# Hoja 3: Análisis sintáctico ascendente LR(0) y SLR

**Ejercicio 1** Comprueba si la siguiente gramática es LR(0):
X → Y | Z
Y → aYb | c
Z → aZbb | d

**Grammar**

```
X → Y
  | Z .
Y → a Y b
  | c .
Z → a Z b b
  | d .
```

LR(0) Table

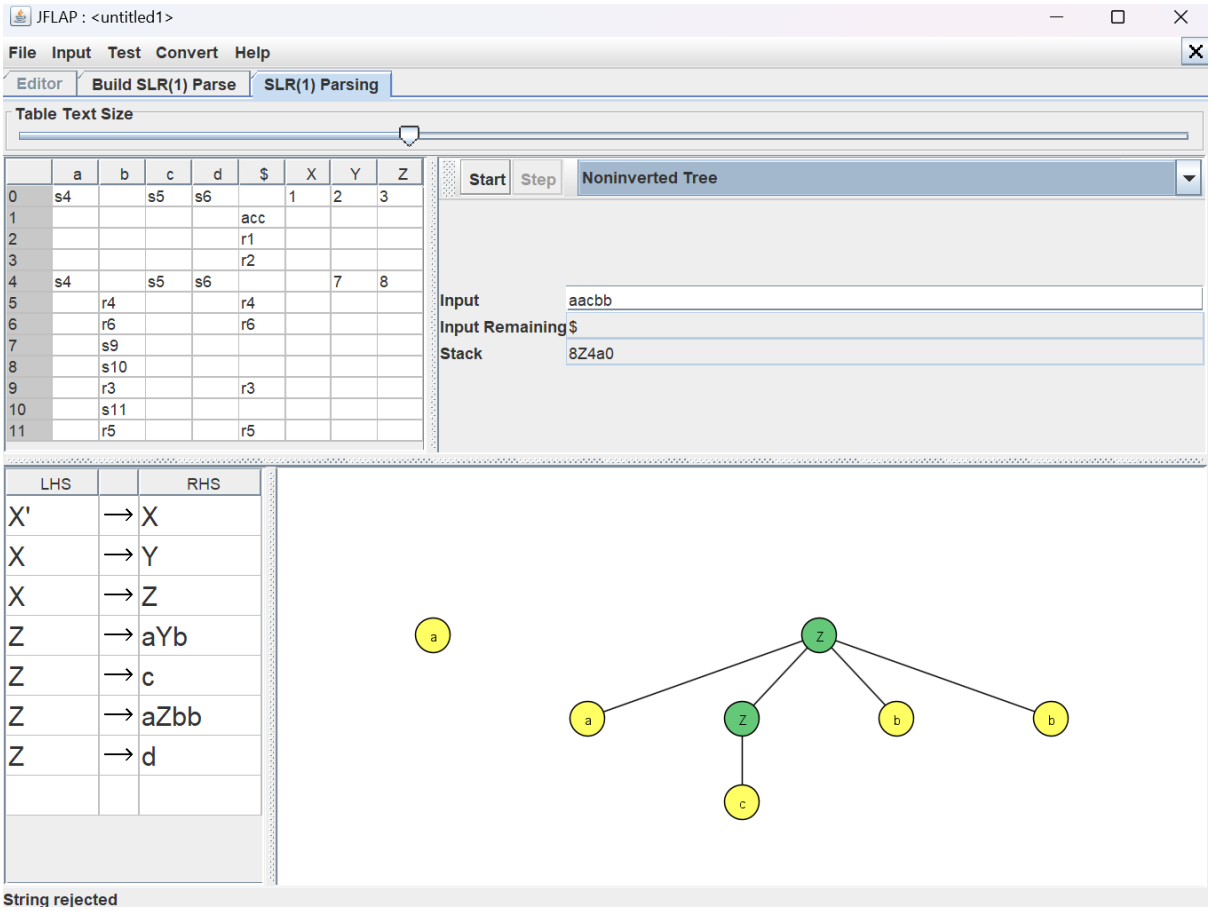
| | $ | d | b | a | c | X | Y | Z |
|---|---|---|---|---|---|---|---|---|
| 0 | | s6 | | s5 | s4 | s3 | s2 | s1 |
| 1 | r(X → Z) | r(X → Z) | r(X → Z) | r(X → Z) | r(X → Z) | | | |
| 2 | r(X → Y) | r(X → Y) | r(X → Y) | r(X → Y) | r(X → Y) | | | |
| 3 | acc | acc | acc | acc | acc | | | |
| 4 | r(Y → c) | r(Y → c) | r(Y → c) | r(Y → c) | r(Y → c) | | | |
| 5 | | s6 | | s5 | s4 | | s8 | s7 |
| 6 | r(Z → d) | r(Z → d) | r(Z → d) | r(Z → d) | r(Z → d) | | | |
| 7 | | | s10 | | | | | |
| 8 | | | s9 | | | | | |
| 9 | r(Y → a Y b) | r(Y → a Y b) | r(Y → a Y b) | r(Y → a Y b) | r(Y → a Y b) | | | |
| 10 | | | s11 | | | | | |
| 11 | r(Z → a Z b b) | r(Z → a Z b b) | r(Z → a Z b b) | r(Z → a Z b b) | r(Z → a Z b b) | | | |

