Course Information and Syllabus

The goal of this course is to acquaint the students with fundamentals of automatic verification (of computer systems, in particular software) and to prepare them for conducting research in the area.

Instructor

Yih-Kuen Tsay (蔡益坤), NTU IM Dept., 3366-1189, `tsay@im.ntu.edu.tw`

Lectures

Wednesday 9:10AM-12:10PM, Room 203, Management II (when the class is small enough, we meet in the seminar room on the 11th floor)

Office Hours

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

Textbooks

1. *Model Checking*, E.M. Clarke, O. Grumberg, and D.A. Peled, The MIT Press, 1999. [CGP]

2. *Principles of Model Checking*, C. Baier and J.-P. Katoen, The MIT Press, 2008. [BK]

3. *The SPIN Model Checker: Primer and Reference Manual*, G.J. Holzmann, Addison-Wesley, 2003. [H]

4. *Temporal Verification of Reactive Systems: Safety*, Z. Manna and A. Pnueli, Springer, 1995. [MP]

5. *Selected Papers.* [SP]

6. *Class Notes.* [CN]

Syllabus/Schedule

This course provides an introduction to the foundations, methods, and tools for automatic verification. The focus is on algorithmic (including model checking) methods. A separate complementary course entitled "Software Specification and Verification" covers deductive methods. 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; BK: Ch. 1; H: Ch. 1]   (.5 week: 2/24a)
- Systems Modeling [CGP: Ch. 2; BK: Ch. 2,3; H: Ch. 2; MP: Ch. 0.1-4]
                                                                   (.5 week: 2/24b)
- Temporal Logic Model Checking [CGP: Ch. 3,4; BK: Ch. 6; MP: Ch. 5.2-3]
                                                                   (2 weeks: 3/3, 3/10)
- Ordered Sets and Fixpoints [CN]   (1 week: 3/17)
- Binary Decision Diagrams [CGP: Ch. 5; SP]   (1 week: 3/24)
- Symbolic Model Checking [CGP: Ch. 6]   (1 week: 3/31)

- Model Checking μ-Calculus [CGP: Ch. 7]   (1 week: 4/14)
- Symbolic Model Checkers [CGP: Ch. 8; SP; CN]   (1 week: 4/21)
- Automata-Theoretic Approach [CGP: Ch. 9; BK: Ch. 4.3,4.4,5; H: Ch. 6; MP: Ch. 5.1]   (1 week: 4/28)
- The Spin Model Checker [H: Ch. 3, 4, 7, 12]   (1 week: 5/5)
- Equivalences and Abstraction [CGP: Ch. 11,13; BK: Ch. 7; SP]   (1 week: 5/12)
- Compositional Reasoning [CGP: Ch. 12; SP; CN]   (1 week: 5/19)
- Satisfiability Solving and Tools [SP; CN]   (1 week: 5/26)
- Bounded Model Checking [SP]   (1 week: 6/2)
- **Final**   (**2010/06/09**)
- Satisfiability Modulo Theories (SMT), Solvers, and Applications [SP; CN]
                                                                                (1 week: 6/23)

Web Site

http://www.im.ntu.edu.tw/~tsay/courses/av/

Grading

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

TA

Chih-Pin Tai (戴智斌), 3366-1205, steve750312@gmail.com