Traductores de Lenguajes

MEMORIA FINAL

Grupo 55

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Índice

| 1 | Intr | roducción | 2 |
|----|------|------------------------------------|----|
| 2 | Dise | eño Analizador Léxico | 3 |
| | 2.1 | Tokens | 3 |
| | 2.2 | Gramática Regular | 4 |
| | 2.3 | Autómata Finito Determinista | 4 |
| | 2.4 | Acciones Semánticas | 5 |
| | 2.5 | Errores | 6 |
| 3 | Dise | eño Analizador Sintáctico | 7 |
| | 3.1 | Gramática | 7 |
| | 3.2 | Tabla LR(1) | 8 |
| 4 | Dise | eño Analizador Semántico | 11 |
| 5 | Dise | eño Tabla de Símbolos | 12 |
| 6 | Ane | exo | 13 |
| | 6.1 | Casos de prueba correctos | 13 |
| | | 6.1.1 Prueba correcta 1 | 13 |
| | | 6.1.2 Prueba correcta 2 | 16 |
| | | 6.1.3 Prueba correcta 3 | 18 |
| | | 6.1.4 Prueba correcta 4 | 20 |
| | | 6.1.5 Prueba correcta 5 | 23 |
| | 6.2 | Casos de prueba erróneos | 27 |
| | | 6.2.1 Prueba errónea 1 | 27 |
| | | 6.2.2 Prueba errónea 2 | 27 |
| | | 6.2.3 Prueba errónea 3 | 27 |
| | | 6.2.4 Prueba errónea 4 | 27 |
| | | 6.2.5 Prueba errónea 5 | 28 |
| 7 | Dise | eño Generador de Código Intermedio | 29 |
| 8 | Dise | eño Generador de Código Final | 33 |
| 9 | Dise | eño Registros de Activación | 34 |
| 10 | Refe | erencias | 35 |

1 Introducción

Hemos decidido usar, como lenguaje de programación, Python, ya que nos apetecía aprender un lenguaje nuevo, además de que es muy usado en la industria.

El trabajo completo, tanto el léxico, como el sintáctico y el semático, ha sido realizado con la herramienta o librería externa "SLY"[1].

Opciones de grupo:

- Sentencias: Sentencia repetitiva (for)
- o Operadores especiales: Post-auto-decremento (-- como sufijo)
- o Técnicas de Análisis Sintáctico: **Ascendente**
- ∘ Comentarios: Comentario de bloque (/* */)
- Cadenas: Con comillas dobles (" ")

2 | Diseño Analizador Léxico

2.1 Tokens

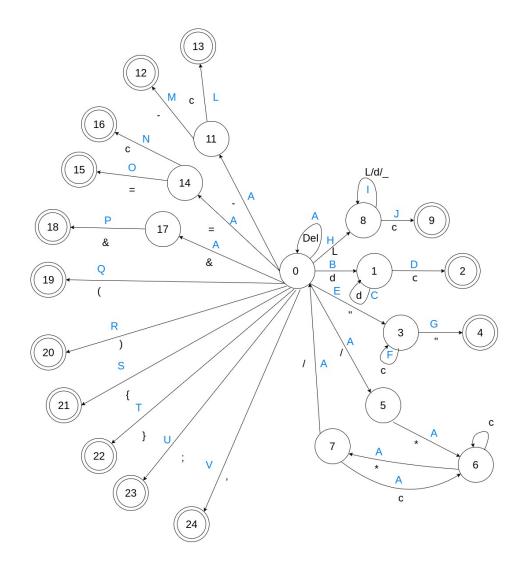
| Identificador | <ID, punteroTS $>$ |
|--|------------------------------------|
| ■ Constante entera | $<\! {\rm CTEENTERA,\ valor} \! >$ |
| ■ Cadena de caracteres | <CADENA, lexema $>$ |
| ■ false | <CTELOGICA, $0>$ |
| • true | <CTELOGICA, 1 $>$ |
| Palabra reservada Number | <NUMBER, -> |
| Palabra reservada String | <STRING, - $>$ |
| Palabra reservada Boolean | <BOOLEAN, -> |
| Palabra reservada Let | <LET $,$ - $>$ |
| Palabra reservada Alert | <ALERT, - $>$ |
| Palabra reservada Input | <INPUT, - $>$ |
| Palabra reservada Function | <FUNCTION, - $>$ |
| Palabra reservada Return | <RETURN, - $>$ |
| Palabra reservada If | <if, -=""></if,> |
| Palabra reservada For | <FOR, - $>$ |
| - | $\langle \text{OPESP}, - \rangle$ |
| - | <OPARIT $,$ - $>$ |
| ■ = | <OPASIG, - $>$ |
| ■ == | <OPREL, - $>$ |
| & & | <OPLOG, - $>$ |
| • (| <ABPAREN, -> |
| | <CEAPAREN, $>$ |
| • { | <ABLLAVE, -> |
| • } | <CELLAVE, - $>$ |
| • , | <COMA $,$ - $>$ |
| . ; | <PUNTOYCOMA, -> |
| | |

2.2 Gramática Regular

```
 \begin{array}{l} {\rm Axioma} \, = \, {\rm A} \\ {\rm A} \, \to \, {\rm del} \, {\rm A} \mid {\rm d} \, {\rm D} \mid " \, \, {\rm S} \mid / \, {\rm C} \mid {\rm l} \, {\rm I} \mid -{\rm M} \mid = {\rm E} \mid \& \, {\rm N} \mid (\mid \mid) \mid \{\mid \} \mid ; \mid , \\ {\rm D} \, \to \, {\rm d} \, {\rm D} \mid \lambda \\ {\rm S} \, \to " \mid {\rm c} \, {\rm S} \\ {\rm C} \, \to * \, {\rm C}' \\ {\rm C}' \, \to * \, {\rm C}" \mid {\rm c} \, {\rm C}' \\ {\rm C}' \, \to * \, {\rm C}" \mid {\rm c} \, {\rm C}' \\ {\rm C}' \, \to / \, {\rm A} \mid {\rm c} \, {\rm C}' \\ {\rm I} \, \to \, {\rm d} \, {\rm I} \mid {\rm l} \, {\rm I} \mid {\rm A} \\ {\rm M} \, \to \, - \mid \lambda \\ {\rm E} \, \to \, = \mid \lambda \\ {\rm N} \, \to \, \& \end{array}
```

Siendo d un dígito, l una letra, c cualquier otro carácter y del un delimitador.

2.3 Autómata Finito Determinista



2.4 Acciones Semánticas

```
A: leer
B: number = int(d), leer
C: number = number * 10 + int(d), leer
D: if number > 32767
    pError("Número fuera de rango")
  else
    genToken(CTEENTERA, number);
E: string = "", contador = 0, leer
F: string = string + otroCS, contador++, leer
G: if contador > 64
    pError("Cadena demasiado larga")
  else
    genToken(CADENA, string)
  leer
H: string = l, leer
I: string = string + l/D/_, leer
J: if palabrasReservadas.contains(string)
    if string == "number"
      genToken(NUMBER, -)
    elif string == "string"
      genToken(STRING,-)
    elif string == "boolean"
      genToken(BOOLEAN, -)
    elif string == "let"
      genToken(LET, -)
    elif string == "alert"
      genToken(ALERT, -)
    elif string == "input"
      genToken(INPUT, -)
    elif string == "return"
      genToken(RETURN, -)
    elif string == "if"
      genToken(IF, -)
    else
      genToken(FOR, -)
```

```
// palabrasReservadas.contains(string) = False
    puntero = TS.get(string)
    if zona decl == True
      if puntero!= None
        pError("Identificador ya declarado")
      else
        TS.update(string)
        puntero = TS.get(string)
        genToken(ID, puntero)
    else
      if puntero == None
        TS.update(string)
        puntero = TS.get(string)
        genToken(ID, puntero)
      else
        genToken(ID, puntero)
L: genToken(OPARIT, -)
M: genToken(OPESP, -), leer
N: genToken(OPASIG, -)
O: genTokeN(OPREL, -), leer
P: genToken(OPLOG, -), leer
Q: genToken(ABPAREN, -), leer
R: genToken(CEPAREN, -), leer
S: genToken(ABLLAVE, -), leer
T: genToken(CELLAVE, -), leer
U: genToken(COMA, -), leer
V: genToken(PUNTOYCOMA, -), leer
W: genToken(EOF, -), leer
```

2.5 Errores

Error léxico (siempre se lanza cuando el analizador léxico encuentra un error).

