# Curriculum Vitae for Michael Reichhardt Hansen January 13, 2009

# Personal information:

Name:	Michael Reichhardt Hansen
Date of Birth:	Juli 11, 1956
Nationality:	Danish
Married to:	Ulrike E. Hansen
Children:	Alexander $(21)$ and Gabriela $(18)$
Degrees:	MSc in Engineering, Technical University of Denmark (DTU), 1982
	PhD in Computer Science, DTU, 1987

## Addresses:

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# Positions held:

1980-1981:	Part-time programmer, BETA-PLAN, Helsingør
Spring 82:	Visiting Scientist, IBM research Center, Heidelberg, Germany
1984-1985:	Post-doctoral fellowship, IBM Research Center, San Jose, California
1985 - 1986:	PhD. student, Department of Computer Science, DTU
1986-1989:	Assistant Professor, Department of Computer Science, DTU
1990:	Associate Professor, Informatics and Mathematical Modelling, DTU
1992-1993:	Guest Professor at Oldenburg University, Germany

In addition to that I have had a number of shorter stays (1 week - 2 month) at international research institutions.

# **Research**:

I'm currently working on modelling and development of real-time, embedded systems, where special focus is on the part where software and hardware techniques are meeting, e.g. [2, 5, 7, 14, 19], and on theories and techniques behind automated analysis of quantitative properties of embedded systems, e.g. [3, 6, 13, 17, 18]. My plan for the coming years is to develop these areas on a mathematically well-founded basis, and to develop associated verification tools, which can cope with some problems of a complexity which occur in industrial applications.

#### **Background:**

I have a background in formal models for the construction of software systems and I have coauthored two books within that area [24, 38].

A special research interest is logical approaches to modelling and analysis of embedded, real-time system, and the research monograph on the real-time logic *Duration Calculus* [24] is the result of an ongoing emphasis in that area. This book is supported by a number of key publications in the field where, for example, [57, 53, 51, 49, 47, 44, 27] concerns the foundations of the logic, [60, 58, 54, 48, 31] concerns applications and [52, 45, 30] concerns mathematically, well-founded methods for systems development. In this area I have been invited to give courses and talks at international conferences and ph.d. schools (see section on teaching) and invited to contribute with chapters, e.g. [3, 13].

A general interest is systematic methods for modelling and development of software systems on a well-founded mathematical basis, where examples of publications are [63, 62, 61, 55, 40, 35, 29, 10, 9, 1].

The textbook [38] presents a model-based approach to programming with the aim of bringing theory to practical use. The rationale behind and the experience with this approach is presented at conferences for education [36, 39] and in the chapter [4].

#### **Current Projects:**

I am a member of the national projects MoDES and DiNES (funded by the Danish Council for Strategic Research) and DaNES (funded by the Danish National Advanced Technology Foundation), I'm active in the European networks ARTEMIS, ARTIST II and ARTIST Design and in The Scandinavian Pedagogy of Programming Network. Furthermore, I'm a member of the Nordic Network in Dependable Computing. I hold a Velux Visiting Professor grant for Prof. Martin Fränzle, Oldenburg Univ. whom I am frequently visiting funded by the German project AVACS and the graduate school TrustSoft.

#### **Previous Projects:**

My research has previously been associated with the European projects ProCoS KIT, Pro-CoS II and ProCoS I, and the national projects RAPID, LUCAS II and LUCAS I (all funded by STVF). My (longer) stays at external institutions were partially funded by SNF, STVF, and the European commission under the Human Capital Mobility programme.

## Miscellaneous $(2000 - \ldots)$

- Accreditation of Master's education (Bergen University College and Bergen University), 2008
- COPLAS, Dept. of computer science, Copenhagen Univ., 2008 (talk)
- Oldenburg Univiversity, TrustSoft graduate school, 2008 (talk)
- Dagstuhl seminar on Quantitative aspects of embedded systems, 2007 (invited)
- Formal Methods and Hybid Real-Time Systems, Macau, 2007 (invited talk)
- Oldenburg Univiversity, TrustSoft graduate school, 2007 (talk)
- Oldenburg University, AVACS, 2006 (talk)
- Teknologisk Institut, 2005 (invited talk)
- Guest editor for Formal aspects of computing, 2004

