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1 Esercizio 5.2

1.1 Grammatica modificata per inserire i connettivi logici

Si aggiungono alla grammatica le produzioni per $\langle bexpr \rangle$ denotate da \star .

$$\begin{aligned} \langle prog \rangle &\rightarrow \langle statlist \rangle \text{ EOF} \\ \langle statlist \rangle &\rightarrow \langle stat \rangle \langle statlistp \rangle \\ \langle statlistp \rangle &\rightarrow ; \langle stat \rangle \langle statlistp \rangle \\ \langle statlistp \rangle &\rightarrow \varepsilon \\ \langle stat \rangle &\rightarrow \text{assign } \langle assignlist \rangle \\ \langle stat \rangle &\rightarrow \text{print } (\langle exprlist \rangle) \\ \langle stat \rangle &\rightarrow \text{read } (\langle idlist \rangle) \\ \langle stat \rangle &\rightarrow \text{for } (\langle state \rangle \langle bexpr \rangle) \text{ do } \langle stat \rangle \\ \langle stat \rangle &\rightarrow \text{if } (\langle bexpr \rangle) \langle stat \rangle \langle statp \rangle \text{ end} \\ \langle stat \rangle &\rightarrow \{ \langle statlist \rangle \} \\ \langle state \rangle &\rightarrow \text{ID} := \langle expr \rangle ; \\ \langle state \rangle &\rightarrow \varepsilon \\ \langle statp \rangle &\rightarrow \text{else } \langle stat \rangle \\ \langle statp \rangle &\rightarrow \varepsilon \\ \langle assignlist \rangle &\rightarrow [\langle expr \rangle \text{ to } \langle idlist \rangle] \langle assignlistp \rangle \\ \langle assignlistp \rangle &\rightarrow [\langle expr \rangle \text{ to } \langle idlist \rangle] \langle assignlistp \rangle \\ \langle assignlistp \rangle &\rightarrow \varepsilon \\ \langle idlist \rangle &\rightarrow \text{ID } \langle idlistp \rangle \\ \langle idlistp \rangle &\rightarrow , \text{ID } \langle idlistp \rangle \\ \langle idlistp \rangle &\rightarrow \varepsilon \\ \langle bexpr \rangle &\rightarrow < \langle expr \rangle \langle expr \rangle \\ \langle bexpr \rangle &\rightarrow > \langle expr \rangle \langle expr \rangle \\ \langle bexpr \rangle &\rightarrow <= \langle expr \rangle \langle expr \rangle \\ \langle bexpr \rangle &\rightarrow <= \langle expr \rangle \langle expr \rangle \\ \langle bexpr \rangle &\rightarrow == \langle expr \rangle \langle expr \rangle \\ \langle bexpr \rangle &\rightarrow <> \langle expr \rangle \langle expr \rangle \\ \star \langle bexpr \rangle &\rightarrow \&\& \langle bexpr \rangle \langle bexpr \rangle \\ \star \langle bexpr \rangle &\rightarrow || \langle bexpr \rangle \langle bexpr \rangle \\ \star \langle bexpr \rangle &\rightarrow ! \langle bexpr \rangle \\ \langle expr \rangle &\rightarrow + (\langle exprlist \rangle) | \\ \langle expr \rangle &\rightarrow - \langle expr \rangle \langle expr \rangle | \\ \langle expr \rangle &\rightarrow * (\langle exprlist \rangle) | \\ \langle expr \rangle &\rightarrow / \langle expr \rangle \langle expr \rangle | \\ \langle expr \rangle &\rightarrow \text{NUM} | \\ \langle expr \rangle &\rightarrow \text{ID} | \\ \langle exprlist \rangle &\rightarrow \langle expr \rangle \langle exprlistp \rangle | \\ \langle exprlistp \rangle &\rightarrow , \langle expr \rangle \langle exprlistp \rangle | \\ \langle exprlistp \rangle &\rightarrow \varepsilon | \end{aligned}$$

1.2 Calcolo di NULL, FIRST e FOLLOW

	NULL	FIRST	FOLLOW
$\langle \text{prog} \rangle$		{ assign, print, read, for, if, { }	{ \$ }
$\langle \text{statlist} \rangle$		{ assign, print, read, for, if, { }	{ EOF, } }
$\langle \text{statlistp} \rangle$	x	{ ; }	{ EOF, } }
$\langle \text{stat} \rangle$		{ assign, print, read, for, if, { }	{ ;, else, end, EOF, } }
$\langle \text{statc} \rangle$	x	{ ID }	{ <, >, <=, >=, ==, <>, &&, , ! }
$\langle \text{statp} \rangle$	x	{ else }	{ end }
$\langle \text{assignlist} \rangle$		{ [}	{ ;, else, end, EOF, } }
$\langle \text{assignlistp} \rangle$	x	{ [}	{ ;, else, end, EOF, } }
$\langle \text{idlist} \rangle$		{ ID }	{), [}
$\langle \text{idlistp} \rangle$	x	{ , }	{), [}
$\langle \text{bexpr} \rangle$		{ <, >, <=, >=, ==, <>, &&, , ! }	{) }
$\langle \text{expr} \rangle$		{ +, -, *, /, NUM, ID }	{ ,, ;, to, +, -, *, /,), NUM, ID }
$\langle \text{exprlist} \rangle$		{ +, -, *, /, NUM, ID }	{) }
$\langle \text{exprlistp} \rangle$	x	{ , }	{) }

