

A.17 Mobility reports

Travel reports by Real-Time graduate students 1999-2007 in reversed chronological order. Most of the 170 reports are also available at <http://www.artes.uu.se/mobility/reports/index.shtml>. The Mobility reports are included in this report.

ARTES Real-Time graduate students	Reported activity
2007	
Martin Thuresson	a Internship at Google.
Yue Lu	a "Two-day visit at Department of Computer Science and Technology, School of Computer Science and Engineering at Beihang University (BUAA) Beijing, China ".
Andreas Hjertström	"14th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) conference in Seattle, USA.".
Carl Bergenhem	"The 13th IEEE Pacific Rim International Symposium on Dependable Computing (PRDC'07) 7-19 December, 2007, Melbourne, Australia".
Peter Funk och Erik Olsson	reporterar från ett "Industrimöte i Trollhättan hos Volv Areo".
Viacheslav Izosimov	a visit to "Computer Architecture Group (LRA) at Albert-Ludwigs-Universität of Freiburg, November-December 2007".
Fredrik Österlind	"ACM SenSys and a research visit to CSIRO Australia, November 2007".
Viktor Leijon	"APLAS 2007 ".
Qinghua Wang	"Visiting UT Arlington".
Peng Cheng	"IECON'07".
Håkan Gustavsson & Peter Wallin, Mälardalen University and Anders Sandberg, KTH	" Electronic Systems for vehicles 10-11 October 2007, Baden-Baden, Germany".
Kaj Hänninen	"Visiting Scuola Superiore Sant'Anna in Pisa".
Hüseyin Aysan, Stefan Bygde, Aneta Vulgarakis, Séverine Sentilles, Farhang Nemati, Yu Lue and Moris Behnam	"Progress trip to Pisa-Viareggio, October - 2007, Italy".
Stefan Bygde	"Nordic Workshop on Programming Theory and was held in Oslo October 10-12 2007.".
Marcelo Santos	"19th International Symposium on Computer Architecture and High Performance Computing, held at Serra Azul Hotel (Gramado, RS, Brazil), from 24th to 27th October 2007".
Mikael Asplund	"ReSIST Summer School 2007 ".
Hongyu Pei Breivold	"Euromicro SEAA 2007 ".
Séverine Sentilles & Aneta Vulgarakis	"19th Euromicro Conference on Real-Time Systems (ECRTS'07), July 3-6 2007, Pisa (Italy)".
Hongyu Pei Breivold	"COMPSAC 2007 ".

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Aneta Vulgarakis & Séverine Sentilles	"CompArch, July 7-14, 2007 Boston, Massachusetts, USA".
Leonid Mokrushin	"MOTIVES Winter School, February 19-23, 2007 Trento, Italy".
Aneta Vulgarakis	"MOTIVES Winter School, February 19-23, 2007 Trento, Italy".
Soheil Samii	"ESWEEK 2006".
Alexander Karlsson	Center for Multisource Information Fusion / International Conference on Scalable Uncertainty Management.
Moris Behnam	EMSOFT October 1-3, 2007, Salzburg, Austria. MOTIVES winter school, Feb. 19 to 23, 2007 - Trento, Italy. RTCSA August 21-23, 2007, Daegu, Korea.
Håkan Gustavsson & Peter Wallin, Mälardalen University Anders Sandberg, KTH	Electronic Systems for vehicles, 10-11 October 2007, Baden-Baden, Germany
Johan Fredriksson	RTCSA 2007.
Pavel Krcal,	ESWEEK'07 (EMSOFT'07 and FORMATS'07 conferences), Salzburg, Austria,.
Håkan Gustavsson	SPLC 2007, Software Productline Conferece, Kyoto ,Japan.
Kaj Hänninen	Visiting Scuola Superiore Sant'Anna in Pisa.
Yue Lu	"ARTIST2 / UNU-IIST summer school 2007, Aug. 1st to 10th, 2007 – Suzhou, China".
Hüseyin Aysan	the First European-South American School for Embedded Systems that took place in Buenos Aires, Argentina between August 21 and 24 in 2007.
Moris Behnam & Hüseyin Aysan	ECRTS 2007 July 4-6, 2007 Pisa, Italy.
Gunnar Mathiason	RTCSA07 in Daegu, Korea.
Pengpeng Ni	report from ACM MM 2006
Johan Lindhult	visited Ericsson in Älvsjö 2006
Marcus Brohede	report from a visit to University of Virginia, VA, USA
Niklas Lepistö	Report from industry visits at CC-Systems in Alfta
Peter Wallin	Industry visit at Volvo 3P
Fredrik Linnarsson	IECON'06 was held in Paris the 7th-10th November 2006.
Magnus Persson	RUNES summer school at University College London 9th – 11th July, 2007. RUNES = (Reconfigurable Ubiquitous Networked Embedded Systems, http://www.ist-runes.org/).
Carl Bergenhem	DSN'07
Gunnar Mathiason	at stay at the Department of Computer Science at University of Virginia spring-summer 2007.
Marcelo Santos	ACACES 2007, the third International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems, from July 15 to July 20, in L'Aquila, Italy.
Tahir Naseer	RUNES summer school at University College London 9th – 11th July, 2007. RUNES = (Reconfigurable Ubiquitous Networked Embedded Systems, http://www.ist-runes.org/).
Huseyin Aysan two events	ARTIST2 MOTIVES'07 Winter School, February 19-23, 2007, Trento, Italy DSN'07, The 37th Annual IEEE/IFIP International Conference on Dependable Systems and Networks.
Raul Barbosa	DSN'07

