Curriculum Vitae

Prof. Lothar Thiele

Professor of Computer Engineering
thiele@ethz.ch

Degrees/Higher Education

1987	Habilitation (venia legendi) for network theory with a thesis entitled «Algorithmically specialized VLSI structures»
1984	Dr.-Ing. from Technical University Munich with a thesis entitled «Analytische Netzwerksynthese»
1981	Dipl.-Ing. in Electrical Engineering, Technical University Munich, Germany

Professional Career

2004	Leave of absence: National University Singapore (NUS). Research in embedded systems
1999	Leave of absence: Hewlett-Packard Research Labs, Palo Alto. Research in parallelizing compilers and computer engineering
1994–present	Professor at ETH Zurich in the area of computer engineering
1991	Leave of absence: IBM Research, Yorktown Heights. Research in the area of computer engineering and parallelizing compilers
1990	Leave of absence: NEC Computer and Communications Lab, Kawasaki, Japan. Research in parallel and distributed computing
1988–1994	Full professor (C4) in Microelectronics at the University Saarland, Saarbrücken. Research in the area of microelectronics, bio-inspired optimization, computer engineering
1987	Research Associate, Stanford University. Member of the Information Systems Lab. in the research group of Prof. Tom Kailath. Research in the area of information technology
1981–1986	Research Assistant in the area of network theory and circuit design, Technical University of Munich

Some Professional Activities

- Organization of various workshops and conferences (general chair, program chair, member of PC)
- Co-leading NCCR MICS (Mobile Information and Communication Systems) in Switzerland
- Steering Committee of the International Master in Embedded Systems ALARI, Lugano, Switzerland
- Member of the Executive Committee of Nano-Tera, a Swiss large-scale research program.
- Editorial Board of various Journals, e.g. IEEE Transaction on Industrial Informatics, IEEE Transactions on Evolutionary Computation, Journal of Real-Time Systems, Journal of Signal Processing Systems, Journal of Systems Architecture, and INTEGRATION, the VLSI Journal.

Major Honors and Awards

- 2010 Member of the "Academia Europaea"
- 2005 "Honorary Blaise Pascal Chair" of the University Leiden, The Netherlands
- 2004 Member of the "German Academy of Natural Sciences, Leopoldina"
- 2000/1 "IBM Faculty Achievement Award"
- 1988 "Browder J. Thompson Memorial Award" of the IEEE

Committees (ETHZ)

- Delegate of the President for the appointment of professors
- Member and Head of Study Committee of D-ITET (until 2001)
- Study Director of D-ITET (2001–2006)
- Member of Konferenz des Lehrkörpers, Vice President (until 2006)
- Member of Research Commission of ETHZ
- Deputy Chair of Department ITET

Teaching

Computer Engineering I (Bachelor), Embedded Systems (Bachelor), Hardware-Software Codesign (Master), PPS Mindstorms (Bachelor), Mobile Information and Communication Systems (PhD Level)

External Research Funding

- CTI projects with companies like Siemens BT, Inalp, BridgeCo, NetModule; direct industry funding
- Participation in European projects (COMBEST, PREDATOR, EURETILE, PRO3D, CERTAINTY, ARTISTDESIGN)
- Participation in Swiss research programs (NCCR Mobile Information and Communication Systems, Nano-Tera)

Research Interests

- Models, methods and software for the design of embedded systems:
  - Software design for massively parallel embedded multiprocessor systems
  - Performance analysis of distributed embedded systems
  - Real-time scheduling under energy and temperature constraints
- Theoretical and practical aspects of cyberphysical systems:
  - Sensor Networks for critical applications, especially under extreme environmental conditions.
  - Energy harvesting
- Bio-inspired optimization strategies:
  - Theoretical and algorithmic aspects of multi-objective evolutionary algorithms
  - Set-based optimization strategies