- 1. Cadena con longitud mayor de 64 caracteres.
- 2. Número fuera de rango (mayor de 32767).
- 3. Identificador ya declarado.
- 4. Carácter ilegal.

Todo error va acompañado de la *linea* y columna en el que se ha encontrado dicho error.

3 Diseño Analizador Sintáctico

3.1 Gramática

Axioma = B

```
No Terminales = { A B C D E F G H I J K L M N O P Q R S T U V W F1 F2 F3 }
Terminales = \{\&\& == - -- () = , ; \text{ id ent cad log let alert input return for if number } \}
                       boolean string function }
Producciones = {
                                                                               O \rightarrow \lambda
             B \to D
             D \to F D
                                                                               C \to G C
             \mathrm{D} \to \mathrm{G}\;\mathrm{D}
                                                                               C \to \lambda
             \mathrm{D} \to \lambda
                                                                               F \to F1~F2~F3
             G \rightarrow if (E) S
                                                                               F1 \rightarrow function P Q id
             \mathbf{G} \to \mathbf{S}
                                                                               P \rightarrow \lambda
             S \rightarrow H;
                                                                               Q \to T
             H \rightarrow id (I)
                                                                               Q \to \lambda
             I \to E \; J
                                                                               F2 \rightarrow (A)
                                                                               \mathbf{A} \to \mathbf{T}id AA
             I \rightarrow \lambda
             J \rightarrow , E J
                                                                               A \rightarrow \lambda
             J \to \lambda
                                                                               AA \rightarrow T id AA
             S \to K;
                                                                               AA \rightarrow \lambda
                                                                               F3 \rightarrow C
             K \rightarrow id = E
             S \rightarrow alert (E);
                                                                               E \rightarrow E \&\& R
             S \rightarrow input (id);
                                                                               E \to R
             S \rightarrow return L;
                                                                               R \rightarrow R == U
                                                                               \mathrm{R} 	o \mathrm{U}
             L \to E
                                                                               U \rightarrow U - V
             L \to \lambda
                                                                               \mathrm{U} \to \mathrm{V}
             G \rightarrow let M T id ;
             M \to \lambda
                                                                               V \rightarrow -- id
             T \rightarrow number
                                                                               V \rightarrow id
             T \to boolean
                                                                               V \rightarrow (E)
             T \rightarrow string
                                                                               V \to H
             G \rightarrow for (N; E; O) C
                                                                               V \rightarrow ent
             N \to K
                                                                               V \to cad
             N \to \lambda
                                                                               V \to \log
             O \to K
             O \rightarrow -- id
}
```

3.2 Tabla LR(1)

| | | | | | | | | | | | | | | | | | | | LR tabl | Le . | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----------|-----------------|----------------------|-----------------|-----------------|----------|-----|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----|------------|-----|--------------|-------------------------|-----------------|-----------------|--------------------------|----------------|-----|-------|-------------|------|----------------|-----|--------|--------|-----|------|----|----------|-------|-------|---------------|----------------|---------------|-----------|-----------|
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| | | H | r46 | | | | | | | | | | | | | | 7 | 7 | | | r ₄₆ | 5113 | - | | + | Ħ | + | + | \top | | | + | - | | Н | H | H | H | \vdash | Ŧ | | \exists | |
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| _ | _ | | 9115 r ₅₀ | - | 859 | - | | - | | - | - | - | | - | - | | | 88 | | 50 | r ₅₀ | | 62 863 86 | 4 | ₩ | H | | 1 | \square | _ | | - | - | - | H | 4 | | - | 1 | | 116 | 5.0 | 5.6 |
| | | | r ₅₂ | | 203 | | | | | | | | | + | | | 8 | | | 52 | r ₅₂ | | 22 203 80 | + | + | Ħ | - 0 | | H | | | + | + | + | Н | H | H | Ħ | \vdash | + | 110 | - | - |
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| | | | rss | | | | | | | | | | | | | | | | | | r ₅₅ | | | | | | | | | | | | | | | | | | | | | | |
| - | _ | H | | 5118 | s117 | | | - | | - | - | | | - | - | | - | _ | | | | - | | + | - | H | 4 | _ | \blacksquare | _ | | + | + | - | H | 4 | H | H | # | - | | | |
| | | | | r ₂₅ | | | | 1 | | | | | | | | | | | | | | | - | + | + | + | | | | | | + | - | + | | | | Н | | | | | |
| | | H | | r ₂₆ | | | | | | | | | | | | | | | | | | | | 1 | 1 | Ħ | | | П | | | 7 | | | Н | T | H | Н | rt | | | \dashv | |
| | | | | | | | s45 | | | | | | | | | | | | | | | | | | ΪĹ | | | | | | | İ | | | | | | | | | | | |
| | | H | | - | s119 | | | - | | | | | | | | | | | | [| | | + | - | 1 | H | | | | | 1 | 1 | - | - | | H | | | | | | | |
| - | | - | | + | r ₃₅ | - | | - | | - | | - | | - | - | | - | - | | | | - | | + | ₩ | H | - | - | \vdash | _ | | + | + | - | H | 4 | H | | + | - | \vdash | \dashv | |
| | - | H | 51 | 20 | r ₃₆ | | | - | | | | | | | - | | - | - | | 111 | | - | - | - | ₩ | H | + | - | + | _ | | + | - | - | H | | H | + | + | # | H | \dashv | |
| r ₁₆ | | | 31 | 21 | | | | | | | | | | | | | | | | | | | | T | | | | | | | | | | | | | | | d | | | | |
| r ₁₆ | 5 | r ₁₆ | | | r ₁₆ | | | r ₁₆ | r ₁₆ | r ₁₆ | r ₁₆ | | | | r ₁₆ | | | 2 | 16 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 839 839 | + | s38 | | | - | | - | | | | | | | 3 | 37 | | | | | 841 842 84 841 842 84 | | | | 4 | 0 | \square | | | - | - | - | | ŖĘ. | | | - | | | 122 | 35 123 |
| | | | 839 839 | + | s38 s38 | | | | | | | | | | | | | 37 | | | | | 341 342 34 341 342 34 | | ₩ | H | | 0 | + | | | + | - | - | H | ₽ | | | | + | \vdash | = | 123 |
| | | | | r49 | | | | | | | | | | | | | | | | r ₄₉ | r ₄₉ | | | | Ì | | | | | | | Ť | | | | | | | | | | | |
| -0.4 | 4 | | 90 | | s 89 | | | | | | | | | | | | s | 88 | | | | | 92 893 89 | 4 | | | 9 | 1 12 | 5 | | | | | | | | | | | | 83 | 85 | 86 |
| s84 | = | $\overline{}$ | 313 | | | | | | | | | | | | | | | | | 3111 | | | | | | | | | | | _ | | | | | | | | $\overline{}$ | = | _ | | |

