Compiler Course (CS3404)

by Prof. Jenq-Kuen Lee

This course will introduce the basic compiler technologies, and design a small subset of C front-end compiler in the class. We will mainly focus on generating RISC-V assembly codes for a subset of C programs. In Taiwan, Andes is a Taiwan-based embedded processor core now used worldwide for RISC-V. In addition, we have many companies developing RISC-V cores and applications. We will need the compiler generated codes to be able to run on RISC-V environments. The topic will include

- Overview of the compiler technologies used such as Khronos language specification, AI compiler, and embedded languages.
- Scanner and lexical analyzer (Lex Tools).
- Regular expression and finite state automata.
- Transformations between regular expression and finite state automata.
- Context-Free Grammar.
- Deterministic push down automata.
- Top down parsing scheme (LL(1)).
- Bottom up parsing scheme (SLR, LALR, LR).
- YACC and Bison compiler generator.
- Symbol table handlings.
- Assembly introductions for RISC-V assembly codes.
- Running Examples on RISC-V Spike environments.
- Compiler code generations on RISC-V Arduino boards.
- Code generator.
- Overview on advanced compiler techniques.
- Compiler optimizations.
- Compiler for RISC-V P Extension (SIMD)
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Languages used

C and RISC-V assembly codes.

Text Book

1. ``Compilers, Principles, Techniques, and Tools'', A. Aho, Monica Lam, R. Sethi, J. Ullmman, Addisin-Wesley, Second Edition, 2007.
2. Class notes with Lex, Yacc, and RISC-V assembly information.

Reference Book

``Crafting a Compiler with C'',
C. Fisher an R. Leblanc, 1991.

``Compiler Design in C'', by Allen I. Holub, Prentice Hall, 1990.

Web Page

http://pllab.cs.nthu.edu.tw/cs3404
another FB page to be announced by TA

Grading

The final score will have 30% from software projects, 30% from midterm exams, 30% from the final exams, and 10% from class participations. Class participation score will be based on a combination of class attendance, class interactions, final project, and final exam.