Course Information and Syllabus

This course provides an introduction to the foundations, methods, and tools for automatic verification (of computer systems, in particular software). The focus is on algorithmic (including model checking) methods. A separate complementary course entitled "Software Specification and Verification" covers deductive methods.

Instructor

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Lectures

Wednesday 9:10AM-12:10PM, Room 203, College of Management, Building II

Office Hours

Wednesday 1:30–2:30PM (Room 1108, Management II) or by appointment

Textbooks

1. *Model Checking*, E.M. Clarke, O. Grumberg, and D.A. Peled, The MIT Press, 1999. [CGP]
2. *The SPIN Model Checker: Primer and Reference Manual*, G.J. Holzmann, Addison-Wesley, 2003. [H]
3. *Temporal Verification of Reactive Systems: Safety*, Z. Manna and A. Pnueli, Springer, 1995. [MP]
4. *Selected Papers*. [SP]
5. *Class Notes*. [CN]

Syllabus/Schedule

We shall seek a balance between breadth and depth, covering both the foundations and some of the more successful methods and tools. Below is a tentative list of topics and their schedule:

- Introduction [CGP: Ch. 1, H: Ch. 1]   (.5 week: 2/20a)
- Systems Modeling [CGP: Ch. 2; H: Ch. 2; MP: Ch. 0.1-4]   (.5 week: 2/20b)
- Temporal Logic Model Checking [CGP: Ch. 3,4; MP: Ch. 5.2-3]   (1 week: 2/27)
- Six Talks in Formal Verification at TFIT 2008   (1 week: 3/5)
- Ordered Sets and Fixpoints [CN]   (1 week: 3/12)
- Binary Decision Diagrams [CGP: Ch. 5, SP]   (1 week: 3/19)
- Symbolic Model Checking [CGP: Ch. 6]   (1 week: 3/26)
- Model Checking μ-Calculus [CGP: Ch. 7]   (1 week: 4/2)
- Tableau-Based Model Checkers [CGP: Ch. 8; SP]   (1 week: 4/9)
- Automata-Theoretic Approach [CGP: Ch. 9; H: Ch. 6; MP: Ch. 5.1] (1 week: 4/16)
- The Spin Model Checker [H: Ch. 3, 4, 7, 12]   (1 week: 4/23)

- Partial Order Reduction [CGP: Ch. 10]   (1 week: 4/30)
- Approximation and Abstraction [CGP: Ch. 13; SP]   (1 week: 5/7)
- Satisfiability Solving and Tools [SP]   (1 week: 5/14)
- Bounded Model Checking [SP]   (1 week: 5/21)
- **Final**   (**2007/05/28**)
- Satisfiability Modulo Theories (SMT), Solvers, and Applications [SP] (1 week: 6/4)
- Compositional Reasoning [CGP: Ch. 12; SP]   (1 week: 6/11)
- Infinite-State Systems [CGP: Ch. 15; SP]   (1 week: 6/18)

FTP Site

`ftp://ftp.im.ntu.edu.tw/` (directory: /home/course/Automatic_Verification/; guest accounts may be requested).

Grading

Homework Assignments 20%, Final Exam 40%, Term Paper/Report 40%.