| 00 | 0121 | | | 2120 | | | _ | | | _ | - | _ | | - | 0120 | | | | | | _ | 120 | | | | | | | | 1-1- | | _ |
|--|--|--|---|--|---|---|---|----------------------------------|--------|-------------------|--|-----------------|------------|------------------------------|---|--|---|---------|-----|---------|----------|----------------|----------------|-----|---------------|------|----|---------|----------|----------|--------------|----------|
| 83 | 8131 | r ₁ ; | 1 | 8130 | | _ | + | | - | | Н | | | _ | 8129 | | | ++ | ╁ | | - | 128 | | | | | | +++ | \vdash | - | ┰ | \vdash |
| 85 | r ₄₄ | | | r44 | | | | | | | | | | | r ₄₄ 3 | 132 | | | | | | | | | | | | | | | | |
| 86 | r46 | | | r46 | | | | | | | | | | | r ₄₆ r | | | | | | | | | | | | | | | | | |
| 87 | r ₄₈ | | | r48 | | | - | | | | | | | | r ₄₈ r | 48 r ₄ | | | Щ | \perp | _ | \perp | \sqsubseteq | | | | | \perp | Щ. | ш | \perp | 느 |
| 88 | r ₅₀ | 8135 | 3 | 134 r ₅₀ | | | - | | | | | - | | | r ₅₀ r | 50 r- | - | ++ | ₩ | - | - | + | | | | | | ++ | - | - | | |
| 90 | 00 | 560 | | 59 | | | | | | | | | s58 | | 00 | -8 | s62 s6 | 3 564 | | | 61 | | | | | | | | | 136 55 | 5 56 | 57 |
| 91 | r ₅₂ | | | r ₅₂ | | | | | | | | | | | r ₅₂ r | | | | | | | | | | | | | | | | | |
| 92 | r ₅₃ | | | r ₅₃ | ₩. | | | | | _ | | | | | r ₅₃ r | | | \perp | Щ | | _ | | \sqsubseteq | | | | | | Щ. | Щ | | 느 |
| 93 94 | r ₅₄ | | | r ₅₄ | - | | + | \vdash | _ | - | Н | - | _ | - | r ₅₄ r | | | ++ | + | | - | + | $\vdash\vdash$ | | | | | + | \vdash | ₩ | + | \vdash |
| 95 | r ₅₅ | | r ₁₃ | rss | | _ | + | ╁ | _ | - | Н | - | _ | - | r ₅₅ r s76 | 55 -5 | | ++- | | - | - | + | | | | | | | - | ₩ | | \vdash |
| 96 | | | -13 | _ | | | _ | | | _ | Н | 3 | 137 | _ | | | | - | | - | _ | \top | | | | | | 1 | \vdash | | - | Н |
| 97 | s98 | 899 | 3 | 16 | 81 | .05 8106 | s107 | s101 | | | s102 | | | | | | | | | 97 100 | 103 | | 104 | | 1 | .38 | | | | | | |
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| 99 100 | re | r ₅ | r | | rs | rs | rs | rs | | _ | rs | - | | | - | - | _ | ++ | ₩ | + | - | + | | | | ₩ | | | \vdash | \vdash | +- | Н |
| 101 | 923 | | | | | | Ť | | | | | | | | | | | | | | | | | 140 | | | | | | | | |
| 102 | | 5141 | | | | | | | | | | | | | | | | | | | | \blacksquare | | | | | | | | | | |
| 103 | - | | 8142 8143 | _ | | _ | + | + | _ | - | Н | - | _ | - | | - | - | ++- | | - | - | + | | | | | | | - | ₩ | | \vdash |
| 105 | | 8144 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 106 | | s145 | | 0.0 | | | | | | | | \blacksquare | -05 | | | | 262 | 2 42 | | | 40 | | | | | | | 40 | H | 22 5 | | - |
| 107 | 833 | 839 | 8 | 38 | | _ | + | | | | | r ₃₇ | s37 | | | | 841 84 | 2 513 | ╁╟╁ | | 40 | - | 146 | | | | | | + | 34 34 | 4 35 | 30 |
| | 8149 | | | 8148 | | | | | | | | - | | | | | | | | | | | | | | | | | 147 | \Box | | |
| 110 | | | | 16 | 31 | 3 814 | 815 | | | | | | | | | | | | | 150 | | | 12 | | | | | | | | | |
| 111 | | a60 a60 | | 59 59 | - | | - | + | | | | - | a58 | - | H | | 562 56 562 56 | | +++ | | 61 61 | - | | | | | | ## | + | 15 | 51 56 152 | 57 |
| 113 | | 860 | 3 | 59 | | | | | | | | | 358 | | | | 862 86 | 3 864 | | | 61 | | | | | | | | | | | 153 |
| 114 | | r ₄ | | | | | | | | | | | | | r ₄₉ r | 49 r ₄ | | | | | | | | | | | | | | | | |
| 115 116 | | 890 | | 89 | | | | | | | | | 888 | | 8111 | | 892 89 | 3 894 | | | 91 15 | 4 | | | | ₩ | | + | - | 83 85 | 86 | 87 |
| 117 | | | 5156 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 118 | | 839 | 8 | 38 | | | | | | | | \Box | s37 | | | | 841 84 | 2 843 | | | 40 | | | | | | | | | 157 34 | 4 35 | 36 |
| 119 | | r ₃₃ | 8158 | | | - | - | | | | | - | | | | | | ++ | | + | - | - | | | | | | ++ | - | \vdash | + | |
| 121 | | | 8159 | | | | | | | | | | | | | | | | | | T | | | | | | | | | | | |
| 122 | | | r43 | | | | | | | | | | | | r ₄₃ s | | | | | | | | | | | | | | | | | |
| 123 124 | | + | r45 | _ | \vdash | | - | \vdash | _ | - | \vdash | \vdash | _ | | r ₄₅ r | | | + | | \bot | - | + | \vdash | | | | | + | - | ₩ | | \vdash |
| 125 | | 31 | r ₄₇ | - | \vdash | _ | + | | - | - | \vdash | \vdash | _ | - | r ₄₇ r | 47 -4 | | ++ | ╁┼┼ | + | - | + | | | | | | + | \vdash | \vdash | + | \vdash |
| 126 | | | r ₅₁ | | | \neg | | | | | П | | | | r ₅₁ r | 51 r ₅ | | | | | T | | | | | | | | | | | |
| 127 | İ | | r ₇ | | | \equiv | Ť | ΤÏ | Ĭ | T T | ī | ΞĬ | | ĺ | ΪÏ | T | | Ť | TT | | ΞĒ | T | | | | TT | TT | TT | TT | | 一一 | Ε |
| 128 | | r _e | | Ì | | | İ | | | | | | | | | | | | | | | | | | | | | | | | | |
| 129 | | 890 | | 89 | \vdash | \rightarrow | | | | _ | \blacksquare | | s88 s88 | | | _ | 892 89 892 89 | | | | 91 | - | | | - | | | + | 4 | 162 8 | 61 86 | |
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| 132 | | 890 | 3 | 89 | | | | | | | | | 588 | | | | 592 59 | | | | 91 | | | | | | | | | | 163 | 87 |
| 133 134 | | 890 | 3 | 89 | | - | - | \vdash | | - | Н | \vdash | 888 | | | | 392 39 | 3 394 | | | 91 | - | \vdash | | \rightarrow | | | + | - | ₩ | | 164 |
| 135 | | 890 | - 3 | r ₄₉ | | \rightarrow | - | | | - | Н | | 888 | - | r ₄₉ r | 49 -4 | | 22 000 | | | | | | | | | | | ++ | 83 8 | 5 86 | 87 |
| 136 | | 81 | | | | | | | | | | | | | | | | | | | 91 16 | | | | | —iii | | | | i i | | |
| 137 | | | | | | | | | | | | | | | s111 | | 892 89 | 3 334 | | | 91 16 | 00 | | | | | | | | | | |
| 138 139 | | r ₄₂ | | 42 | r ₄ | 2 r ₄₂ | r ₄₂ | r ₄₂ | | | r ₄₂ | | | r ₄₂ | 8111 | | | 3 551 | | | 91 16 | 0.5 | | | | | | | Ħ | | | |
| 140 | - | | r | | r ₄ | 2 r ₄₂ | r ₄₂ | r ₄₂ | | | r ₄₂ | r | 30 | | s111 | | 892 89 | | | | | | | | | | | | | 167 5 | 5 56 | 57 |
| | | r ₄₂ | r | 59 | F4 | 2 r ₄₂ | r ₄₂ | | 51 852 | 353 | r ₄₂ | r | | | s111 | | | | | | 61 | | | 168 | | | | | | 167 5 | 5 56 | 57 |
| 141 | s68 | 860 | s s | 59 | | | | 3 | 51 852 | 953 | | r | 30 | | s111 | | 892 89 | | | | | | 67 | | 169 | | | | | 167 5 | 5 56 | 57 |
| 141 | s68 r ₆ | 860 r ₆ | s s | 59 69 6 | r ₆ | r ₆ | r ₆ | r ₆ | 51 852 | 853 | re | r | 30 | | s111 | | 892 89 | | | | | | 67 | | 169 | | | | | 167 5 | 5 56 | 57 |
| 141 142 143 | ## ## ## ## ## ## ## ## ## ## ## ## ## | 860 | s s | 59 | | r ₆ | r ₆ | 3 | 51 852 | 853 | | r | 30 | r ₄₂ | 8111 | | 892 89 | 53 864 | | | | | 67 | | 169 | | | | | 167 5 | | |
| 141 142 143 144 145 | s68 r ₆ r ₁₂ | | | 59 69 6 | r ₆ | r ₆ | r ₆ | r ₆ | 51 852 | 853 | re | | 30 858 | r ₄₂ | 8111 | | 892 89 | 53 864 | | | 61 | | 67 | | 169 | | | | | | | |