SLR(1) Table

| | $ | d | b | a | c | X | Y | Z |
|---|---|---|---|---|---|---|---|---|
| 0 | | s6 | | s5 | s4 | s3 | s2 | s1 |
| 1 | r(X → Z) | | | | | | | |
| 2 | r(X → Y) | | | | | | | |
| 3 | acc | | | | | | | |
| 4 | r(Y → c) | | r(Y → c) | | | | | |
| 5 | | s6 | | s5 | s4 | | s8 | s7 |
| 6 | r(Z → d) | | r(Z → d) | | | | | |
| 7 | | | s10 | | | | | |
| 8 | | | s9 | | | | | |
| 9 | r(Y → a Y b) | | r(Y → a Y b) | | | | | |
| 10 | | | s11 | | | | | |
| 11 | r(Z → a Z b b) | | r(Z → a Z b b) | | | | | |

The grammar is LR(0).

En caso de serlo, utiliza el analizador LR(0) resultante para analizar la palabra *aacbb*.




**Ejercicio 2** Comprueba si la siguiente gramática es SLR:
S’ → S
S → V = S | S + P | P
P → (S) | id
V → id

(en calgary el “=” me da error, como se solucionaria este problema?)

**Grammar**

```
S' → S .
S → V = S
  | S + P
  | P .
P → ( S )
  | i .
V → i .
```

# Line 1: ignoring bad character '='.

The grammar is ambiguous. Some sentences with ambiguous derivation: i i + i.

Some sentences generated by this grammar: {i, i i, i + i, i i i, ( i ), ( i i ), i i + i, i ( i ), (

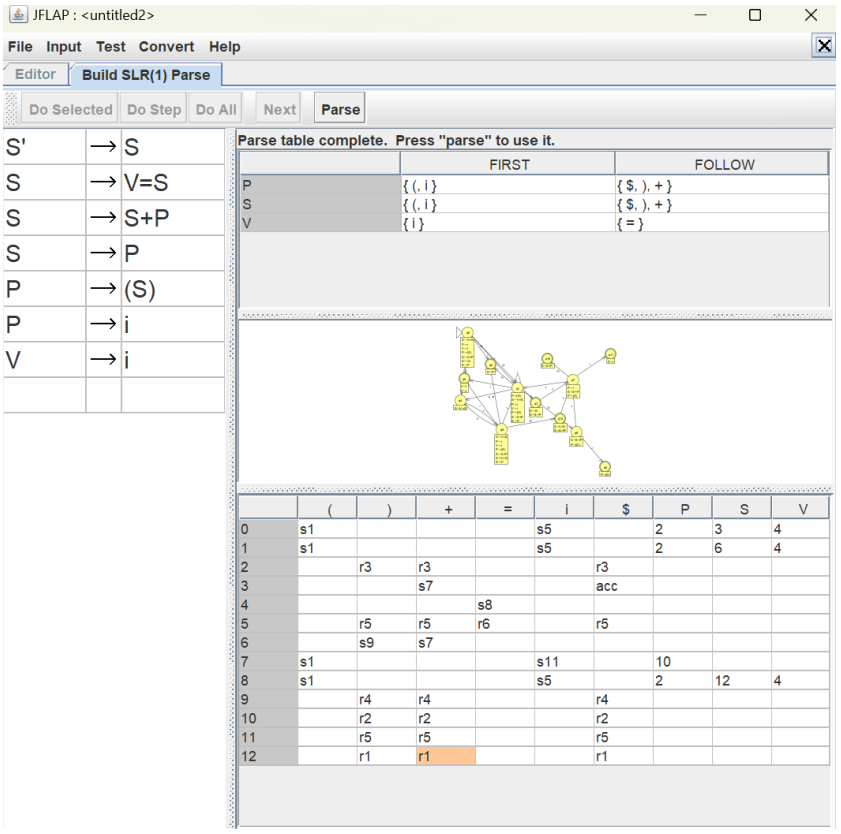
- All nonterminals are reachable and realizable.
- There are no nullable nonterminals.
- The endable nonterminals are: P S' S.
- No cycles.