- ESSLLI 2003, workshop on Interval logic and duration calculus (Invited talk)
- Dialogue Meetings at DTU, 2003 (Chairman mødeleder)
- Guest editor for Nordic journal of computing, 2002
- 10th Nordic Workshop on Programming Theory, DTU 2001 (Chair)
- In steering/programme committee for NWPT since 2001
- In the programme committee for a variety of conferences: SEFM09, M4M09, ICTAC07, ICTAC06, ICTAC05, SEFM06, SNDP03, NWPT01 –
- Session chair at a number of conferences, e.g. NWPTxx, ICTACyy, Formal Methods and Hybrid Real-Time Systems 2007
- Ph.d. evaluation committee for A. Schäfer, Oldenburg (2006), Davide Bresolin, Pisa Univ. (2007), Morten Ib Nielsen Copenhagen Univ. (2008)
- In evaluation committee for assistant and associate professors
- Supervisor for assistant professor, Jørgen Villadsen, DTU, Completed 2003
- In the board of governors for the Department of Information Technology, DTU, and engaged in the forming of Informatics and Mathematical Modelling, 2000-2001

# Teaching

## Ph.d.-level courses:

- 02917 Advanced Topics in Embedded Systems. 3 weeks period in June. A current DTU course which is shared with H.H. Løvengreen and Jan Madsen
- Course on Modelling and analysis of real-time properties using Duration Calculus, at the post-graduate school on Domain Modelling and Duration Calculus, Shanghai, September 17-21, 2007. (My part corresponded to about 25% of the week)
- Course on *Duration Calculus* at the ph.d. summer School on *Logics of Formal Software Specification Languages*, The High Tatras, Slovakia, June 6-19, 2004. (My part corresponded to about 25% of the second week)
- ITI9120 Duration Calculus: A formal approach to real-time systems, Department of Computer Science, Technical Univ. of Tallinn, November 17-21, 2003. (Intensive course one week)
- Interval Logics and Duration Calculii, workshop at 15th European Summer School in Logic, Language and Information, Vienna, August 18-29, 2003 (Invited lecture).
- Duration Calculus: A Logical Approach to Real-Time Systems, workshop at 10th European Summer School in Logic, Language and Information, Saarbrücken, August 17-28, 1998. (Organizer of workshop)
- Ph.d. course in *Duration Calculus* DTU Fall 96 and Fall 97. (Intensive course one week)
- Course on *Functional Programming* at the Estonian Winter School in Computer Science, Phajärve, March 3-8, 1996 (My part corresponded to 10% of the week)
- Course on *Duration Calculus*, at the Estonian Winter School in Computer Science, Phajärve, March 3-8, 1996. (My part corresponded to 20% of the week)
- Spezifikation von Realzeitsystemen, Department of Computer Science, Oldenburg Univ. Full course in the Fall semester, 1992
- and the arrangements of a number of study and seminar courses

For each of the following courses on master or bachelor level I have given a major part if not the whole course.

### Master-level courses:

- 02224/02225 Real-time systems, a current course which is shared with H.H. Løvengreen and Jesper Black Møller
- 02240 Computability and Semantics
- 49409 Computability
- 49285 Advanced Algorithms
- a number of special courses on computability (for around 10 20 students before it became a regular course
- a number of special courses in real-time systems for 10-15 students, before it became a regular course
- and of a number of seminar courses

## **Bachelor-level courses:**

- 02157 Functional Programming
- 02153 Declarative Modelling, a current course which is shared with J. Villadsen and A. Haxthausen
- 02161 Software engineering 1
- 02165 Development of software products, a current course which is given by Microsoft. The DTU role and examination duties is shared with S. Høgh
- 02140 Languages and Parsing
- 02120 Software engineering projects (Fagpakke projekter)
- 49135 Programming
- 4305 Functional Programming
- 4306 Program Construction
- 4312 Programming theory. Version on Databases, parsing and algorithms
- 4312 Theoretical Computer Science. Version on Program specification and correctness, Algebraic specification, and automata theory
- 4301 Elementær Datalogi 1. A programming course based on Pascal

In addition to that should be mentioned: involvement at various degrees in a number of other regular courses, and supervisor for at number of mid-term projects (midvejsprojekter) and special courses.

## Theses' supervision:

I am currently the main supervisor of one ph.d. student and co-supervising another, and the main supervisor for two master thesis projects.

I have been the supervisor for about 44 students at all levels (ph.d., master, bachelor, and IT-diploma). A vast majority of these are at the master level.