| 141 142 143 144 145 146 | s68 r ₆ r ₁₂ | r ₆ r ₁₂ s60 | | 59 69 6 | r ₆ | r ₆ | r ₆ | r ₆ | 51 952 | 853 | re | r, | 30 858 | r ₄₂ | 8111 | | 892 89 | 53 864 | | | 61 | | 67 | | L69 | | | | | | | |
| 141 142 143 144 145 146 | s68 r ₆ r ₁₂ | | | 59 69 6 | r ₆ | r ₆ | r ₆ | r ₆ | | | re | r | 30 858 | r ₄₂ | 8111 | | 892 89 | 53 864 | | | 61 | | 67 | | L69 | | | | | | | |
| 141 142 143 144 145 146 147 148 | s68 r ₆ r ₁₂ | | x x x x x x x x x x | 59 69 6 12 59 171 | r ₆ | r ₆ | r ₆ | r ₆ | 51 852 | 953 953 953 | r ₆ | F 1 | 30 858 | F42 | 9111 | | 892 89 | 53 864 | | | 61 | | 67 | | L69 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 | s68 r ₆ r ₁₂ | | | 59 69 6 12 59 171 | r ₆ | r ₆ | r ₆ | r ₆ | | | re | | 30 858 | F42 | | | 892 89 | 53 864 | | | 61 | | 67 | | 169 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 | | | | 59 69 6 12 59 171 | r ₆ | r ₆ | r ₆ | r ₆ | | | r ₆ | | 30 858 | F42 | r ₄₃ 5 | | 862 86 862 86 | 53 864 | | | 61 | | 67 | | 169 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 | | | | 59 69 6 12 59 171 | r ₆ | r ₆ | r ₆ | r ₆ | | | r ₆ | | 30 858 | F42 | r ₄₃ 5 | 45 81 | \$92 \$1 | 53 864 | | | 61 | | 67 | | 169 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 | ## ## ## ## ## ## ## ## ## ## ## ## ## | | | 59 69 6 12 59 171 | r ₆ | r ₆ | r ₆ | r ₆ | | | r ₆ | | 30 858 | F42 | r ₄₃ 5 | 45 81 | \$92 \$1 | 53 864 | | | 61 | | 67 | | 1.69 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 | ## ## ## ## ## ## ## ## ## ## ## ## ## | | 9 9 172 8 9 172 8 9 173 8 9 174 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 59 69 6 12 59 171 | r ₆ | r ₆ | r ₆ | r ₆ | | | r ₆ | | 30 858 | F42 | r ₄₃ 5 | 45 S1 | 592 50 10 10 10 10 10 10 10 | 53 864 | | | 61 | | 67 | | 1.69 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 | ### ################################## | s60 | | 59 69 6 12 59 171 | Γ _ε Γ _ε | r ₆ | Ye6 F12 | r ₆ r ₁₂ | | | r ₆ | | 30 858 | F42 | r43 5 r45 r | 45 S1 | 592 50 10 10 10 10 10 10 10 | 53 864 | | | 61 | | 67 | | 169 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 | ### ################################## | s60 | | 59 69 6 12 59 171 4 4 19 19 19 | r ₆ | r ₆ 2 r ₁₂ | r ₆ r ₁₂ r ₄ | r ₆ r ₁₂ s | | | r ₆ | | 30 858 | £42 | r43 s | 45 S1 | 592 50 10 10 10 10 10 10 10 | 53 864 | | | 61 | | 67 | | 169 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 | | Fe Square Fig. 1 | | 59 69 6 12 59 171 4 4 | r ₄ | r ₆ 2 r ₁₂ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ | | | r ₆ r ₁₂ r ₄ | | 30 858 | F42 | r43 5 r45 r | 45 S1 | 592 50 10 10 10 10 10 10 10 | 53 864 | | | 61 | | 67 | | | | | | | | | |
| 141 142 143 144 145 146 147 148 150 151 152 153 154 155 156 157 158 | | Fe Square Fig. 1 | | 59 69 6 12 59 1771 4 4 19 19 14 15 15 16 16 16 16 16 16 16 16 16 16 16 16 16 | r ₄ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E42 E44 E19 E19 E16 | T43 5 T45 T47 T | 45 81 47 r ₄ 51 r ₅ 7 r ₇ | 592 5 1 1 1 1 1 1 1 1 1 | 53 864 | | | 61 | | 67 | | | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 158 158 158 158 159 160 161 | ### ################################## | Fe Square Fig. 1 | | 59 69 6 112 559 1171 1171 1171 1171 1171 1171 1171 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E44 E44 E19 E14 E15 | F43 9 F46 F F47 F F51 F F76 F F77 F F43 9 F | 45 81 47 r4 51 r5 7 r7 132 | 592 5 1 1 1 1 1 1 1 1 1 | 53 864 | | | 61 | | | | 1.69 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 | ### ################################## | Fe Square Fig. 1 | | 59 69 6 6 12 559 1771 4 4 15 19 14 15 8 136 6 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E42 E44 E45 E46 E19 | T43 9 7 447 T 51 | 45 81 47 r ₄ 51 r ₅ 7 r ₇ 132 | 952 952 95 | 53 864 | | | 61 | 176 | | | 1.69 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 155 154 155 157 168 159 160 161 | ### ### #### ######################### | Fe Square Fig. 1 | | 59 69 69 6 6 112 2 1559 1771 1 14 4 15 15 15 15 15 15 15 15 15 15 15 15 15 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E44 E44 E19 E14 E15 | | 45 81 47 r4 51 r5 7 r7 132 | 992 93 93 | 53 864 | | | 61 | | | | 65 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 164 165 | ### ################################## | Fe Square Fig. 1 | | 59 59 68 68 68 68 68 112 58 171 17 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E42 E44 E44 E44 E45 | F40 5 F46 F F47 F F48 5 F47 F F48 5 F47 F F48 7 F F48 7 F F48 7 F F49 | 45 81 47 r ₄ 51 r ₅ 7 r ₇ 132 45 81 47 r ₄ | 992 93 93 93 93 93 93 93 93 93 93 93 93 93 | 53 864 | | | 61 | | | | 650 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 164 165 | ### ################################## | G | | 59 69 69 69 69 60 60 60 60 60 60 60 60 60 60 60 60 60 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E4 E4 F19 E14 F15 | F43 8 F45 F47 F51 F43 F45 F47 F51 F45 F47 F51 F45 F47 F45 F47 F51 F45 F47 F45 F47 F45 F47 F51 F51 F51 F51 F51 F51 F51 F51 F51 F51 | 45 81 74 51 74 51 75 77 77 77 74 74 74 74 74 74 75 75 75 75 75 75 75 75 75 75 75 75 75 | 992 93 93 93 93 93 93 93 93 93 93 93 93 93 | 53 864 | | | 61 | | | | | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 160 161 162 163 164 165 166 166 167 | ### ################################## | F6 F12 F44 F14 F15 F15 F15 F15 F15 F15 F15 F15 F15 F15 | | 59 69 69 6 6 112 59 171 4 4 1 15 15 15 15 15 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E4 E4 F19 E14 F15 | F40 5 F46 F F47 F F48 5 F47 F F48 5 F47 F F48 7 F F48 7 F F48 7 F F49 | 45 81 74 51 74 51 75 77 77 77 74 74 74 74 74 74 75 75 75 75 75 75 75 75 75 75 75 75 75 | 992 93 93 93 93 93 93 93 93 93 93 93 93 93 | 53 864 | | | 61 | | | | 169 | | | | | | | |
| 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 160 161 162 163 164 | # # # # # # # # # # # # # # # # # # # | E6 F12 F61 F | | 59 59 68 68 68 68 68 112 58 171 17 | r _ε r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ r ₁ | r ₆ 2 F ₁₂ r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ s r ₄ | F ₆ F ₁₂ F ₄ F ₁₉ F ₁₄ | r ₆ r ₁₂ s | | | F ₆ F ₁₂ F ₁₄ F ₁₉ | | 30 858 | E42 E44 E45 E45 E15 | F43 8 F45 F47 F51 F43 F45 F47 F51 F45 F47 F51 F45 F47 F45 F47 F51 F45 F47 F45 F47 F45 F47 F51 F51 F51 F51 F51 F51 F51 F51 F51 F51 | 45 81 74 51 74 51 75 77 77 77 74 74 74 74 74 74 75 75 75 75 75 75 75 75 75 75 75 75 75 | 992 93 93 93 93 93 93 93 93 93 93 93 93 93 | 53 864 | | | 61 | | | | .69 | | | | | | | |