| nonterminal | first set | follow set | nullable | endable |
|---|---|---|---|---|
| S' | ( i | ∅ | no | yes |
| P | ( i | + ) | no | yes |
| S | ( i | + ) | no | yes |
| V | i | ( i | no | no |

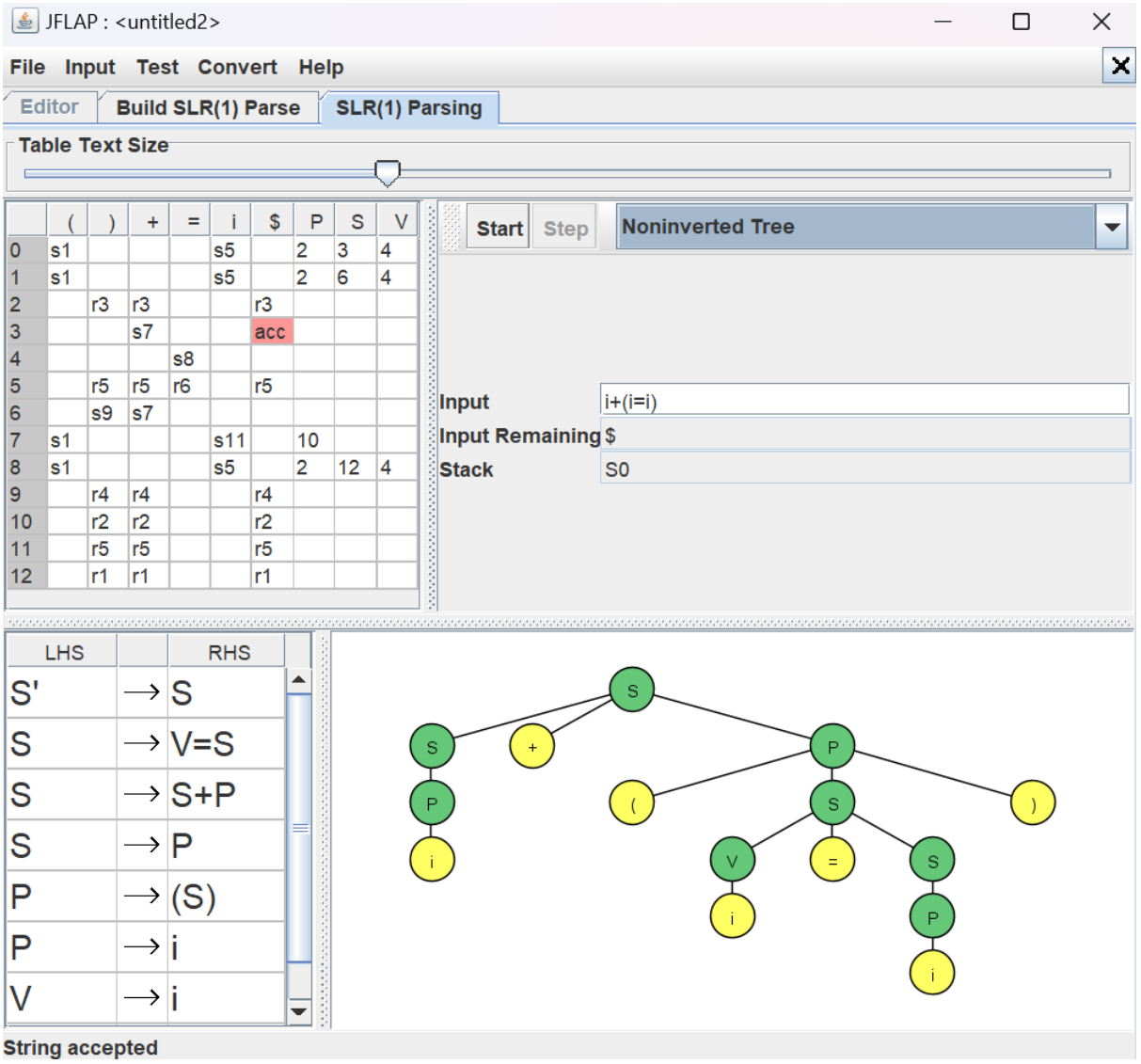
The grammar is not LL(1) because:

- S is left recursive.
- S has a first set conflict.