#### Publications in chronological order.

- Nicholas Schultz-Møller, Christian Hølmer, and Michael R. Hansen. Software and Data Technologies - ICSOFT 2008, chapter Declarative Business Process Modelling and the Generation of ERP systems, page (To appear). Springer, 2009.
- [2] Jan Madsen, Michael R. Hansen, and Aske W. Brekling. Model-Based Design of Heterogeneous Embedded Systems, chapter A modelling and analysis framework for embedded systems, page (To appear). CRC Press, 2009.
- [3] Michael R. Hansen. Logics of Specification Languages, chapter Duration Calculus, pages 291–341. EATCS: Monographs in Theoretical Computer Science. Springer-Verlag, 2008.
- [4] Michael R. Hansen and Jens Thyge Kristensen. Reflections on the Teaching of Programming, volume 4821 of LNCS, chapter Experiences with Functional Programming in an Introductory Curriculum, pages 30–46. Springer-Verlag, 2008.
- [5] Aske W. Brekling, Michael R. Hansen, and Jan Madsen. Models and formal verification of multiprocessor system-on-chips. *Journal of Logic and Algebraic Programming*, 77:1–19, 2008.
- [6] Martin Fränzle and Michael R. Hansen. Efficient model checking for duration calculus based on branching-time approximations. In Antonio Cerone and Stefan Gruner, editors, Sixth IEEE International Conference on Software Engineering and Formal Methods (SEFM 2008), pages 63–72. IEEE, 2008.
- [7] Jan Madsen, Michael R. Hansen, Kristian S. Knudsen, Jens E. Nielsen, and Aske W. Brekling. System-level verification of multi-core embedded systems using timed automata. In 17th World Congress International Federation of Automatic Control, pages 9302–9307, 2008.
- [8] Aske W. Brekling, Michael R. Hansen, and Jan Madsen. Formal verification of design properties of hardware architectures. (poster). In DATE'08 University Booth, 2008.
- [9] Nicholas Schultz-Møller, Christian Hølmer, and Michael R. Hansen. Generation of erp systems from rea specifications. In *Third International Conference on Software and Data Technologies*, volume Information Systems and Data Management, pages 12–19. INSTICC, 2008.
- [10] Christian Sellberg, Michael R. Hansen, and Paul Fischer. Faults analysis in distributed systems: Quantitative estimation of reliability and resource requirements. In *Third International Conference on Software and Data Technologies*, volume Software Engineering, pages 45–52. INSTICC, 2008.
- [11] Tolga Ovatman, Aske W. Brekling, and Michael R. Hansen. Analysis of costs of embedded systems: experiments with priced timed automata. In *Formal Foundations of Embedded* Software and Component-Based Software Architectures (FESCA@ETAPS), volume (To appear in ENTCS.), 2008.
- [12] Per Larsen, Michael R. Hansen, and Jan Madsen. Towards traceability in descriptive software models. In Nordic Workshop and Doctoral Symposium on Dependability and Security, pages 63–72. Dept. of Computer Science, Tallinn University of Technology, 2008.
- [13] Michael R. Hansen and Dang Van Hung. Domain Modelling and the Duration Calculus, volume 4710 of LNCS, chapter A Theory of Duration Calculus with Application, pages 119–176. Springer-Verlag, 2007.

