

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:
 - 6 Feb – 15 Feb (part I, 4 lectures)
 - 20 Feb – 8 Mar (part II, 4 lectures; break from 27 Feb – 3 Mar)
 - 14 Mar – 23 Mar (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: **Friday 10 March** (available from 15 February)
 - Assignment 2: **Friday 31 March** (available from 8 March)
- Note: if you did the assignment last year, you'll get a different one.
- ▶ 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):
 - Monday, 10 April, 2017, 13.30 - 16.30
 - Friday, 7 July, 2017, 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:

6 Feb	The temporal logics CTL*, CTL and LTL: syntax and semantics
8 Feb	Symbolic Model Checking for CTL
13 Feb	Symbolic Model checking: fairness and counterexamples
15 Feb	Mu-calculus + Assignment

Part II (advanced):

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

Tentative schedule:

20 Feb	Boolean Equation Systems
22 Feb	Parity Games
...	Silly Break
6 Mar	Recursive Algorithm for Parity Games
8 Mar	Small Progress Measures for Parity Games + Assignment

Part III (advanced++):

- ▶ Model checking with data
- ▶ Data abstraction

Tentative schedule:

13 Mar	μ -calculus with data
15 Mar	Parameterised Boolean Equation Systems
20 Mar	Data abstraction
22 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.

YOU CAN BRING BOOKS AND NOTES TO THE EXAM

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).