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Moris Behnam	RTSS 2006 conference in Rio.
Peter Wallin & Andreas Hjertröm	ICSE'07.
Kaj Hänninen	RTSS'06.
Marcelo Santos	- "CASTNESS school and workshop, Jan. 15 to 19, 2007 - Rome, Italy". "ETAPS Conference, Mar. 24 to Apr. 1, 2007 - Braga, Portugal". "MOTIVES winter school, Feb. 19 to 23, 2007 - Trento, Italy".
Magnus Persson	"NeRES 2007 Networks for Reconfigurable Embedded Systems Workshop in Aveiro, Portugal, April 2nd".
Daniel Skarin	The third Workshop on Silicon Errors in Logic – System Effects (SELSE 3) at the University of Texas at Austin.
Andreas Hjertröm	ARTIST2 Winter School 2007
Tahir Naseer	Advanced Automotive Electronics Technical Conference and Exhibition, January 2007 a four day workshop at Mentor Graphics, April 2007
Pavel Krcal	ETAPS'07
2006	
Carl Bergenhem	"The 12th IEEE Pacific Rim Symposium on Dependable Computing".
Raul Barbosa	"The 12th IEEE Pacific Rim Symposium on Dependable Computing".
AnnMarie Ericsson	First international Workshop on Event-driven Architecture, Processing and Systems (EDA-PS 06), September 2006, Chicago.
Christer Gerdman	rapporterar från ”Svenska Läkaresällskapets Riksstämman” Göteborg, 29 november - 1 december, 2006 och från European Medical and Biological Engineering Conference (EMBEC 05)
Jerker Bengtsson	RTCSA06 "12th IEEE conference on Embedded Real-Time Computing Systems and Applications", 16th to 18th of August in Sydney, Australia.
Alexander Karlsson	"The 9th International Conference on Information Fusion, 2006" in Florence, Italy, 10-13 July 2006.
Viacheslav Izosimov	a visit to DTU and describe the "Paper Pipeline".
Ewa Hansen	International Symposium on Wireless Pervasive Computing January 2006. and from The Fifth Annual Mediterranean Ad Hoc Networking Workshop (Med-Hoc-Net 2006).
Johan Lindhult	The International Workshop on Compilers for Parallel Computers (CPC).
Martin Kero	POPL (Principles Of Programming Languages), SPACE (Semantics, Program Analysis and Computing Environments for memory management) and PEPM (Partial Evaluation and Program Manipulation), January 2006.
2005	
Olga Grichtein	GAMES 2005, a Research Training Network.
John Håkansson	FACS 2005, International Workshop on Formal Aspects of Component Software.
Andreas Johnsson	the 4th Mediterranean Ad-Hoc Networking Workshop

