Bangladesh University of Engineering & Technology
Dept. of Computer Science & Technology
February 2015

CSE 309: Compiler

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June 17, 2015

Syllabus of the second part

Reference Book

- Compilers: Principles, Techniques, & Tools, *Second Edition*
  - Alfred V. Aho
  - Monica S. Lam
  - Ravi Sethi
  - Jeffrey D. Ullman

1 Syntax-Directed Translation

- Lecture note from stanford cs course
- Chapter 5 of the reference book
- Section 5.1 → full
- Section 5.2 → upto 5.2.5 (5.2.5 not included)
- Practice exercise problems, 5.1.1, 5.1.2, 5.1.3
- Definitions with examples,
  - attributed grammar
  - synthesized & inherited attribute
  - syntax-directed definitions & syntax-directed translations
  - dependency graphs
  - S-attributed definitions & L-attributed definitions

2 Semantic Analysis

- Slide from stanford cs course
- Practice drawing symbol tables from code,
  - explicit stack
  - spaghetti stack
  - scoping with inheritance
- Definition with examples
  - static & dynamic scoping

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3 Intermediate-Code Generation

- Chapter 6 of the reference book
- Section 6.1 → full
- Section 6.2 → upto 6.2.4 (6.2.4 not included)
- Section 6.3 → upto 6.3.6 (6.3.6 not included)
- Section 6.4 → full
- Section 6.6 → upto 6.6.5 (6.6.5 not included)
- Practice exercise problems, 6.1.1, 6.1.2, 6.2.1, 6.2.2, 6.4.1, 6.4.2, 6.4.3, 6.6.1 (both a and b)

4 Type Checking

- Slide from stanford cs course
- Definition with examples
  - static & dynamic type checking
  - type systems
  - strong & weak type systems
- Logic inference rules
  - example
  - how to add scope in the rules
  - ordering types based on conversion (for example, bool $\leq$ int $\leq$ double)

5 Code Optimization

- Rajkumar Sir's slide
- Chapter 8 of the reference book,
  - only some parts of section 8.4 (8.4.1 → basic block, 8.4.3 → flow graph)
- Chapter 9 of the reference book,
  - section 9.1 → full
- Practice generating flow graphs for given three-address code sequence and apply optimization techniques on it
- Practice exercise problem, 9.1.1

6 Run-Time Environments

- Chapter 7 of the reference book
- Section 7.1 → full
- Section 7.2 → upto 7.2.3 (7.2.3 not included)
  - Practice drawing activation tree, control stack with activation records for a given code sequence
- Practice exercise problems, 7.2.3, 7.2.4

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6.1 Garbage Collection

- Slide from stanford cs course
- Definition with examples, pros & cons of,
  - manual & automatic memory management
  - incremental & stop-the-world garbage collector
  - garbage & reachability
- Reference counting,
  - simulation for a given code
  - advantages
  - major problems (reference cycles)
- Mark-and-sweep
  - simulation for a given scenario

7 Code Generation

- Chapter 8 of the reference book
- Section 8.1 → full
- Section 8.2 → full
- Section 8.3 → upto 8.3.3 (8.3.3 not included)
- Practice how to measure **instruction cost**s for a give machine code sequence
- Practice exercise problem, 8.2.6 (a, b, c, d, e, f)

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