| 71 | | | | s182 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|-----------------|-----------------|--------|-----------------|-----------------|-----|---------------|-----|-----------------|-----------------|-----------------|-----------------|-----------------|------|-----|-----|-----------------|----------------|----------------|-------------|----------|--------|-------------|---------|-------------|--------|---|-----|-----|-----------------|-------------|-----|---------------|--------|------|
| 72 r | 16 | r ₁₆ | | | r ₁₆ | | | | r ₁₆ | r ₁₆ | r ₁₆ | r16 | r ₁₆ | | | | | | | | | | | | | | | | | ш | | | | | |
| .73 | | | | | s18 | 33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| .74 | | | | r7 | | | П | | | | | | | | | | r ₇ | r ₇ | r7 | | | | | | | | | | | | | | | | |
| .75 s | 187 | | | | s18 | 88 | \neg | | | | | | | | | 186 | | $\neg \vdash$ | | $\neg \neg$ | | | | | 185 | | | 184 | | | | | | \Box | |
| 76 | | \Box | \neg | r ₉ | $\neg \vdash$ | | $\neg r$ | | | | \Box | | \neg | | | | | $\neg \vdash$ | | | | | $\neg \Box$ | | $\neg \Box$ | | | | П | | $\Box\Box$ | | \Box | \Box | |
| .77 r | r ₇ | m | | | | r | T | | | | | | | m | T | | r ₇ | r7 | r ₇ | | | | T | | | | | | m | | | | ΠÌΤ | ŤΪ | |
| 78 | | т | | | s1 | 5 | 寸 | | s105 | s106 | s107 | | $\overline{}$ | | | | | \neg | | | | \neg | \top | 189 103 | 104 | | T | | m | | | | \Box | T | ΠÌ |
| 79 | | T | | | 190 | | T | | | | | | | i | T | | | \neg | Ť | | | Tit | T | | | | | | m | ĦΠ | | | | Ħ | ΠÌ |
| 80 | | | 839 | | 838 | 3 | | | | | | | | | 1 | 37 | | | | 841 842 | 843 | | | 40 | | | | | | | | | 193 | 34 | 35 3 |
| 81 | | | | | 192 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 82 | | | | | 193 | | | | 9 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 83 9 | 149 | | | | | 31 | 148 | | | | | | | | | | | | | | | | | | | | | | | | | 194 | | | |
| 84 | | | | 3195 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 85 | | | | r ₂₇ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 86 | | | | | s19 | 96 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 87 | | | | r ₂₉ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 88 | | | | | | | 3 | 197 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 89 r | 4 | r ₄ | | | r ₄ | | \neg | | r ₄ | r ₄ | r ₄ | r ₄ | r ₄ | | | | | Т | | | | П | | | | | | | П | | | | | П | |
| 90 r | 19 | r19 | | | r19 | | \neg | | r ₁₉ | r ₁₉ | r ₁₉ | r ₁₉ | r19 | | | | | | | | | | | | | | | | | | | | | | |
| 91 | | т | | | 198 | T | 十 | | | | $\overline{}$ | | \neg | i | | | 37 | 6 | \vdash | \neg | | | | | $\neg \neg$ | | | | m | | $\neg \neg$ | | \Box | m | |
| 92 r | r ₁₄ | r ₁₄ | | | r ₁₄ | | \neg | | r ₁₄ | r ₁₄ | r ₁₄ | r ₁₄ | r ₁₄ | | | | | | | | | | | | | | | | | $\sqcap \sqcap$ | | | | | |
| 93 r | 15 | r ₁₅ | | | r ₁₅ | | \neg | | r ₁₅ | r ₁₅ | r ₁₅ | r ₁₅ | r ₁₅ | | | | | | | | | | | | | | | | | | | | | | |
| 94 | | | | r40 | | | Ť | | | | | | | í | Tì | | | Ť | | i | ΤĖ | Tì | | | | = | | | m | | | | | m | |
| 95 | | т | | | _ | _ | 一 | _ | | | - | _ | _ | 5199 | T | | | _ | 1 | | | TH | _ | | | | | | m | | | | $\overline{}$ | T | m |
| 96 | | m | | r ₂₈ | \neg | _ | | | | - | | - | i | | | | | 7 | 1 | | m | | | | | \neg | | | m | | | | $\overline{}$ | m | |
| 97 | | | s60 | - | 859 | - | 十 | | | | - | _ | _ | | | s58 | | _ | + | 862 863 | 364 | | - | 61 | | | | _ | m | \vdash | \vdash | | 200 | 55 | 56 5 |
| 98 8 | 187 | | | | 818 | | 十 | | , | | | | Ť | i | | 186 | | \neg | | | | | | | 185 | | | 201 | | | | | | | |
| 99 9 | 98 | 899 | i | | s1 | | 一 | | s105 | s106 | s107 | s101 | s102 | m | | | | ì | | | T | | 97 | 100 103 | 104 | | m | | 202 | ТΠ | | | \vdash | i | ΠÌ |
| 00 | | | | r ₁₃ | T | T | Ť | | | | | | | ΠÌ | | | 51 | 11 | | | T | | | | | | П | | | | | | | T | |
| 01 | | П | | 3203 | | | Ť | | | | | | | | | | | | | | | TH | | | \neg | | T | | m | ТΠ | | | m | T | |
| 02 | | | | | $\overline{}$ | | 十 | | | | | | | | 204 | | | \neg | | | | | | | 一 | | T | | m | | | | | | |
| 03 | | | | | | | Ť | | | | | | | s205 | | | | | | | | | | | | | | | | | | | | | |
| 04 r | 24 | r24 | Î | | r ₂₄ | | | | r ₂₄ | r24 | r24 | r24 | r24 | | | | r ₂₄ | | | | | | | | | | | | | | | | | í | |
| 05 B | | 899 | | | 81 | | 7 | | | | 8107 | | 8102 | | | | | | | | \vdash | m | 97 | 100 103 | 104 | | | | 206 | | | | \Box | Ì | |
| 06 | | П | T | | | | 一 | | | | Ì | | | | 207 | | | ì | | | | | T | | | | m | | m | ΤП | | | | m | |
| 07 r | | r ₂₄ | | | r ₂₄ | T T | $\overline{}$ | | r ₂₄ | r ₂₄ | ro. | r ₂₄ | r24 | ī | | | | \neg | | | | | | | | | T | | | | | | | | |