CORRIGIDO:



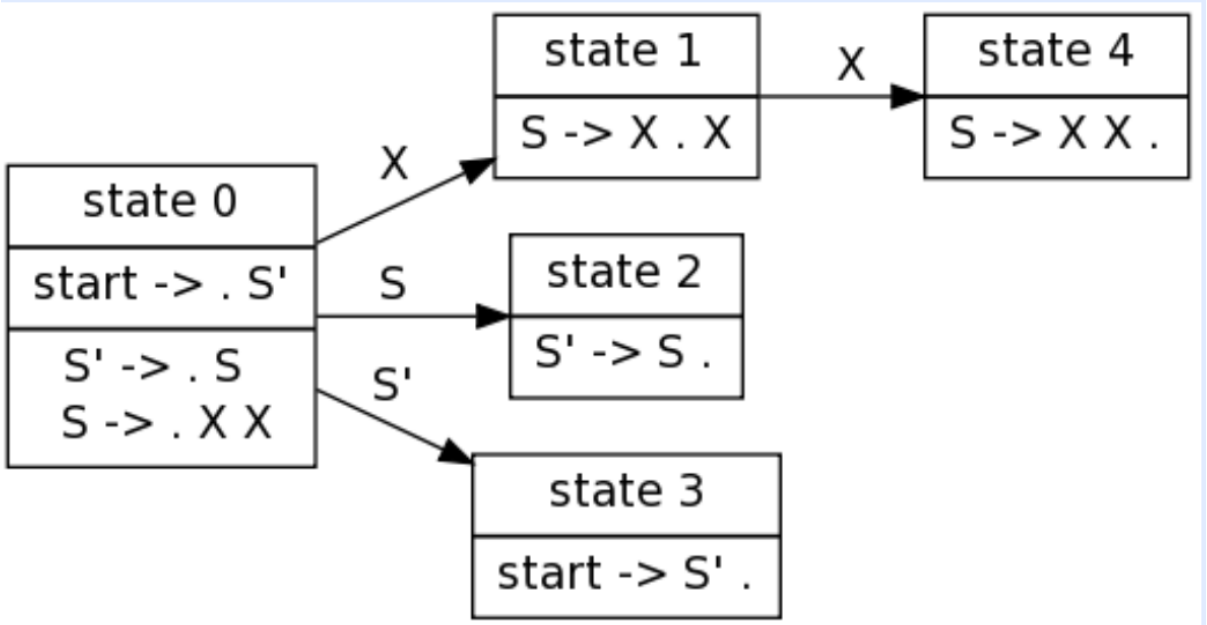
En caso de serlo, utiliza el analizador SLR resultante para analizar la palabra *id1 + (id2 = id3 )*.




| | ( | ) | + | = | i | $ | P | S | V |
|---|---|---|---|---|---|---|---|---|---|
| 0 | s1 | | | | s5 | | 2 | 3 | 4 |
| 1 | s1 | | | | s5 | | 2 | 6 | 4 |
| 2 | | r3 | r3 | | | r3 | | | |
| 3 | | | s7 | | | acc | | | |
| 4 | | | | s8 | | | | | |
| 5 | | r5 | r5 | r6 | | r5 | | | |
| 6 | | s9 | s7 | | | | | | |
| 7 | s1 | | | | s11 | | 10 | | |
| 8 | s1 | | | | s5 | | 2 | 12 | 4 |
| 9 | | r4 | r4 | | | r4 | | | |
| 10 | | r2 | r2 | | | r2 | | | |
| 11 | | r5 | r5 | | | r5 | | | |
| 12 | | r1 | r1 | | | r1 | | | |

| LHS | | RHS |
|---|---|---|
| S' | → | S |
| S | → | V=S |
| S | → | S+P |
| S | → | P |
| P | → | (S) |
| P | → | i |
| V | → | i |

