Tabelle SLR: un esempio

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La gramatica

Esercizio: dimostrare che la seguente grammatica è una grammatica SLR

$$
\begin{array}{lcl}
E & \rightarrow & E + T \\
E & \rightarrow & T \\
T & \rightarrow & T * F \\
T & \rightarrow & F \\
F & \rightarrow & (E) \\
F & \rightarrow & \mathbf{id}
\end{array}
$$

Passo 1: aumentare la grammatica

Aggiungiamo un nuovo non terminale iniziale E' e una produzione $E' \longrightarrow E$ ottenendo

$$
\begin{array}{ll}
 & E' \longrightarrow E \\
(1) & E \longrightarrow E + T \\
(2) & E \longrightarrow T \\
(3) & T \longrightarrow T * F \\
(4) & T \longrightarrow F \\
(5) & F \longrightarrow (E) \\
(6) & F \longrightarrow \mathbf{id}
\end{array}
$$

Passo 2: collezione canonica

Costruiamo la collezione canonica a partire dall'insieme iniziale definito dalla $closure(\{E' \rightarrow \bullet E\})$

$$
\begin{aligned}
I_0 = closure(\{E' \rightarrow \bullet E\}) \quad = \{ & \\
& E' \rightarrow \bullet E, \\
& E \rightarrow \bullet E + T, \\
& E \rightarrow \bullet T, \\
& T \rightarrow \bullet T * F, \\
& T \rightarrow \bullet F, \\
& F \rightarrow \bullet (E), \\
& F \rightarrow \bullet \mathbf{id} \\
\} &
\end{aligned}
$$

Passo 2: collezione canonica

$$
\begin{aligned}
I_0 = \{ & \\
& E' \to \bullet E, \\
& E \to \bullet E + T, \\
& E \to \bullet T, \\
& T \to \bullet T * F, \\
& T \to \bullet F, \\
& F \to \bullet (E), \\
& F \to \bullet \mathbf{id} \\
\} &
\end{aligned}
$$

$$goto(I_0, E) =$$
$$closure(\{E' \to E\bullet, E \to E \bullet + T\}) =$$
$$\{E' \to E\bullet, E \to E \bullet + T\} = I_1$$

$$goto(I_0, T) =$$
$$closure(\{E \to T\bullet, T \to T \bullet * F\}) =$$
$$\{E \to T\bullet, T \to T \bullet * F\} = I_2$$

$$goto(I_0, F) =$$
$$closure(\{T \to F\bullet\}) = \{T \to F\bullet\} = I_3$$

Passo 2: collezione canonica

$$
\begin{aligned}
I_0 = \{ & \\
& E' \to \bullet E, \\
& E \to \bullet E + T, \\
& E \to \bullet T, \\
& T \to \bullet T * F, \\
& T \to \bullet F, \\
& F \to \bullet(E), \\
& F \to \bullet \mathbf{id} \\
\} &
\end{aligned}
$$

$$
\begin{aligned}
& goto(I_0, () = \\
& closure(\{F \to (\bullet E)\}) = \\
& \{ \\
& \quad F \to (\bullet E), \\
& \quad E \to \bullet E + T, E \to \bullet T, \\
& \quad T \to \bullet T * F, T \to \bullet F, \\
& \quad F \to \bullet(E), F \to \bullet \mathbf{id} \\
& \} = I_4
\end{aligned}
$$

$$
\begin{aligned}
& goto(I_0, \mathbf{id}) = \\
& closure(\{F \to \mathbf{id}\bullet\}) = \{F \to \mathbf{id}\bullet\} = I_5
\end{aligned}
$$

Passo 2: collezione canonica

$$I_1 = \{E' \to E\bullet, \quad E \to E \bullet + T\}$$

$$I_2 = \{E \to T\bullet, \quad T \to T \bullet * F\}$$

$$I_3 = \{T \to F\bullet\}$$

$$goto(I_1, +) = closure(\{E \to E + \bullet T\}) = \{ E \to E + \bullet T,\ T \to \bullet T * F,\ T \to \bullet F,\ F \to \bullet(E),\ F \to \bullet \mathbf{id} \} = I_6$$

$$goto(I_2, *) = closure(\{T \to T * \bullet F\}) = \{ T \to T * \bullet F,\ F \to \bullet(E),\ F \to \bullet \mathbf{id} \} = I_7$$