Como puede observarse en la tabla[2], esta gramática es adecuada para este tipo de analizador sintáctico, puesto que no se produce ningún tipo de conflicto.

4 Diseño Analizador Semántico

asdasdas

asda

5 | Diseño Tabla de Símbolos

La TS se compone de una lista de tablas, una de ellas es global y se crea al empezar, mientras que el resto son locales y se van creando a medida que avanza la compilación. Están ordenadas en orden de creación. Cada tabla tiene un flag que indica si la tabla existe (esta activa) o se ha eliminado, pero realmente no las eliminamos para posteriormente imprimirlas.

A su vez cada tabla contiene una lista de diccionarios, cada diccionario simboliza una entrada en la tabla de símbolos. Un diccionario es un hashmap que tiene como claves la palabra "lexema" y los tipos de atributos que le corresponda (por ejemplo "Tipo" ó "Despl"), como valores tiene el valor del lexema y de sus atributos en si mismos (por ejemplo "main" ó "entero").

6 Anexo

6.1 Casos de prueba correctos

6.1.1 Prueba correcta 1

Programa introducido:

```
let string texto;
let string textoAux;
textoAux = texto;
alert
(textoAux);
```

Tokens:

```
< FUNCTION, >
<NUMBER, >
<ID , 0>
<\!\!\mathrm{ABPAREN}\ ,>
<NUMBER, >
<ID , 0>
<CEPAREN , >
<ABLLAVE, >
<IF, >
<ABPAREN , >
<ID , 0>
<OPREL , >
<CTEENTERA , 0>
<CEPAREN , >
<RETURN , >
<CTEENTERA, 1>
<PUNTOYCOMA, >
<RETURN , >
<ID , 0>
<OPARIT, >
<ID , 0>
<ABPAREN , >
<ID , 0>
<OPARIT , >
<CTEENTERA , 1>
< CEPAREN, >
<PUNTOYCOMA , >
<CELLAVE, >
```

Tabla de símbolos:

CONTENIDO DE LA TABLA 0:

```
* LEXEMA : 'texto'
ATRIBUTOS :
+ Tipo : 'cadena'
+ Despl : '0'
```

^{*} LEXEMA : 'textoAux'
ATRIBUTOS :

+ Tipo : 'cadena' + Despl : '64'

VASt:

```
Ė-B (1)
 Ė ·D (3)
    Ġ-G (20)
      --let
⊟-M (21)
       --lambda
       □·T (24)
        string
       ...id
....;
    □-D (3)
       □ G (20)
         ...let
⊟.·M (21)
          lambda
         T (24)
          string
          ...id
       ...D (3)
         Ġ (6)
           .
-S (13)
              Ė-K (14)
               ...id
                E (45)
                 .:.R (47)
                    .:.U (49)
                     i...id
         □-D (3)
           Ġ (6)
              Ė-S (15)
                alert
                 ---(
                E (45)
                 Ė-R (47)
                   ...id
           □ D (4)
              lambda
```

6.1.2 Prueba correcta 2

Programa introducido:

```
function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

function number Factorial (number n)

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function number Factorial (number n)

function number function number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number number
```

Tokens:

```
<FUNCTION, >
<NUMBER , >
<ID , 0>
<ABPAREN, >
<NUMBER , >
<ID , 0>
<CEPAREN , >
<ABLLAVE , >
<IF ,>
<ABPAREN , >
<ID , 0>
<OPREL,>
<CTEENTERA , 0>
<CEPAREN ,>
<RETURN , >
<CTEENTERA, 1>
<PUNTOYCOMA, >
<\!\!\mathrm{RETURN}\ ,>
<ID , 0>
<OPARIT , >
<ID , 0>
<ABPAREN , >
<ID , 0>
<OPARIT , >
<CTEENTERA , 1>
<CEPAREN ,>
<PUNTOYCOMA, >
<CELLAVE, >
```

Tabla de símbolos:

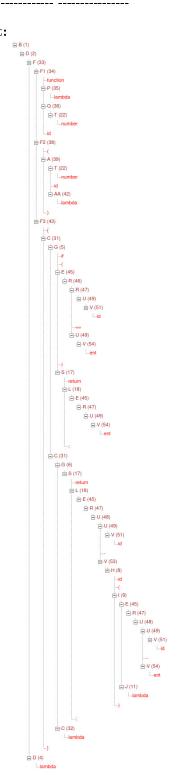
CONTENIDO DE LA TABLA 0:

```
* LEXEMA: 'Factorial'
ATRIBUTOS:
+ Tipo: 'funcion'
+ TipoRetorno: 'entero'
+ EtiqFuncion: 'Et_Fun_0'
+ numParam: '1'
+ TipoParam1: 'entero'
```

CONTENIDO DE LA TABLA 1:

LEXEMA: 'n' ATRIBUTOS: + Tipo: 'entero' + Despl: '0'

VASt:



6.1.3 Prueba correcta 3

Programa introducido:

```
1 let boolean z;
2 for (b=1;z; )
3 {
4 alert (88);
5 }
```