- [14] Michael R. Hansen, Jan Madsen, and Aske Wiid Brekling. Formal Methods and Hybrid Real-Time Systems, volume 4700 of LNCS, chapter Semantics and Verification of a Language for Modelling Hardware Architectures, pages 300–319. Springer-Verlag, 2007.
- [15] Aske Brekling, Michael R. Hansen, and Jan Madsen. Hardware modelling language and verification of design properties. In Einar Broch Johnsen, Olaf Owe, and Gerodo Schneider, editors, NWPT'07/FLACOS'07, volume Research Report, pages 49–51. Institute for Informatics, University of Oslo, 2007.
- [16] Robin Sharp and Michael R. Hansen. Timed traces and strand spaces. In M. Volkov V. Dickert and A. Voronkov, editors, CSR 2007, volume 4649 of LNCS, pages 373–386. Springer-Verlag, 2007.
- [17] Martin Fränzle and Michael R. Hansen. Deciding an interval logic with accumulated durations. In O. Grumberg and M. Huth, editors, *TACAS 2007*, volume 4424 of *LNCS*, pages 201–215. Springer-Verlag, 2007.
- [18] T. Bolander, J. Hansen, and M. R. Hansen. Decidability of a hybrid duration calculus. Electronic Notes in Theoretical Computer Science, 174(6):113–133, jun 2007.
- [19] J. Ellebæk, K. S. Knudsen, A. Brekling, M. R. Hansen, and J. Madsen. MOVES a tool for modeling and verification of embedded systems. In *DATE'07 University Booth*, apr 2007.
- [20] T. Bolander, J. Hansen, and M. R. Hansen. Decidability of a hybrid duration calculus. In HyLo 2006, pages 104–123, 2006.
- [21] A. Brekling, M. R. Hansen, and J. Madsen. A timed-automata semantics for a systemlevel mpsoc model. In *Nordic Workshop on Programming Theory*. Reykjavik University, 2006.
- [22] Jacob Enslev, Anne-Sofie Nielsen, Martin Fränzle, and Michael R. Hansen. Bounded model construction for duration calculus. In Neil D. Jones, editor, *Proceedings of the* 17th Nordic Workshop on Programming Theory, 2005.
- [23] Martin Fränzle and Michael R. Hansen. A robust interpretation of duration calculus. In Dang Van Hung and Martin Wirsing, editors, *Theoretical Aspects of Computing – ICTAC 2005*, volume 3722 of *LNCS*, pages 257–271. Springer-Verlag, 2005.
- [24] Zhou Chaochen and Michael R. Hansen. Duration Calculus: A Formal Approach to Real-Time Systems. EATCS: Monographs in Theoretical Computer Science. Springer, 2004.
- [25] Cliff Jones and Michael R. Hansen. Special issue on duration calculus. Formal Aspects of Computing, 16(2), 2004.
- [26] Michael R. Hansen. Duration calculus. In Branislav Rovan Martin Henson and Dines Bjørner, editors, Summer school in Logics og Formal Specification Languages, pages 364–385, 2004.
- [27] Martin Fränzle and Michael R. Hansen. A robust interpretation of duration calculus. In Paul Pettersson and Wang Yi, editors, *Proceedings of the 16th Nordic Workshop on Programming Theory*, pages 83–85, 2004.
- [28] Robin Sharp and Michael R. Hansen. Timed traces and strand spaces. In Paul Pettersson and Wang Yi, editors, *Proceedings of the 16th Nordic Workshop on Programming Theory*, pages 96–98, 2004.
- [29] Tue Becker Jensen, Terkel K. Tolstrup, and Michael R. Hansen. Generating web-based systems from specifications. In *The 19th ACM Symposium on Applied Computing (SAC 2004)*, volume 2, pages 1647 – 1653. ACM Press, 2004.

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- [31] Michael R. Hansen and Robin Sharp. Using interval logics for temporal analysis of security protocols. In Michael Backes, David Basin, and Michael Waidner, editors, *First* ACM Workshop on Formal Methods in Security Engineering (FMSE'03), pages 24–31. ACM Press, 2003.
- [32] Michael R. Hansen. Duration calculus (extended abstract). In Valentin Goranko and Angelo Montanari, editors, Workshop on Interval Logics and Duration Calculi, ESSLLI'03, pages 66–84, 2003. Invited Talk.
- [33] Henrik Pilegaard, Michael R. Hansen, and Robin Sharp. Using interval logic and isabelle/hol for analyzing real-time properties of security protocols. In J. Vain and Tarmo Uustalu, editors, *The 14th Nordic Workshop on Programming Theory*, pages 84–86. Onstitute of Cybernetics, Tallinn Technical University, 2002.
- [34] Magne Haaveraaen and Michael R. Hansen. Selected papers of the 13th nordic workshop on programming theory (nwpt'01). Nordic Journal of Computing, 9(4), 2002.
- [35] S. Larsen and Michael R. Hansen. Systematic design and implementation of web-based systems. In *International Symposium on Telecommunications - IST2001*, pages 38–41. ITRC, 2001.
- [36] Jens Thyge Kristensen, Michael R. Hansen, and Hans Rischel. Teaching object-oriented programming on top of functional programming. In *Frontiers in Education (FIE'01)*, pages 15–20. IEEE, 2001.
- [37] Michael R. Hansen, editor. The 13th Nordic Workshop on Programming Theory, number IMM2001-0840. Technical University of Denmark, IMM, 2001.
- [38] Michael R. Hansen and Hans Rischel. Introduction to Programming using SML. Addison Wesley Longman, 1999.
- [39] Michael R. Hansen, Jens Thyge Kristensen, and Hans Rischel. A theory-based introductory programming course. In *Frontiers in Education (FIE'99)*, volume 1, pages "11b4–25 11b4–30". IEEE, 1999.
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