CS250 Lab 7 – Grammars

Objectives: In this lab you will learn how to

- determine languages derived from grammars
- construct grammars for specific languages
- determine parse trees for strings derived by a grammar

The Grammar button in JFLAP brings you to an editor where you can enter a grammar. The brute force parse option under the Input menu simply repeatedly replaces symbols starting with the start symbol of the grammar until it just happens to stumble on the string the user entered.

Download the lab7 files.

Assignment 1:
Open ex7.1 in the grammar editor and test it out with the brute force parser or multiple brute force parser. List three strings accepted by the grammar and three strings rejected by the grammar. Clearly and succinctly describe in words the language the grammar represents.

Assignment 2:
In a new editor window, create and thoroughly test grammars for exercise 14 a,b,c on p29 of your text.

Assignment 3:
The grammar in ex7.2 is more complex than we have seen so far. Test it out. Give three strings accepted by the grammar and conjecture on what language this grammar represents.

Assignment 4:
Section 3.3 of your text defines a special form of grammar called a Regular Grammar. As you might expect, regular grammars precisely describe the regular languages. We can show this by showing that all regular grammars have an equivalent FA. And all FAs have an equivalent regular grammar.

Open grammar ex7.1 and use the convert to FA option in JFLAP to do the conversion. Briefly explain the algorithm for converting a regular right-linear grammar to an FA.

Assignment 5:
How would we convert from a FA to a regular grammar? Briefly describe this algorithm. (Trying out some conversions in JFLAP with the convert from FA to grammar option will probably help you see this simple algorithm).

Assignment 6:
A context free grammar (CFG) is another special form of a grammar. A CFG must have a single non-terminal on the left side of productions and the right side can contain any combination of terminals and non-terminals.

Open grammar ex7.3 and test it out. What language does it accept? It should be clear that CFGs can accept languages which are non-regular.

Assignment 7:
Create and test a CFG for the grammar in exercise 12 c on p139.

Assignment 8:
When you do a brute force parse in JFLAP you have the option of viewing the parse tree which illustrates how a derivation may be done. Open the file ex7.4 and test it with the input a-b-a. Look at the parse tree.

Draw another possible parse tree for the input a-b-a with this grammar.

A grammar for which there is a string which may have two distinct parse trees is said to be *ambiguous*. Some ambiguous grammars can be rewritten so as to recognize the same language but no longer be ambiguous. Other languages are inherently ambiguous so that all grammars accepting them are ambiguous. The grammar in ex7.4 can be rewritten. Open ex7.5 and test it out.

Submit your files in goucherLearn for grading.