Tokens:

```
{<}\mathrm{LET} , {>}
<BOOLEAN, >
<ID , 0>
<PUNTOYCOMA , >
<FOR , >
<\!\!\mathrm{ABPAREN}\ ,>
<ID , 1>
<\! \mathrm{OPASIG} \ ,>
<CTEENTERA , 1>
<PUNTOYCOMA , >
<ID , 0>
<PUNTOYCOMA, >
<CEPAREN , >
<ABLLAVE , >
<ALERT , >
<ABPAREN , >
<\!CTEENTERA , 88>
<\! {\rm CEPAREN} \ , >
<PUNTOYCOMA, >
<CELLAVE , >
```

Tabla de símbolos:

CONTENIDO DE LA TABLA 0:

```
* LEXEMA: 'z'
ATRIBUTOS:
+ Tipo: 'logico'
+ Despl: '0'

* LEXEMA: 'b'
ATRIBUTOS:
+ Tipo: 'entero'
+ Despl: '1'
```

VASt:

```
Ė ·B (1)
Ė ·D (3)
    Ġ (20)
     ...let
⊟-M (21)
       lambda
       □ T (23)
        boolean
       --id
     ⊡..D (3)
       □ G (25)
        ...for
...(
....( 26)
           Ė K (14)
            ...id
...=
            Ē-E (45)
              .:⊢R (47)
               ...U (49)
                 ent
         --;
---E (45)
           Ė-R (47)
            ...U (49)
            Ė-V (51)
               ...id
         —O (30)
          --lambda
          ---)
---{
         □·C (31)
           □ G (6)
            Ė-S (15)
               ...alert
...(
               E (45)
                 Ė-R (47)
                   ≟.·U (49)
                     ...V (54)
                         ent
           □-C (32)
            lambda
       □ D (4)
         lambda
```

6.1.4 Prueba correcta 4

Programa introducido:

```
1
   /* prueba
2
                correcta */
     let boolean b; let number x;
   input (z);
   alert (z);
   x=z;
6
   alert (z-1);
   b=b&&b;if (b)
   x =
9
10
     x - 6
       - z
11
        - 1
12
        - (2
13
14
        - у
        - 6);
```

Tokens:

```
<LET , >
<BOOLEAN , >
<ID, 0>
<PUNTOYCOMA , >
<LET , >
<NUMBER , >
<ID , 1>
<PUNTOYCOMA , >
<INPUT , >
<ABPAREN, >
<ID , 2>
<CEPAREN , >
<PUNTOYCOMA , >
<ALERT , >
<ABPAREN , >
<ID , 2>
<\! {\rm CEPAREN} \ , >
<PUNTOYCOMA , >
<ID , 1>
<OPASIG , >
<ID , 2>
<PUNTOYCOMA, >
<ALERT , >
<ABPAREN , >
<ID , 2>
<OPARIT, >
<\!CTEENTERA , 1>
<CEPAREN , >
<PUNTOYCOMA, >
<ID , 0>
<OPASIG , >
<ID , 0>
<OPLOG , >
```

```
<ID , 0>
  <PUNTOYCOMA , >
  <IF , >
  <ABPAREN , >
  <ID , 0>
  <CEPAREN , >
  <ID , 1>
  <OPASIG , >
  {<}\mathrm{ID} , 1>
  <OPARIT, >
  <\!CTEENTERA , 6>
  <OPARIT, >
  <ID , 2>
  <OPARIT , >
  <CTEENTERA , 1>
  <OPARIT , >
  <ABPAREN , >
  <CTEENTERA , 2>
  <OPARIT, >
  {\rm <ID} , 3>
  <\! \mathrm{OPARIT} \ , >
  <CTEENTERA, 6>
  <CEPAREN, >
  <PUNTOYCOMA , >
Tabla de símbolos:
  CONTENIDO DE LA TABLA 0:
        LEXEMA: 'b'
       ATRIBUTOS:
       + Tipo : 'logico'
       + Despl: '0'
      -----
        LEXEMA: 'x'
       ATRIBUTOS:
       + Tipo: 'entero'
       + Despl: '1'
        LEXEMA: 'z'
       ATRIBUTOS:
       + Tipo: 'entero'
       + Despl: '2'
        LEXEMA: 'y'
       ATRIBUTOS:
       + Tipo: 'entero'
       + Despl: '3'
```

VASt:



6.1.5 Prueba correcta 5

Programa introducido:

```
function FuncionSentencia (number b, boolean z)
2
       for (b=0;true; --b )
3
4
       {
       alert ("hola");
5
       }
6
7
   function Funcion (number x, boolean b)
8
9
       if (x == 0) FuncionSentencia(x,b);
10
11
       alert
            (cadena); return;
12
  }
13
```

Tokens:

```
<FUNCTION, >
<ID , 0>
<ABPAREN , >
<NUMBER , >
<ID, 0>
<COMA , >
<BOOLEAN , >
<ID , 1>
<CEPAREN , >
< ABLLAVE, >
<FOR , >
<ABPAREN , >
<ID , 0>
\langle OPASIG, \rangle
<CTEENTERA , 0>
<PUNTOYCOMA , >
<CTELOGICA , 1>
<PUNTOYCOMA, >
<OPESP , >
<ID , 0>
< CEPAREN, >
<ABLLAVE , >
<ALERT , >
<ABPAREN , >
<\! CADENA , "hola">
<\! {\rm CEPAREN} \ , >
<PUNTOYCOMA, >
<\! \mathrm{CELLAVE} \ , >
<CELLAVE, >
<FUNCTION, >
<ID , 1>
<ABPAREN , >
<NUMBER, >
<\!\mathrm{ID} , 0\!>
<COMA , >
<BOOLEAN, >
```

```
<ID , 1>
  <\! {\rm CEPAREN} \ , >
  <ABLLAVE, >
  <IF , >
  <ABPAREN , >
  <ID , 0>
  <OPREL , >
  <CTEENTERA , 0>
  <CEPAREN ,>
  <ID , 0>
  <ABPAREN , >
  <ID , 0>
  <COMA , >
  <ID , 1>
  <CEPAREN,>
  <PUNTOYCOMA , >
  <ALERT , >
  <ABPAREN , >
  <ID, 2>
  <CEPAREN , >
  <PUNTOYCOMA , >
  <RETURN , >
  <PUNTOYCOMA, >
  <CELLAVE , >
Tabla de símbolos:
  CONTENIDO DE LA TABLA 0:
        LEXEMA: 'FuncionSentencia'
       ATRIBUTOS:
       + Tipo: 'funcion'
       + TipoRetorno : 'void'
       + EtiqFuncion: 'Et Fun 0'
       + numParam: '2'
       + TipoParam1 : 'entero'
       + TipoParam2: 'logico'
        LEXEMA: 'Funcion'
       ATRIBUTOS:
       + Tipo: 'funcion'
       + TipoRetorno: 'void'
       + EtiqFuncion: 'Et Fun 1'
       + numParam : '2'
       + TipoParam1 : 'entero'
       + TipoParam2: 'logico'
        LEXEMA: 'cadena'
       ATRIBUTOS:
       + Tipo: 'entero'
       + Despl: '0'
```

CONTENIDO DE LA TABLA 1:

LEXEMA: 'b' ATRIBUTOS: + Tipo : 'entero'

+ Despl: '0'

LEXEMA: 'z' $\mathbf{ATRIBUTOS}:$ + Tipo : 'logico' + Despl: '1'

CONTENIDO DE LA TABLA 2:

LEXEMA: 'x' ATRIBUTOS: + Tipo : 'entero'

+ Despl: '0'

LEXEMA: 'b' ATRIBUTOS:

+ Tipo: 'logico' + Despl: '1'

