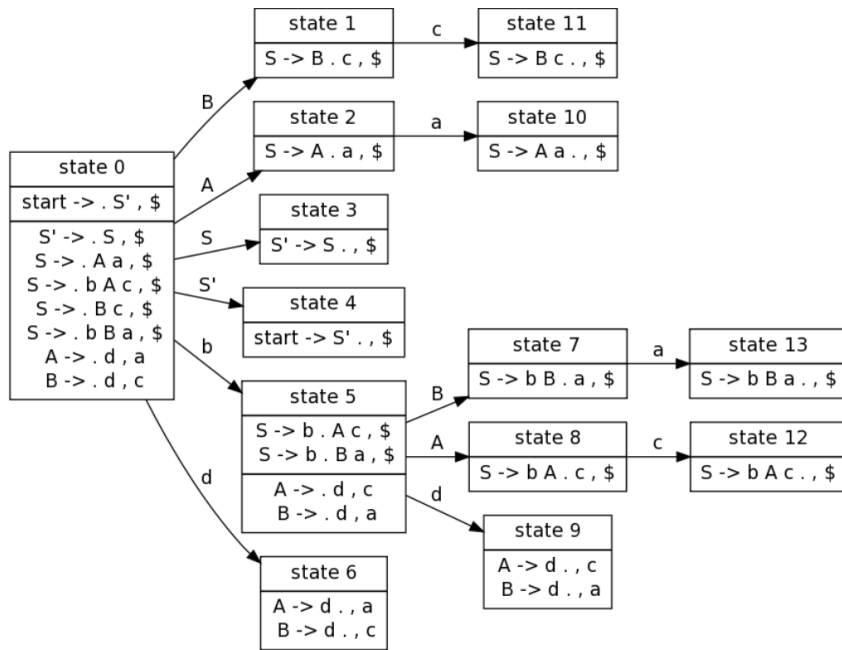
$B \rightarrow d$



LR(1) Table									
	S	d	a	b	c	S'	S	A	B
0		r6		r5		r4	r3	r2	r1
1				r10					
2			r9						
3	r(S → S)								
4	acc								
5		r6						r8	r7
6		r(A → d) r(B → d)		r(A → d) r(B → d)					
7			r12						
8				r11					
9	r(S → A a)								
10	r(S → B c)								
11	r(S → b A c)								
12	r(S → b B a)								

It is not LALR(1) because:

- reduce/reduce conflict in state 6.



Grammar

```

S' -> S .
S -> A a .
S -> b A c .
S -> B c .
S -> b B a .
A -> d .
B -> d .

```

LR(1) Table

	\$	d	a	b	c	S'	S	A	B
0		s6		s5		s4	s3	s2	s1
1					s11				
2			s10						
3	r(S' → S)								
4	acc								
5		s9						s8	s7
6			r(A → d)		r(B → d)				
7			s13						
8					s12				
9			r(B → d)		r(A → d)				
10	r(S → A a)								
11	r(S → B c)								
12	r(S → b A c)								
13	r(S → b B a)								

It is LR(1).

Utiliza el analizador LR(1) para construir el árbol sintáctico de bda.

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File Input Test Convert Help

Editor Build SLR(1) Parse SLR(1) Parsing

Table Text Size

	a	b	c	d	\$	A	B	S
0		s4		s5		1	2	3
1	s6							
2			s7					
3					acc			
4				s5		8	9	
5	r5		r5					
6					r1			
7					r3			
8			s10					
9	s11							
10					r2			
11					r4			

Start Step Noninverted Tree

Input: bda

Input Remaining: a\$

Stack: 8A4b0

LHS	RHS
S'	→ S
S	→ Aa
S	→ bAc
S	→ Bc
S	→ bBa
A	→ d
B	→ d

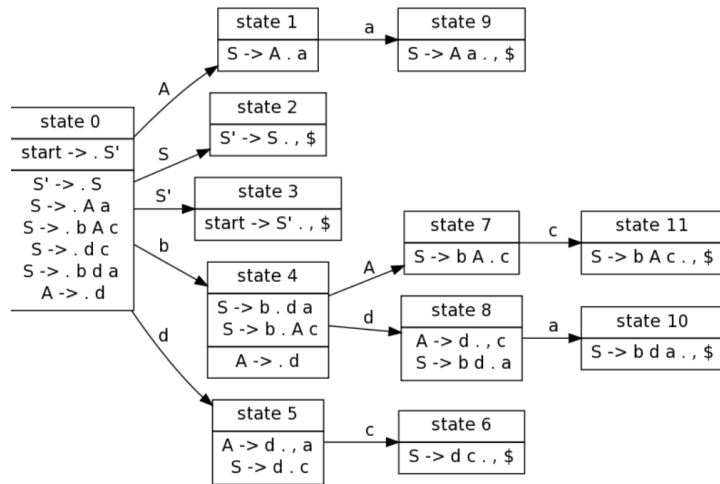
String rejected

Ejercicio 4 Comprueba que la siguiente gramática es LALR(1) pero no SLR:

$S' \rightarrow S$

$S \rightarrow Aa \mid bAc \mid dc \mid bda$

$A \rightarrow d$



Grammar

$S' \rightarrow S$
 $S \rightarrow Aa$
 $\mid bAc$
 $\mid dc$
 $\mid bda$
 $A \rightarrow d$

LALR(1) Table

	S	d	a	b	c	S'	S	A
0		s5		s4		s3	s2	s1
1			s9					
2	r(S' → S)							
3	acc							
4		s8						s7
5			r(A → d)		s6			
6	r(S → dc)							
7					s11			
8			s10		r(A → d)			
9	r(S → Aa)							
10	r(S → bda)							
11	r(S → bAc)							

It is LALR(1).

Grammar	
$S' \rightarrow S \cdot$	
$S \rightarrow A a$	
$b A c$	
$d c$	
$b d a \cdot$	
$A \rightarrow d \cdot$	

LR(0) Table

	S	d	a	b	c	S'	S	A
0		s5		s4		s3	s2	s1
1			s9					
2	$r(S' \rightarrow S)$	$r(S' \rightarrow S)$	$r(S' \rightarrow S)$	$r(S' \rightarrow S)$	$r(S' \rightarrow S)$			
3	acc	acc	acc	acc	acc			
4		s8						s7
5	$r(A \rightarrow d)$	$r(A \rightarrow d)$	$r(A \rightarrow d)$	$r(A \rightarrow d)$	$r(A \rightarrow d)/s6$			
6	$r(S \rightarrow d c)$	$r(S \rightarrow d c)$	$r(S \rightarrow d c)$	$r(S \rightarrow d c)$	$r(S \rightarrow d c)$			
7					s11			
8	$r(A \rightarrow d)$	$r(A \rightarrow d)$	$r(A \rightarrow d)/s10$	$r(A \rightarrow d)$	$r(A \rightarrow d)$			
9	$r(S \rightarrow A a)$	$r(S \rightarrow A a)$	$r(S \rightarrow A a)$	$r(S \rightarrow A a)$	$r(S \rightarrow A a)$			
10	$r(S \rightarrow b d a)$	$r(S \rightarrow b d a)$	$r(S \rightarrow b d a)$	$r(S \rightarrow b d a)$	$r(S \rightarrow b d a)$			
11	$r(S \rightarrow b A c)$	$r(S \rightarrow b A c)$	$r(S \rightarrow b A c)$	$r(S \rightarrow b A c)$	$r(S \rightarrow b A c)$			

SLR(1) Table

	S	d	a	b	c	S'	S	A
0		s5		s4		s3	s2	s1
1		s9						
2	$r(S' \rightarrow S)$							
3	acc							
4		s8						s7
5		$r(A \rightarrow d)$			$r(A \rightarrow d)/s6$			
6	$r(S \rightarrow d c)$							
7					s11			
8		$r(A \rightarrow d)/s10$			$r(A \rightarrow d)$			
9	$r(S \rightarrow A a)$							
10	$r(S \rightarrow b d a)$							
11	$r(S \rightarrow b A c)$							

The grammar is not LR(0) because:

- shift/reduce conflict in state 5.
- shift/reduce conflict in state 8.

Neither is it SLR(1) because:

- shift/reduce conflict in state 5.
- shift/reduce conflict in state 8.

Utiliza el analizador LALR(1) para construir el árbol sintáctico de bd

JFLAP : <untitled1>
File Input Test Convert Help
Editor Build SLR(1) Parse SLR(1) Parsing
Table Text Size
Start Step Noninverted Tree
Input bdc
Input Remaining \$
Stack S0
LHS RHS
S' → S
S → Aa
S → bAc
S → dc
S → bda
A → d
String accepted

	a	b	c	d	\$	A	S
0		s3		s4		1	2
1	s5						
2					acc		
3				s7		6	
4	r5		r5				
5				r1			
6			s9				
7	r5		r5				
8				r3			
9				r2			
10				r4			

```
graph TD; S((S)) --- b((b)); S --- A((A)); S --- c((c)); A --- d((d));
```