BU CS320 Assignment 5: Context Free Grammars

October 30, 2023

1. Given the following grammar where $\langle expr \rangle$ is the starting symbol

$$
\begin{array}{lll}
\langle digit \rangle & ::= & 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9 \\
\langle nat \rangle & ::= & \langle digit \rangle \mid \langle digit \rangle \langle nat \rangle \\
\langle int \rangle & ::= & \langle nat \rangle \mid \text{-}\langle nat \rangle \\
\langle expr \rangle & ::= & \langle int \rangle \\
 & \mid & (\ \langle expr \rangle\ ) \\
 & \mid & \langle expr \rangle + \langle expr \rangle \\
 & \mid & \langle expr \rangle * \langle expr \rangle
\end{array}
$$

   Derive the sentence using *rightmost derivation*.

   12 + 2 * -07

2. Given the following grammar where $\langle stmt \rangle$ is the starting symbol.

$\langle digit \rangle$ ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

$\langle letter \rangle$ ::= a | b | c | . . . | z

$\langle nat \rangle$ ::= $\langle digit \rangle$ | $\langle digit \rangle \langle nat \rangle$

$\langle int \rangle$ ::= $\langle nat \rangle$ | -$\langle nat \rangle$

$\langle expr \rangle$ ::= $\langle int \rangle$
| ($\langle expr \rangle$)
| $\langle expr \rangle$ + $\langle expr \rangle$
| $\langle expr \rangle$ * $\langle expr \rangle$

$\langle id \rangle$ ::= $\langle letter \rangle$ | $\langle letter \rangle \langle id \rangle$

$\langle stmt \rangle$ ::= $\langle id \rangle$ = $\langle expr \rangle$
| for $\langle id \rangle$ = $\langle expr \rangle$ to $\langle expr \rangle$ do $\langle stmt \rangle$
| { $\langle stmts \rangle$ }
| pass

$\langle stmts \rangle$ ::= $\langle stmt \rangle$ | $\langle stmt \rangle$; $\langle stmts \rangle$

Derive the sentence using *leftmost derivation*.

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for x = -12 to 10 do { y = 0; pass }
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