**Ejercicio 3** Comprueba si la siguiente gramática es LR(0) o SLR:
S’ → S
S → XX
X → aX | b




Grammar

```
S' →S .
S → X X .
P → a X
  | b .
```

LR(0) Table

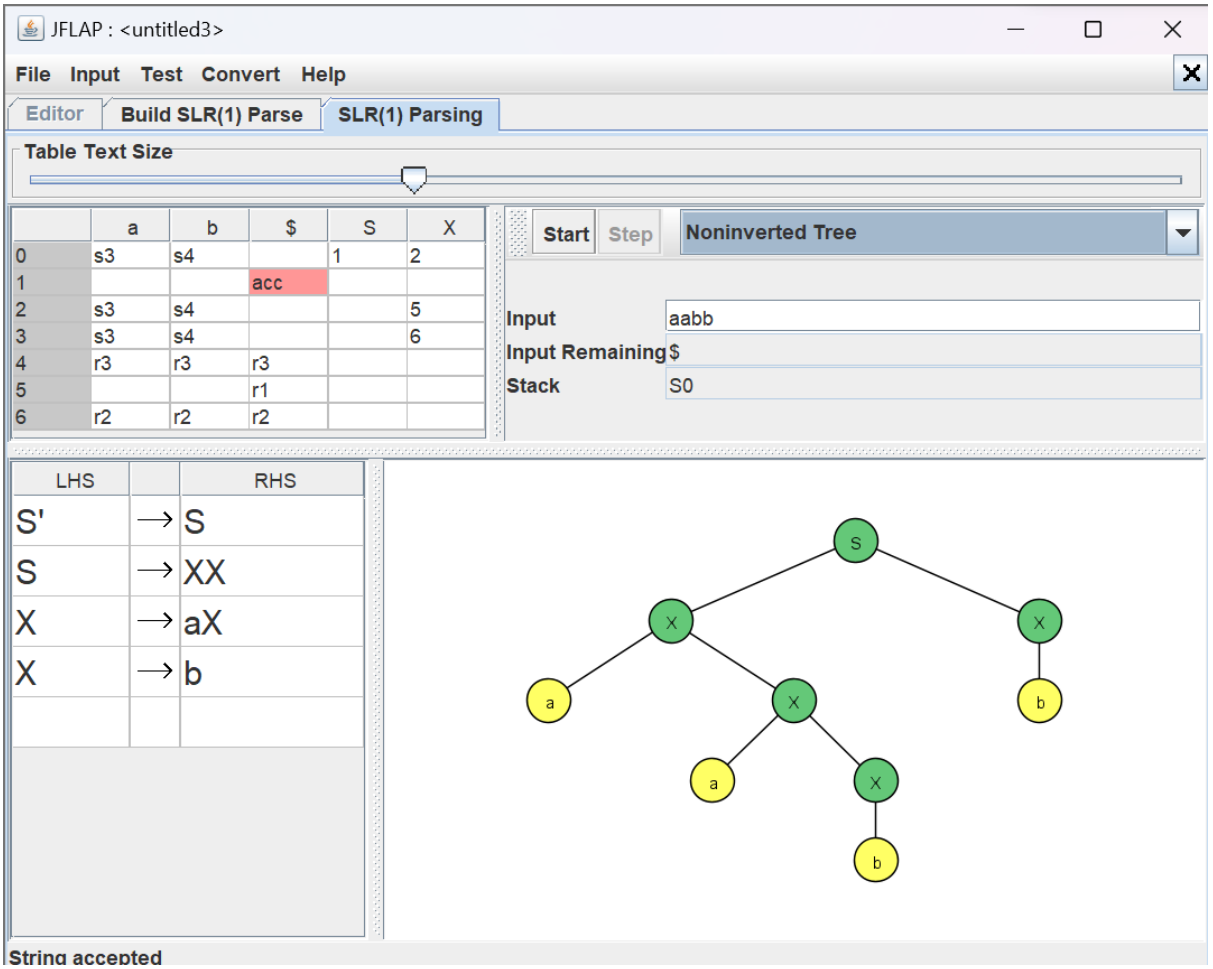
| | S | b | a | S' | S | P | X |
|---|---|---|---|---|---|---|---|
| 0 | | | | s3 | s2 | | s1 |
| 1 | | | | | | | s4 |
| 2 | r(S' → S) | r(S' → S) | r(S' → S) | | | | |
| 3 | acc | acc | acc | | | | |
| 4 | r(S → X X) | r(S → X X) | r(S → X X) | | | | |

SLR(1) Table

| | S | b | a | S' | S | P | X |
|---|---|---|---|---|---|---|---|
| 0 | | | | s3 | s2 | | s1 |
| 1 | | | | | | | s4 |
| 2 | r(S' → S) | | | | | | |
| 3 | acc | | | | | | |
| 4 | r(S → X X) | | | | | | |

The grammar is LR(0).

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



**Ejercicio 4** Comprueba si la siguiente gramática es LR(0) o SLR:
S' → S
S → Aa | bAc | dc | bda |
A → d

**Grammar**

```
S' → S .
S → A a
  | b A c
  | d c
  | b d a .
A → d .
```

LR(0) Table

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

SLR(1) Table

| | $ | 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) | | r(A → d)/s6 | | | |
| **6** | r(S → d c) | | | | | | | |
| **7** | | | | | s11 | | | |
| **8** | | | r(A → d)/s10 | | r(A → d) | | | |
| **9** | r(S → A a) | | | | | | | |
| **10** | r(S → b d a) | | | | | | | |
| **11** | r(S → 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.

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