

Algorithms for Model Checking (2IMF35)

Domestic Announcements

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MF 6.073

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Course organisation:

- ▶ Lectures are (tentatively) organised as follows:
 - 1 February – 17 February (part I, 4 lectures and a break)
 - 22 February – 2 March (part II, 4 lectures)
 - 14 March – 23 March (part III, 4 lectures)
- ▶ Office hours: Wednesday from 13.30-14.00; drop me an email to ensure I'm in.
- ▶ Assignment deadlines (30% of the final mark; average 5.5/10 needed):
 - Assignment 1: Wednesday 16 March (available from 17 February)
 - Assignment 2: Friday 8 April (available from 2 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):
 - Friday, 15 April, 2016, 9.00 - 12.00
 - Friday, 1 July, 2016, 18.00 - 21.00 (but I prefer you ace the first one)

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

<http://www.win.tue.nl/~timw/2IMF35.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 $\wedge, \vee, \Rightarrow, \forall, \exists, \neg, \dots$

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:

1 Feb	The temporal logics CTL*, CTL and LTL: syntax and semantics
3 Feb	Symbolic Model Checking for CTL
...	Silly Break
15 Feb	Symbolic Model checking: fairness and counterexamples
17 Feb	Mu-calculus + Assignment

Part II (advanced):

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

Tentative schedule:

22 Feb	Boolean Equation Systems
24 Feb	Parity Games
29 Feb	Recursive Algorithm for Parity Games
2 Mar	Small Progress Measures for Parity Games + Assignment

Part III (advanced++):

- ▶ Model checking with data
- ▶ Data abstraction

Tentative schedule:

14 Mar	μ -calculus with data
16 Mar	Parameterised Boolean Equation Systems
21 Mar	Data abstraction
23 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:

A.1	2IMF20	Hardware Verification. (J. Schmaltz).
A.1	2IMF30	System Validation (J.F. Groote).
A.2	2IMF25	Automated Reasoning (H. Zantema).
A.2	2IMF00	Seminar Formal System Analysis (H. Zantema).
A.2	2IMP10	Program Verification Techniques (R. Kuiper).
B.4	2IMF45	Process Algebra (B. Luttik).