	(MedHocNet).
Anders Möller	Embedded Real-Time Systems Implementation Workshop in conjunction with the 26th IEEE International Real-Time Systems Symposium December 5-8, 2005 Miami, USA.
Andreas Johnsson	the 3rd Swedish National Computer Networking Workshop (SNCNW).
Niklas Lepistö	NORCHIP 2005.
Najeem Lawal	NORCHIP 2005.
Johan Lindhult	NWPT05.
Jianlin Shi	ARTIST summerschool 2005.
Pavel Krcal	FORMATS'05.
David Svensson	Net.ObjectDays 2005.
Najeem Lawal	International Conference on Field Programmable Logic and Applications (FPL).
Niklas Lepistö	FPL'05.
Jianlin Shi	RTiS and ARTES summerschool 2005.
Niklas Lepistö	The 5th International Forum on Application-Specific Multi-Processor SoC (MPSoC'05).
Najeem Lawal	also MPSoC'05.
Kaj Hänninen	The 2005 international conference on embedded systems and applications (ESA) and The 17th Euromicro Conference on Real-Time Systems (ECRTS).
Martin Kero	Real-World Wireless Sensor Networks.
Johan Fredriksson	ICSE 2005.
Johan Andersson	The European Conference on Software Maintenance and Reengineering.
Jianlin Shi	the 5th ARTES Graduate Student Conference
Erik Kuiper	MIMEMA summer school 2005 with the theme "Wireless and Mobile Computing".
Viacheslav Izosimov	the conference "DATE05" and "Architectural Paradigms for Dependable Embedded Systems" Summer School in Baden/Vienna
Johan Erikson	APPSEM05. APPSEM is a thematic network funded by the IST program of the European Union. Its objective is to promote research into application-oriented semantics of programming languages.
2004	
Anderas Johnsson	CiC'04 "International Conference on Communications in Computing" in Las Vegas, USA.
Johan Fredriksson	"26th International Conference on Software Engineering (ICSE), 23-28 May 2004, Edinburgh, Scotland".
Joakim Eriksson and Linus Svensson	ECRTS 2004 and WCET 2004.
Larisa Rizvanovic	"16th Euromicro Conference on Real-Time Systems (ECRTS 04) and RTMM - International Workshop on Real-Time for Multimedia, Catania, Sicily, Italy, June 29th - July 2nd, 2004".
Dan Henriksson	"2004 American Control Conference (ACC04)".
Martin Andersson	"The 10th IEEE RealTime and Embedded Technology and Applications Symposium (RTAS 2004)".
Mikael Åkerholm	"26th International Conference on Software Engineering (ICSE), 23-28 May 2004, Edinburgh, Scotland".

Johan Andersson	"26th International Conference on Software Engineering (ICSE 2004) May 22nd – 29th 2004, Edinburgh, Scotland, UK".
Håkan Zeffner and Martin Karlsson	"The Tenth International Symposium on High-Performance Computer Architecture (HPCA 2004)".
2003	
Cecilia Ekelin	"the 7th International Conference on Principles of Distributed Systems (OPODIS'03)"
Lars Albetsson	"The Fourth International Workshop on Software and Performance (WOSP 2004), California."
Björn Andersson	RTSS 2003, Cancun, Mexico
AnnMarie Ericsson	RTSS 2003, Cancun, Mexico
Sven Gestegård Robertz	"The 2003 ACM SIGPLAN Symposium on Languages, Compilers and Tools for Embedded Systems (LCTES'03)"
Radoslaw Szymanek	Design Automation Conference 2003
Anders Pettersson	RTCSA 2003 in Tainan, Taiwan
Jonas Neander	International Parallel and Distributed Processing Symposium, (IPDPS), 22-26 april 2003, Nice, France
2002	
Elisabeth Uhlemann	UniSA 2002, RTAS 2002, ISIT 2001
Anders Möller	The 17th International Parallel & Distributed Processing Symposium (IPDPS) in Nice 22 – 26 April 2003.
Dan Henriksson	RTAS02
Jonas Norberg	DSN02
Cecilia Ekelin	ICPP'02, 31th International Conference on Parallel Processing, August 18-21, 2002
Håkan Sundell	LCR'02: Sixth Workshop on Languages, Compilers and Run-time Systems for Scalable Computers.
Thiemo Voigt	Protocols for High-Speed Networks April 2002, Berlin
2001	
Andréas Johansson, Robert Lindström, Martin Hiller	ISSRE 2001
Thomas Nolte	ETFAs 2001
Martin Karlsson	ISCA 2001
Vilgot Claesson	SRDS 2001
Alexandre David	ETAPS 2002
Tomas Lennvall	ETFAs 2001
Bo Lincoln	University of Illinois
Ulf Assarsson	SIGGRAPP 2001
Örjan Askerdal	European Test Workshop, Saltsjöbaden, Stockholm May 29 -June 1, 2001.
Yi Zhang	SPAA 2001
Thiemo Voigt	USENIX 2001
Lars Albertsson	RTAS 2001
Asmus Pandikow	INCOSE 2001 in Melbourne, Australia.
Jan Carlson	ECRTS'01

