University of Nevada, Las Vegas Computer Science 456/656 Spring 2024
Assignment 5: Due Saturday March 30, 2024, 11:59 PM

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. You will receive a message from the graduage assistant, Zachary Edwards, telling you how to turn in the assignment.

LALR Parsers

You will learn much more about parsing when you take the compiler class. In the past, students were quite grateful that they had seen parsing in CS456, since that helped them when they took compilers.

A compiler has several parts, one of which is parsing. Modern programming languages are not usually context-free, but they typically have an "underlying" context-free grammar. Call it G. All programs are generated by G, but G also generates strings that look like programs at first glance, but aren't, since (for example) they don't follow the declaration rules.

Despite this limitation, it makes sense to first parse the program as if the rogramming language were context-free, then continue from there.

An LALR parser is basically a DPDA with output. The input is a string L generated by a context-free grammar, say G, and the output is a reverse rightmost derivation of L. The rules for an LALR parser are slightly different from that for a DPDA. For example, any number of symbols can be popped from the stack in a step, and there is possibly output at a step.

Not every context-free grammar can be parsed with an LALR parser, but we'll only consider those that can be. We will consider languages of expressions, as well as languages which model programs. All our example languages will be very, very, simple compared to those used in real life.

Tasks

Download the handout lalrhandout1.pdf, which is 5 pages long. Read it. Work problems 1. through 8. in the handout. You need to draw a parse tree. It would be best if you could draw it using some kind of graphics package that would allow you to attach the figure to a pdf file. Check with Mr. Edwards about that, since he's in charge of how you need to submit.

Do not wait until Saturday night to get started. It won't work. LALR parsing seems easy to me now, but I recall that it was pretty confusing at first. When I first learned LALR parsing, I needed to go back to the book repeatedly to figure out what I'd done wrong, and it wasn't simple.