Reading Assignments

- For lecture on 9/14/2011: Dragon-book 2.1-2.5 (35 pages)
- For lecture on 9/21/2011: Dragon-book 3.1-3.6 (43 pages)

Homework Assignments

1. Precedence and associativity (8 points).
   Consider the following ambiguous grammar:
   \[
   E \rightarrow E \ast E \\
   \mid E + E \\
   \mid F
   \]
   \[
   F \rightarrow 0 \mid 1 \mid \ldots \mid 9
   \]
   Assume that operator \( \ast \) is right-associative, and operator \( + \) is left-associative. Further assume that operator \( + \) has higher precedence than \( \ast \), in other words, \( + \) binds stronger than \( \ast \). Rewrite the grammar to make it unambiguous, by enforcing the associativity and precedence rules. To do this, you will need to apply the “asymmetric layered grammar” technique, similarly to the examples for disambiguating grammars with operators +, -, *, and /.

2. Left-recursion elimination (8 points).
   Consider the following left-recursive grammar:
   \[
   \text{logicOrExpr} \rightarrow \text{logicOrExpr} | | \text{logicAndExpr} \\
   \mid \text{logicAndExpr}
   \]
   \[
   \text{logicAndExpr} \rightarrow \text{logicAndExpr} \&\& \text{eqExpr} \\
   \mid \text{eqExpr}
   \]
   \[
   \text{eqExpr} \rightarrow \text{eqExpr} == \text{ID} \\
   \mid \text{ID}
   \]
   Rewrite the grammar to make it right-recursive. To do this, you will need to apply the “left-recursion elimination” technique commonly used for top-down, predictive parsers.
3. Syntax-directed translation (8 points).
Consider the following right-recursive grammar for relational expressions:

\[
\begin{align*}
\text{relExpr} & \rightarrow D \text{ relExprTail} \\
\text{relExprTail} & \rightarrow \leq D \text{ relExprTail} \\
& \mid < D \text{ relExprTail} \\
& \mid \geq D \text{ relExprTail} \\
& \mid > D \text{ relExprTail} \\
& \mid \varepsilon \\
D & \rightarrow 0 \\
& \mid 1 \\
& \mid \ldots \\
& \mid 9
\end{align*}
\]

Extend this grammar by adding a syntax-directed translation scheme that translates the infix expressions into postfix expressions. Here are some examples of translations:

\[
\begin{align*}
1 < 2 & \Rightarrow 1 2 < \\
9 \geq 8 > 7 & \Rightarrow 9 8 \geq 7 >
\end{align*}
\]

http://cs.nyu.edu/courses/fall11/CSCI-GA.2130-001/hw2.pdf
Total points: 24.