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Jakob Engblom	DARP HIRTS WS in York May 2001 (only available on paper)
Flavius Gruian	ASP-DAC 2001
2000	
Per-Håkan Sundell	Opodis 2000
Björn Andersson	RTCSA 2000
Radu Dobrin	RTCSA 2000
Anton Cervin and Bo Lincoln	CDC 2000
Anders Pettersson	RTSS'2000
Tomas Lennvall	RTSS'2000
Anders Wall and Markus Lindgren	RTCSA '00.
Ola Redell	RTSS'2000
Ulf Assarsson	SIGGRAPH2000
Flavius Gruian	PACS 2000 and 9:th ASPLOS
Elena Fersman	SPIN'2000
Patrik Persson	TOOLS EUROPE 2000.
Lars Albertsson	RTAS'00
Cecilia Ekelin	RTAS'00
1999	
Monika Andersson Wiklund	RTMCS and RTSS 99.
Martin Sanfridson	RTMCS and RTSS 99.
Marcus Nilsson	Visit to Liafa Paris
Ulf Assarsson	SIGGRAPH 99
Johan Eker	RTCSA'99
Thomas Lundqvist	from RTCSA'99 and RTSS '99
Cecilia Ekelin	from CP'99 and RTC'99
Paul Pettersson	FM'99 , World Congress on Formal Methods, 20-24 September 1999.
Alexandre David	FM'99 , World Congress on Formal Methods, 20-24 September 1999.
Per Håkan Sundell	EUROMICRO'99 (on Real-Time Systems), June 9-11th, 1999.
Jakob Engblom	RTAS '99, Vancouver, June 2-4, 1999
Anton Cervin	EUROMICRO'99 (on Real-Time Systems), June 9-11th, 1999.
Andreas Ermedahl	EUROMICRO'99 (on Real-Time Systems)
Man Lin	24th IFAC/IFIP Workshop on Real Time Programming WRTP'99 and the Third International Workshop on Active and Real-Time Database Systems ARTDB-99
Patrik Persson	LCTES '99, ACM SIGPLAN 1999 Workshop on Languages, Compilers, and Tools for Embedded Systems
Patrik Persson	ETAPS '99 (European Joint Conferences on Theory and Practice of Software)

Industry Visit Report: Ericsson AB, Stockholm

Johan Lindhult
Department of Computer Science and Electronics
Mälardalen University
johan.lindhult@mdh.se

Introduction

During 2006, I have spent approximately 1-2 days/week at Ericsson AB in Älvsjö, Stockholm. The site in Älvsjö is, among other things, responsible for the development and the maintenance of the software in the AXE exchange system. Ericsson as a company shouldn't need any further introduction.

The project that I am involved in, deals with adapting software written for sequential architectures to parallel hardware. This is carried out together with people from Ericsson, and I also have two of my (assistant) supervisors at the company.

The purpose of my visits

My visits to Ericsson started 2004 with the purpose to document (by a formal semantics) the language PLEX, which is used to program the functionality in the AXE system. This work was carried out together with my supervisors at Ericsson, and described in a previous Industry Visit Report ¹.

The visits has continued during 2006, with inspection of the current software in order to get an opinion on how well the existing code is suitable for parallel processing, i.e., by trying to identify those parts of the software that are suitable candidates for concurrent processing. To determine this, we have looked at how the shared variables in the system are used, and if there are any potential problems/conflicts. A previous master thesis project [1] discussed this in general terms, but did not perform the necessary inspections.

The result of our studies was planned to be published during this fall, but the inspection has been far more time-consuming than we first expected, and the planned Technical Report (and a corresponding conference/workshop paper) has been postponed until this spring.

References

- [1] B. Lindell. Analysis of reentrancy and problems of data interference in the parallel execution of a multi processor AXE-APZ system. Master's thesis, Mälardalen University, 2003.

¹http://www.artes.uu.se/mobility/industri/ind_ericsson-2005_JL.pdf

ARTES++ Travel Report to AAE'07

Advanced Automotive Electronics Technical Conference and Exhibition, 31st January 2007 at Heritage Motor Centre, Gaydon, United Kingdom.

About the event

The second Advanced Automotive Electronics, one-day technical conference and exhibition was held at the Heritage Motor Centre at Gaydon a part of Warwick county also known as the County of Shakespere, on 31st January 2007. This event was an essential diary date for every engineer, project leader and technical management professional involved in automotive electronic system design and development.

Comprehensive, practical and authoritative, the conference directly addressed specialist information needs. Selected by an independent judging panel of experts from within the industry, the seminar program was timetabled into three complimentary tracks, enabling the visitor to build ones own itinerary to meet his/her particular professional requirements. The conference papers were highly technical, but with practical applications in mind.

An integral part of the event, the aae07 exhibition featured a broad range of suppliers of automotive electronics solutions. Within the exclusive surroundings (see the picture below) of the Heritage Motor Centre, all visitors were able to investigate an extensive array of technology and services from these market-leading organizations and discuss their specific project needs throughout the day.