VASt:



6.2 Casos de prueba erróneos

6.2.1 Prueba errónea 1

Programa introducido:

```
1 let number id;
2 id(2);
```

Mensaje de error:

Error en la linea 2:

La variable no se puede invocar como una función, con argumentos

6.2.2 Prueba errónea 2

Programa introducido:

```
1 let boolean id;
2 res = --id;
```

Mensaje de error:

Error en la linea 2:

El operador especial '--' solo trabaja con tipos de datos enteros

6.2.3 Prueba errónea 3

Programa introducido:

```
function Funcion (number a, boolean b, string c){}
funcion(a,a,a);
```

Mensaje de error:

Error en la linea 2:

El tipo de los parámetros no es el esperado, se esperaban "'entero', 'logico', 'cadena'"

6.2.4 Prueba errónea 4

Programa introducido:

```
let string texto;
function pideTexto ()
{
   alert ("Introduce un texto");
   input (texto);
}

return;
```

Mensaje de error:

Error en la linea 8:

No puede haber una sentencia return fuera de una función

6.2.5 Prueba errónea 5

Programa introducido:

```
1 let boolean bool;
2 alert(bool);
```

Mensaje de error:

Error en la linea 2:

La expresión introducida no es una cadena o un entero

7 | Diseño Generador de Código Intermedio

```
{ generar etiqueta alert/input ¿? }
Axioma = B
NoTerminales = { A AA B C D E F F1 F2 F3 G H I J K L M N O P Q R S T U V }
Terminales = \{ \&\& == --- () = ;, \{ \} \text{ id ent cad log let alert input return for if } \}
                  number boolean string function }
B \to D\ \{
   B.cod = D.cod
D \to F D \{
   D.cod = F.cod \parallel D.cod
D \rightarrow G D \{
   D.cod = G.cod \parallel D.cod
D \rightarrow lambda \{
   D.cod = vacio
G \rightarrow if ( E ) S {
   G.desp = nuevaetiq()
   G.cod = E.cod || gen(if, E.lugar, =, 0, goto, G.desp) || S.cod || gen(:, G.desp)
G \rightarrow S  {
   G.cod = S.cod \\
S \, \rightarrow \, H \, \, ; \, \{
   S.cod = H.cod
H \rightarrow id (I) 
   H.lugar = nuevatemp()
   H.cod = I.codE \parallel I.codP \parallel gen(H.lugar, =, call, buscaEtiquetaTS(id.pos))
I \rightarrow E J  {
   I.codE = E.cod \mid\mid J.codE
   I.codP = gen(param, E.lugar) \mid\mid J.codP
J \rightarrow , E J \{
   J.codE = E.cod \mid \mid J1.codE
   J.codP = gen(param, E.lugar) || J1.codP
J \rightarrow lambda \{
   L.codE = vacio
   L.codP = vacio
I \rightarrow lambda \{
   J.codE = vacio
   J.codP = vacio
```

```
S \to K; {
   S.cod = K.cod
K \rightarrow id = E  {
   K.cod = E.cod \parallel gen(buscaLugarTS(id.pos), =, E.lugar)
S \rightarrow alert (E); {
   S.cod = E.cod || gen(param, E.lugar) || gen(call, alert.etiq)
                                                                                -----¿?
S \rightarrow input (id); {
   S.cod = gen(param, buscaLugarTS(id.pos)) || gen(call, input.etiq)
S \rightarrow return L; {
   if( L.cod = vacio )
   S.cod = gen(return)
   S.cod = L.cod \parallel gen(return, L.lugar)
L \to E  {
   L.cod = E.cod
   L.lugar = E.lugar
L \rightarrow lambda \{
   L.cod = vacio
G \rightarrow let M T id ; {
   B.cod = vacio
   }
M \rightarrow lambda \{ \}
T \rightarrow number \{ \}
T \rightarrow boolean \{ \}
T \to string \{ \}
G \rightarrow for \ (\ N\ ; E\ ; \ O\ ) \ \{\ C\ \} \ \{
   G.inicio = nuevaetiq()
   G.desp = nuevaetiq()
   G.cod = N.cod || gen(:, G.inicio) || E.cod || gen(if, E.lugar, =, 0, goto, G.desp) || C.cod || O.cod || gen(goto, G.desp)
N \to K {
   N.cod = K.cod
N \rightarrow lambda \{
   N.cod = vacio
   }
O \to K {
   O.cod = K.cod
O \rightarrow -- id \{
   O.lugar = nuevatemp()
   id.lugar = buscaLugarTS(id.pos)
```

```
O.cod = gen(id.lugar, =, id.lugar, -, 1) || gen(O.lugar, =, id.lugar)
O \rightarrow lambda \{
   O.cod = vacio
C \rightarrow G C1  {
   C.cod = G.cod \mid\mid C1.cod
C \to lambda \; \{
   C.cod = vacio
F \rightarrow F1 F2 F3  {
   F.cod = F1.cod || F2.cod || F3.cod || gen(return)
F1 \rightarrow function P Q id \{
   F1.cod = gen(:, buscaEtiquetaTS(id.pos))
P \rightarrow lambda \{ \}
Q \to T \{ \}
Q \rightarrow lambda \{ \}
F2 \rightarrow (A) \{
   F2.cod = vacio
A \rightarrow T \text{ id } AA \{ \}
A \rightarrow lambda \{ \}
AA \rightarrow T id AA \{ \}
AA \rightarrow lambda \{ \}
F3 \rightarrow \{C\} \{
   F3.cod = C.cod
   }
E \rightarrow E1 \&\& R  {
   E.lugar = nuevatemp();
   E.cod = E1.cod || R.cod || gen(E.lugar, =, E1.lugar, AND, R.lugar)
E \to R  {
   E.lugar = R.lugar
   E.cod\,=\,R.cod
   }
R \rightarrow R1 == U \{
   R.cod = R1.cod || U.cod || gen(if, R1.lugar, =, U.lugar, goto, esta + 3) || gen(R.lugar, =, 0) || gen(goto, esta -
R \rightarrow U {
   R.cod = U.cod
   R.lugar = U.lugar
U \rightarrow U1 - V {
   U.lugar = nuevatemp()
```

```
U.cod = gen(U.lugar, =, U1.lugar, -, V.lugar)
U \xrightarrow{f} V \{
   U.lugar = V.lugar
   U.cod \, = V.cod
V \rightarrow -- id \{
   V.lugar = nuevatemp()
   id.lugar = buscaLugarTS(id.pos)
   V.cod = gen(id.lugar, =, id.lugar, -, 1) || gen(V.lugar, =, id.lugar)
V \to id \{
   V.lugar = buscaLugarTS(id.pos)
   V.cod = vacio
V \rightarrow (E)  {
   V.lugar = H.lugar
   V.cod \, = H.cod
V \to H {
   V.lugar = H.lugar
   V.cod = H.cod
   }
V \to ent \{
   V.lugar = nuevatemp()
   V.cod = gen(V.lugar, =, ent.valor)
\begin{array}{c} \\ V \to \mathrm{cad} \ \{ \end{array}
   V.lugar = nuevatemp()
   V.cod = gen(V.lugar, =, cad.valor)
V \to \log \{
   V-lugar = nuevatmp()
   V.cod = gen(V.lugar, =, log.valor)
   }
```

8 | Diseño Generador de Código Final

9 | Diseño Registros de Activación

10 Referencias

1. Documentación libreria SLY

https://sly.readthedocs.io/en/latest/

2. Generador de tabla LR(1)

http://jsmachines.sourceforge.net/machines/lr1.html