Passo 2: collezione canonica

$I_4 = closure(\{F \to (\bullet E)\}) =$
$\{$
$F \to (\bullet E),$
$E \to \bullet E + T, E \to \bullet T,$
$T \to \bullet T * F, T \to \bullet F,$
$F \to \bullet(E), F \to \bullet \mathbf{id}$
$\}$

$I_5 = \{F \to \mathbf{id}\bullet\}$

$goto(I_4, E) =$
$closure(\{F \to (E\bullet), E \to E \bullet + T\}) =$
$\{F \to (E\bullet), E \to E \bullet + T\} = I_8$

$goto(I_4, T) =$
$closure(\{E \to T\bullet, T \to T \bullet * F\}) = I_2$

$goto(I_4, F) =$
$closure(\{T \to F\bullet\}) = I_3$

$goto(I_4, () =$
$closure(\{F \to (\bullet E)\}) = I_4$

$goto(I_4, \mathbf{id}) =$
$closure(\{F \to \mathbf{id}\bullet\}) = I_5$

Passo 2: collezione canonica

$$
\begin{aligned}
I_6 = \{ & \\
& E \to E + \bullet T, \\
& T \to \bullet T * F,\ T \to \bullet F, \\
& F \to \bullet(E),\ F \to \bullet \mathbf{id} \\
\}&
\end{aligned}
$$

$$
\begin{aligned}
& goto(I_6, T) = \\
& closure(\{E \to E + T\bullet, T \to T \bullet *F\}) = \\
& \{E \to E + T\bullet, T \to T \bullet *F\} = I_9
\end{aligned}
$$

$$
\begin{aligned}
& goto(I_6, F) = \\
& closure(\{T \to F\bullet\}) = I_3
\end{aligned}
$$

$$
\begin{aligned}
& goto(I_6, () = \\
& closure(\{E \to (\bullet E)\}) = I_4
\end{aligned}
$$

$$
\begin{aligned}
& goto(I_6, \mathbf{id}) = \\
& closure(\{F \to \mathbf{id}\bullet\}) = I_5
\end{aligned}
$$

Passo 2: collezione canonica

$$I_7 = \{ \\ T \to T * \bullet F, \\ F \to \bullet(E),\ F \to \bullet\mathbf{id} \\ \}$$

$goto(I_7, F) = closure(\{T \to T * F\bullet\}) =$
$\{T \to T * F\bullet\} = I_{10}$

$goto(I_7, () =$
$closure(\{E \to (\bullet E)\}) = I_4$

$goto(I_7, \mathbf{id}) =$
$closure(\{F \to \mathbf{id}\bullet\}) = I_5$

Passo 2: collezione canonica

$$I_8 = \{ \\ F \to (E\bullet),\ E \to E \bullet + T \\ \}$$

$$I_9 = \{ \\ E \to E + T\bullet,\ T \to T \bullet * F \\ \}$$

$$goto(I_8,)) = closure(\{F \to (E)\bullet\}) = \\ \{F \to (E)\bullet\} = I_{11}$$

$$goto(I_8, +) = \\ closure(\{E \to E + \bullet T\}) = I_6$$

$$goto(I_9, *) = \\ closure(\{T \to T * \bullet F\}) = I_7$$

Passo 3: calcolo della FOLLOW di non terminali della grammatica aumentata

$$\text{FOLLOW}(E') = \{\$\}$$
$$\text{FOLLOW}(E) = \{+,), \$\}$$
$$\text{FOLLOW}(T) = \{+, *,), \$\}$$
$$\text{FOLLOW}(F) = \text{FOLLOW}(T) = \{+, *,), \$\}$$

La tabella

	id	$+$	$*$	$($	$)$	\$	E	T	F
s_0	S5			S4			1	2	3
s_1		S6				acc			
s_2		R2	S7		R2	R2			
s_3		R4	R4		R4	R4			
s_4	S5			S4			8	2	3
s_5		R6	R6		R6	R6			
s_6	S5			S4				9	3
s_7	S5			S4					10
s_8		S6			S11				
s_9		R1	S7		R1	R1			
s_{10}		R3	R3		R3	R3			
s_{11}		R5	R5		R5	R5			