

Curso de Compiladores

Ejercicios de Preparación del Segundo Parcial 14 de marzo de 2008

Ejercicios recomendados:

1. Exercise 4.2.1 : Consider the context-free grammar: $S \rightarrow SS + \mid SS * \mid a$ and the string $aa + a^*$.
 - a) Give a leftmost derivation for the string.
 - b) Give a rightmost derivation for the string.
 - c) Give a parse tree for the string.
 - d) Is the grammar ambiguous or unambiguous? Justify your answer.

2. Exercise 4.2.2 : Repeat Exercise 4.2.1 for each of the following grammars and strings:
 - b) $S \rightarrow +SS \mid *SS \mid a$ with string $+ * aaa$.
 - c) $S \rightarrow S(S)S \mid \varepsilon$ with string (00) .

3. Exercise 4.3.1 : The following is a grammar for regular expressions over symbols a and b only, using $+$ in place of \mid for union, to avoid conflict with the use of vertical bar as a metasymbol in grammars:
 $rexpr \rightarrow rexpr + rterm \mid rterm$
 $rterm \rightarrow rterm rfactor \mid rfactor$
 $rfactor \rightarrow rfactor * \mid rprimary$
 $rprimary \rightarrow a \mid b$
 - a) Left factor this grammar.
 - b) Does left factoring make the grammar suitable for top-down parsing?
 - c) In addition to left factoring, eliminate left recursion from the original grammar.
 - d) Is the resulting grammar suitable for top-down parsing?

4. For each of the following grammars, devise predictive parsers and show the parsing tables. You may left-factor and/or eliminate left-recursion from your grammars first.
 - b) $S \rightarrow +SS \mid *SS \mid a$ with string $+ * aaa$.
 - c) $S \rightarrow S(S)S \mid \varepsilon$ with string (00) .
 - e) $S \rightarrow (L) \mid a$ and $L \rightarrow L, S \mid S$ with string $((a,a),a,(a))$.
 - g) The following grammar for boolean expressions:
 $beexpr \rightarrow beexpr \text{ or } bterm \mid bterm$
 $bterm \rightarrow bterm \text{ and } bfactor \mid bfactor$
 $bfactor \rightarrow \text{not } bfactor \mid (beexpr) \mid \text{true} \mid \text{false}$

5. Exercise 4.4.3 : Compute FIRST and FOLLOW for the grammar of Exercise 4.2.1.
6. Exercise 4.4.4: Compute FIRST and FOLLOW for each of the grammar:
 - b) $S \rightarrow +SS \mid *SS \mid a$ with string $+ * aaa$.
 - c) $S \rightarrow S(S)S \mid \varepsilon$ with string (00) .
 - e) $S \rightarrow (L) \mid a$ and $L \rightarrow L, S \mid S$ with string $((a,a),a,(a))$.
 - g) The following grammar for boolean expressions:
 $bexpr \rightarrow bexpr \text{ or } bterm \mid bterm$
 $bterm \rightarrow bterm \text{ and } bfactor \mid bfactor$
 $bfactor \rightarrow \text{not } bfactor \mid (bexpr) \mid true \mid false$
7. Exercise 4.4.5 : The grammar $S \rightarrow aSa \mid aa$ generates all even-length strings of a's. We can devise a recursive-descent parser with backtrack for this grammar. If we choose to expand by production $S \rightarrow aa$ first, then we shall only recognize the string aa . Thus, any reasonable recursive-descent parser will try $S \rightarrow aSa$ first. a) Show that this recursive-descent parser recognizes inputs aa , $aaaa$, and $aaaaaaaa$, but not $aaaaaa$.
8. Exercise 4.5.1: For the grammar $S \rightarrow 0S1 \mid 01$ of Exercise 4.2.2(a), indicate the handle in each of the following right-sentential forms: 000111 y $00S11$.
9. Exercise 4.5.3 : Give bottom-up parses for the following input strings and grammars: a) The input 000111 according to the grammar of Exercise 4.5.1.
 b) The input $aaa * a + +$ according to the grammar $S \rightarrow SS + \mid SS * \mid a$
10. Exercise 4.6.2 : Construct the SLR sets of items for the (augmented) grammar of Exercise 4.2.1. Compute the GOTO function for these sets of items. Show the parsing table for this grammar. Is the grammar SLR?
11. Exercise 4.6.3 : Show the actions of your parsing table from Exercise 4.6.2 on the input $aa * a+$.
12. Exercise 4.6.4 : For each of the (augmented) grammars: b) $S \rightarrow +SS \mid *SS \mid a$ with string $+ * aaa$.
 c) $S \rightarrow S(S)S \mid \varepsilon$ with string (00) .
 e) $S \rightarrow (L) \mid a$ and $L \rightarrow L, S \mid S$ with string $((a,a),a,(a))$.
 g) The following grammar for boolean expressions:
 $bexpr \rightarrow bexpr \text{ or } bterm \mid bterm$
 $bterm \rightarrow bterm \text{ and } bfactor \mid bfactor$
 $bfactor \rightarrow \text{not } bfactor \mid (bexpr) \mid true \mid false$
 a) Construct the SLR sets of items and their GOTO function.
 b) Indicate any action conflicts in your sets of items.
 c) Construct the SLR-parsing table, if one exists.
13. Exercise 4.6.5 : Show that the following grammar:
 $S \rightarrow AaAb \mid BbBa$
 $A \rightarrow \varepsilon$

$B \rightarrow \varepsilon$
is LL(1) but not SLR(1).

14. Exercise 4.6.6 : Show that the following grammar:
 $S \rightarrow SA \mid A$
 $A \rightarrow a$
is SLR(1) but not LL(1).
15. Exercise 4.7.1 : Construct the
 - a) canonical LR, and
 - b) LALRsets of items for the grammar $S \rightarrow SS + \mid SS * \mid a$ of Exercise 4.2.1.
16. Exercise 4.7.2 : Repeat Exercise 4.7.1 for each of the (augmented) grammars (b)-(g).