For more information visit www.tik.ee.ethz.ch/~thiele

Prof. Lothar Thiele - Research Focus

Embedded Systems and Software

Focus

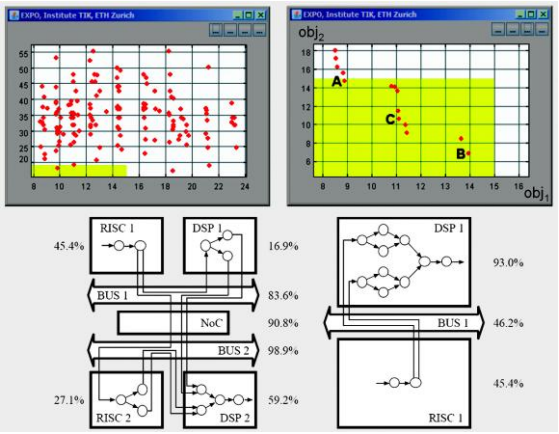
Our research and teaching activities concentrate on models and methods for analyzing and designing embedded systems. The focus of research is on the interaction between the computation and communication on the one hand and their physical environment on the other. New models and abstraction mechanisms that include physical quantities like time, power, energy and temperature are the basis for analysis and design methods. In addition, we are investigating theoretical and practical aspects of multi-objective optimization and apply bio-inspired methods to the design of embedded system architectures and embedded software under conflicting criteria. Finally, we are engaged in research and teaching in the area of speech processing. The research in this area is supervised by Dr. Beat Pfister.

Embedded Systems

So-called «embedded systems» or «cyberphysical systems» can be considered as one of the motors of the present digital revolution. Whether speaking of high-definition TV, cellular systems, digital cameras, automotive and avionics systems, home automation or classical industrial automation, the operation of machines and systems depends on such embedded systems. Examples of recent developments are massively distributed embedded systems such as sensor and actuator networks for environmental monitoring (climate change, disaster monitoring, pollution, building diagnostics and control, energy saving strategies), health, security and logistics.

Performance Analysis

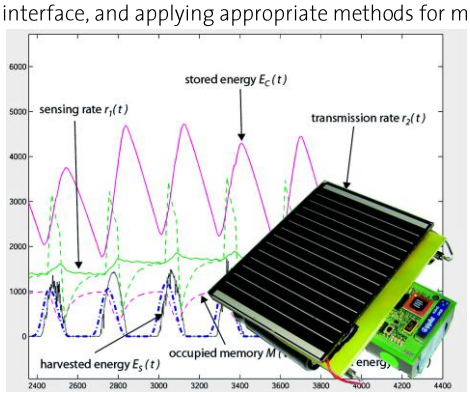
Embedded systems are getting increasingly parallel, distributed and networked, i.e. they are comprised of many cooperating individual components. Modularity is a key requirement for any performance analysis and design method as distributed systems are heterogeneous in terms of (a) the underlying execution platform, (b) the diverse applications running concurrently and (c) the different scheduling and arbitration policies used. In this context, we are investigating analytic methods based on network calculus and real-time calculus that allow worst case and best case analysis and design of distributed embedded systems in terms of time, memory, energy and temperature.



Exploration of parallel embedded system platforms and the associated application mappings

Parallel and Distributed Systems

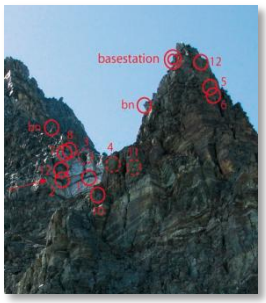
The focus in embedded system design is moving away from single processor implementations towards (heterogeneous) multiprocessor system-on-chip (MPSoC) architectures. While offering high scale integration, high computing power and low power consumption, these systems face enormous challenges in terms of software design. Our research concentrates on the challenge of providing an environment for programming parallel applications and mapping them to heterogeneous distributed architectures under timing, energy and temperature constraints. We try to tackle this challenge by leveraging appropriate models of computation, using a dedicated application programming interface, and applying appropriate methods for mapping optimization.



Solar-powered sensor network node and finite horizon control of a sensing application

Sensor Networks

The research in the area of sensor networks is managed by Dr. Jan Beutel. We investigate one extreme in the design space of communicating embedded systems: low energy, small size, large-scale distribution. In particular, we approach research problems in the design, implementation and deployment of wireless sensor networks. We are interested in the following subjects: deployment of sensor networks in extreme real-world settings; methods and tools for designing sensor networks that are reliable and can be used in applications with high dependability requirements; development of formal methods for specific problems such as time synchronization, validation of non-functional properties, topology control, and testing; energy harvesting and application control; investigation of applications such as environmental sensing (permafrost), community sensing and safety (fire) networks in buildings.



Sensor networks for permafrost monitoring in the Swiss Alps for scientific applications and early warning

Multi-objective Optimization

The goals of our research in the area of evolutionary multi-objective optimization are to extend the theory of multi-objective optimization in run-time analysis, convergence proofs, comparison of different search methods, and performance indicators. Furthermore, we develop new, alternative multi-criteria optimization methods for indicator-based multi-objective search in high-dimensional spaces and apply them to the computer aided design of complex, heterogeneous hardware/software systems.

For more information on visit www.tik.ee.ethz.ch/~tec