1.3 Calcolo degli insiemi GUIDA

GUIDA($\langle \text{prog} \rangle \rightarrow \langle \text{statlist} \rangle \text{ EOF}$)	{ assign, print, read, for, if, { }
GUIDA($\langle \text{statlist} \rangle \rightarrow \langle \text{stat} \rangle \langle \text{statlistp} \rangle$)	{ assign, print, read, for, if, { }
GUIDA($\langle \text{statlistp} \rangle \rightarrow ; \langle \text{stat} \rangle \langle \text{statlistp} \rangle$)	{ ; }
GUIDA($\langle \text{statlistp} \rangle \rightarrow \varepsilon$)	{ EOF, } }
GUIDA($\langle \text{stat} \rangle \rightarrow \text{assign } \langle \text{assignlist} \rangle$)	{ assign }
GUIDA($\langle \text{stat} \rangle \rightarrow \text{print } (\langle \text{exprlist} \rangle)$)	{ print }
GUIDA($\langle \text{stat} \rangle \rightarrow \text{read } (\langle \text{idlist} \rangle)$)	{ read }
GUIDA($\langle \text{stat} \rangle \rightarrow \text{for } (\langle \text{statc} \rangle \langle \text{bexpr} \rangle) \text{ do } \langle \text{stat} \rangle$)	{ for }
GUIDA($\langle \text{stat} \rangle \rightarrow \text{if } (\langle \text{bexpr} \rangle) \langle \text{stat} \rangle \langle \text{statp} \rangle \text{ end}$)	{ if }
GUIDA($\langle \text{stat} \rangle \rightarrow \{ \langle \text{statlist} \rangle \}$)	{ { }
GUIDA($\langle \text{statc} \rangle \rightarrow \text{ID} := \langle \text{expr} \rangle ;$)	{ ID }
GUIDA($\langle \text{statc} \rangle \rightarrow \varepsilon$)	{ <, >, <=, >=, ==, <>, &&, , ! }
GUIDA($\langle \text{statp} \rangle \rightarrow \text{else } \langle \text{stat} \rangle$)	{ else }
GUIDA($\langle \text{statp} \rangle \rightarrow \varepsilon$)	{ end }
GUIDA($\langle \text{assignlist} \rangle \rightarrow [\langle \text{expr} \rangle \text{ to } \langle \text{idlist} \rangle] \langle \text{assignlistp} \rangle$)	{ [}
GUIDA($\langle \text{assignlistp} \rangle \rightarrow [\langle \text{expr} \rangle \text{ to } \langle \text{idlist} \rangle] \langle \text{assignlistp} \rangle$)	{ [}
GUIDA($\langle \text{assignlistp} \rangle \rightarrow \varepsilon$)	{ ;, else, end, EOF, } }
GUIDA($\langle \text{idlist} \rangle \rightarrow \text{ID } \langle \text{idlistp} \rangle$)	{ ID }
GUIDA($\langle \text{idlistp} \rangle \rightarrow , \text{ID } \langle \text{idlistp} \rangle$)	{ , }
GUIDA($\langle \text{idlistp} \rangle \rightarrow \varepsilon$)	{), [}
GUIDA($\langle \text{bexpr} \rangle \rightarrow < \langle \text{expr} \rangle \langle \text{expr} \rangle$)	{ < }
GUIDA($\langle \text{bexpr} \rangle \rightarrow > \langle \text{expr} \rangle \langle \text{expr} \rangle$)	{ > }
GUIDA($\langle \text{bexpr} \rangle \rightarrow <= \langle \text{expr} \rangle \langle \text{expr} \rangle$)	{ <= }
GUIDA($\langle \text{bexpr} \rangle \rightarrow >= \langle \text{expr} \rangle \langle \text{expr} \rangle$)	{ >= }
GUIDA($\langle \text{bexpr} \rangle \rightarrow == \langle \text{expr} \rangle \langle \text{expr} \rangle$)	{ == }
GUIDA($\langle \text{bexpr} \rangle \rightarrow <> \langle \text{expr} \rangle \langle \text{expr} \rangle$)	{ <> }
GUIDA($\langle \text{bexpr} \rangle \rightarrow \&\& \langle \text{bexpr} \rangle \langle \text{bexpr} \rangle$)	{ && }
GUIDA($\langle \text{bexpr} \rangle \rightarrow \langle \text{bexpr} \rangle \langle \text{bexpr} \rangle$)	{ }
GUIDA($\langle \text{bexpr} \rangle \rightarrow ! \langle \text{bexpr} \rangle$)	{ ! }

GUIDA($\langle expr \rangle \rightarrow + (\langle exprlist \rangle)$)	{ + }
GUIDA($\langle expr \rangle \rightarrow - \langle expr \rangle \langle expr \rangle$)	{ - }
GUIDA($\langle expr \rangle \rightarrow * (\langle exprlist \rangle)$)	{ * }
GUIDA($\langle expr \rangle \rightarrow / \langle expr \rangle \langle expr \rangle$)	{ / }
GUIDA($\langle expr \rangle \rightarrow \text{NUM}$)	{ NUM }
GUIDA($\langle expr \rangle \rightarrow \text{ID}$)	{ ID }
GUIDA($\langle exprlist \rangle \rightarrow \langle expr \rangle \langle exprlist \rangle$)	{ +, -, *, /, NUM, ID }
GUIDA($\langle exprlist \rangle \rightarrow , \langle expr \rangle \langle exprlist \rangle$)	{ , }
GUIDA($\langle exprlist \rangle \rightarrow \varepsilon$)	{) }
