CS480

Compilers

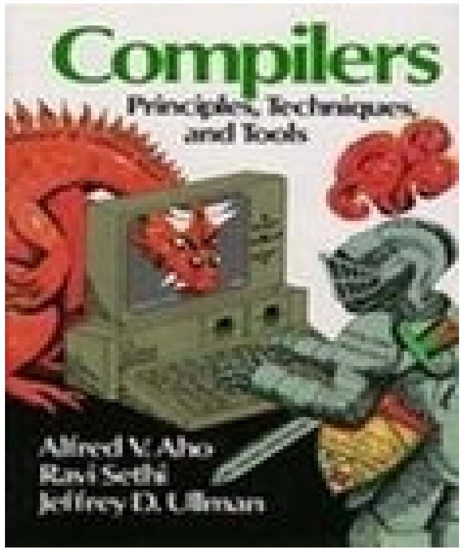
January 28, 2013

Welcome to Compilers.

You are already behind!

Goals of the class

- Understand the theory behind compilers
  - Grammars
  - Parsing
  - Activation Records
- Build a complier!
  - Semester long project
    - Each project builds on the previous
    - Don't fall behind (or I'll see you again in two years)
    - Eclipse/Subversion/Make/Linux/C/Dynamic Memory
  - First assignment Due Friday
    - Start early!



Prerequisites

- CS 310 with a C or better
  - Grammars, parsing,
- CS 300
  - Hash tables, dynamic memory with C, Makefiles
  - Pointers, pointers, pointers
- CS 380
  - Efficiency, trees
- CS 430
  - Activation records, assembly language, stack
- Various
  - Eclipse, Linux, Subversion, ...

Restated....

I expect much more out of you in this class

Syllabus

Compiler Project

- Input:
  - Simple C-lite language (grammar provided)
  - int, if, else, for, return, input, output, …
  - functions
- Output:
  - Machine instructions for simple virtual machine
    - and data
  - Quads
    - operator operand1 operand2 operand3
    - Various addressing modes
  - Add, subtract, multiply, branch, ...

Breakdown

- Symbol Table & Error Handler
- Lexical Analyzer
- Recursive Descent Parser (top down)
- Operator Precedence Parser (bottom up)
- Semantic Actions for Declarations
- Semantic Actions for Expressions
- Remaining Semantic Actions
- *Final Integration*
- Each worth 1/8 of project grade*

Design

- Design is very important
  - What are your function prototypes?
  - What are your data structures?
  - What data gets passed around to whom?

- All pieces must work apart and together

- Easy to code yourself into a corner
  - Short cuts today will cause problems later

Design

- This course is 70% compilers and 30% project management.
- By design, requirements will change during the semester
  - you will need to fix and update code from previous modules
- Write maintainable code!

Testing

- I will post a few public test cases
  - With correct output

    ```
    diff -Bw correct.out youroutput.out
    ```

    - ignore blanks & whitespaces

- You need to come up with good test cases
  - What makes an interesting test case?
  - I may ask the class for test cases …

Testing via shell script

- Naming artifacts correctly is vital
  - files
  - make targets
  - Eclipse projects
- All output must go to stdout
- Projects must build after being pulled out of SVN
  - test this!
  - don't scp code to zeus

```
#!/bin/bash

echo "----GMAKE CLEAN START----"
gmake clean
echo "----GMAKE CLEAN END----"

echo "----GMAKE LEX_DRIVER START----"
gmake bin/lex_driver
echo "----GMAKE LEX_DRIVER END----"

echo "----GMAKE VALGRIND LEX START----"
gmake run_valgrind_lex
echo "----GMAKE VALGRIND LEX END----"

echo "----GMAKE CLEAN START----"
gmake clean
echo "----GMAKE CLEAN END----"

echo "----GMAKE LEX TEST1 START----"
gmake run_lex_test1
echo "----GMAKE LEX TEST1 END----"
```

Moodle Message Boards

- Use them

- Don't post source code for your compiler
- I will monitor the messages
  - Answer questions
  - Post questions

Coding Standards

- 30% of your project grade is style points
  - Eclipse Code Style profile posted!
    - Shift-Ctrl-F
- Readable code is a must
  - For me and for you
- Comments cannot be an afterthought
- Valgrind must not find errors

Subversion/Make/Eclipse/C

- In class lab (222 Strain) Wednesday
  - Before class, complete page one
    - build an Eclipse project / commit to SVN
    - Open your project in Eclipse. Be ready at 4:45pm!

- Some of this will be review
- Some of this will be new
- All will be of vital importance to the project
- Read handouts before class!
  - Current SVN Notes

Today's Project....

CS Lab

- Linux 64 bit OpenSUSE
- Eclipse
- http://zeus.cs.pacificu.edu/chadd/CSLabFAQ.html
- Questions/problems/comments/crashes
  – let me know immediately

Recommendations (of the letter writing type)

- Ask me in person
  - I'll tell you how positive/negative it will be
- I need:
  - Consent form
  - Up to date resume
    - Grades in CS classes I have not taught
  - Information on receiver (U/job/scholarship)
  - Three week notice