

Algorithms for Model Checking (2IW55)

Domestic Announcements

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MF 6.073

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Course organisation:

- ▶ Lectures are (tentatively) organised as follows:
 - 3 February – 11 February (part I, 4 lectures)
 - 24 February – 4 March (part II, 4 lectures)
 - 17 March – 25 March (part III, 4 lectures)
- ▶ Assignment deadlines (30% of the final mark; average 5.5/10 needed):
 - Assignment 1: 7 March (available from 11 February)
 - Assignment 2: 3 April (available from 4 March)
- ▶ Exam dates (70% of the final mark; average 5.5/10 needed, minimal score for the exam must be 5.5 or more to pass the course):
 - Wednesday, 8 April, 2015, 13.30 - 16.30
 - Tuesday, 23 June, 2015, 13.30 - 16.30

Up-to-date course information and handouts are made available through:

<http://www.win.tue.nl/~timw/2IW55.php>

Bug-related health issues are communicated also through the above interface

Background knowledge (required):

- ▶ Set theory $\cap, \cup, \subseteq, 2^S, \dots$
- ▶ (First-order) logic $\wedge, \vee, \Rightarrow, \forall, \neg, \dots$

Background knowledge (helpful):

- ▶ Automata theory
- ▶ Process theory (process algebra, bisimulations, Petri nets)

Part I (basics):

- ▶ syntax and semantics of CTL* (today)
- ▶ symbolic model checking CTL, counterexamples and fairness
- ▶ the modal μ -calculus

Tentative schedule:

3 Feb	The temporal logics CTL*, CTL and LTL: syntax and semantics
4 Feb	Symbolic Model Checking for CTL
10 Feb	Symbolic Model checking: fairness and counterexamples
11 Feb	Mu-calculus + Assignment

Part II (advanced):

- ▶ Boolean equation systems for μ -calculus model checking
- ▶ Parity Games for model checking

Tentative schedule:

24 Feb	Boolean Equation Systems
25 Feb	Parity Games
3 Mar	Recursive Algorithm for Parity Games
4 Mar	Small Progress Measures for Parity Games + Assignment

Part III (advanced++):

- ▶ Model checking with data
- ▶ Data abstraction

Tentative schedule:

17 Mar	μ -calculus with data
18 Mar	Parameterised Boolean Equation Systems
24 Mar	Data abstraction
25 Mar	Q&A & Wrap-up

Additional reading:

- ▶ Handouts (accessible via the website on occasions) and slides
- ▶ Exercises and solutions to the 2010 and a 2009 exam are available from the 2010 and 2009 incarnations of the course's website, see <http://www.win.tue.nl/~timw/pastcourses.php>
- ▶ Book: Model Checking. Edmund M. Clarke, Jr., Orna Grumberg, and Doron A. Peled. MIT Press, ISBN 0-262-03270-8
- ▶ Book: Principles of Model Checking. Christel Baier and Joost-Pieter Katoen. MIT Press, ISBN 978-0-262-02649-9 (mainly for the interested reader)

Note: Books not strictly required, as virtually all slides are self-contained.

Related Courses (at the TU/e):

A.2	2IF85	Program Verification Techniques (R. Kuiper).
A.2	2IW15	Automated Reasoning (H. Zantema).
A.1	2IW26	System Validation (J.F. Groote).
B.4	2IF45	Process Algebra (B. Luttik).
B.4	2IF96	Seminar Formal System Analysis (H. Zantema).