My contribution and experience

I presented my paper whose title was “*Dynamically self reconfigurable automotive systems*”. I was allotted 25 minutes time which, in my opinion was very short to introduce the different aspects of my project that I was presenting. The conference started with keynote speech by Mr. Alan Benett, the Chief Engineer of Auston Martin which was followed by a presentation of a paper “*Consumer Preferences and Attitudes Towards Navigation Systems in Europe*”. Both of these persons mentioned the need for incorporating consumer electronic devices such as mobile phones and laptops along with the requirement of better technology than existing ones such as AUTOSAR and FlexRay

for dynamic reconfiguration of real time systems. I was very pleased to know and present that I am part of one of the first groups, who are working on these current as well as future requirements.

Relevance and Conclusion

The title of conference and exhibiton, at first glance does not seem to be relevant for real time systems, but if one go through the proceedings and the presentaion, he/she will realize its relevance as the future automtive vehicles which this event was all about, will be distributed real time systems. This was my first publication and also the first step towards my PhD. It has boosted my morale.

ARTES++ Travel Report to ACM MM 2006

Ni, Pengpeng

Jan. 2007

1 Introduction

The ACM Multimedia conference is the premier international multimedia conference. It is held annually, and covers all aspects of multimedia computing from underlying technologies to applications, theory to practice, and servers to networks to devices. It provides a perfect forum for communications among researchers from both academia and industry.

2 Conference program

In 2006, the conference was held in Santa Barbara, US. The topics of its interest included context-aware multimedia communications, peer-to-peer streaming, audio/video streaming, multimedia content distribution, wireless multimedia, adaptive support for scalable media, multimedia servers, operating systems, middleware and QoS.

Besides the main conference, where full technical research paper and short working progress paper were presented, the conference program included also tutorials, workshops, exhibitions covering various issues.

Those conference events were scheduled in parallel during about a week. But various topics were classified into three main research groups such as Content based information retrieval, Multimedia applications and System. Presentations in each group were organized in sequence. Collision could happen when your interest cross those slightly different areas.

3 My contribution

My contribution to this conference was a shot paper titled *User friendly H.264 for Remote video browsing*. I got the opportunity to interactively present my research idea and my research has gained some interests already during the conference time.

In addition, as the first conference I attended since my PHD study, this was a very good chance for me to broaden my sight in the enormous area of multimedia. I have

also learned a lot from other researchers' experiences. Moreover, some advanced techniques developed in other areas will probably benefit to my research or the broadcast industry (in where I do my current job). Examples are such as automatic video segmentation and classification etc.

4 Conclusion

ACM MM is a right conference for my own research interests, and the quality of the accepted papers is in general good, for example, the acceptance rate of ACM MM 2006 Short Papers was about 35 percent. And there were 180 short papers submissions in 2006.

I was motivated a lot by the conference experience, and I definitely agree on the value of attending relevant conference as a researcher. However, time is running away and the submission of the corresponding full paper is somehow influenced by activities such as preparation, traveling and others.

ARTES++ Travel Report

CASTNESS school and workshop, Jan. 15 to 19, 2007 - Rome, Italy

Marcelo Santos¹, PhD. Student at MRTC, Mälardalen University

Purpose of Travel

The purpose of the trip was to attend the CASTNESS workshop and school. The CASTNESS (Computing Architectures and Software Tools for Numerical Embedded Scalable Systems) took place from 15th to 17th January 2007 in Rome, Italy, at the La Sapienza university, Physics department. The event was promoted by SHAPES (Scalable Software Hardware Architecture Platform for Embedded Systems) and ARTIST2. The objective of the event was cross-dissemination among SHAPES, projects like SARC and AETHER, HARTES, the APE Massive Parallel Processor initiative, and the academic and industrial research community sharing the topics addressed by those projects.

Activities

In the first day the workshop took place: the whole day was composed of 20 minutes talks from senior academic and industrial researchers and european/national research officers. In the second and third days it was the time for the school. It was composed of 2 hours in depth lessons about current research activities on exploration/generation tools of system software and hardware, with emphasis in software and analysis, focusing on tools and methodologies for automated generation of System Software. Particular interesting were the seminars by Peter Marwedel “Get Rid of Caches: Compiler Techniques for Scratch-pads” and Lothar Thiele’s modular performance analysis and real-time calculus.

Travel support

The trip was supported by grants from ARTES (approx. 5000 SEK) and the ARTIST2 network of excellence.

¹Email: marcelo.santos@mdh.se

ARTES++ Travel Report

MOTIVES winter school, Feb. 19 to 23, 2007 - Trento, Italy

Moris H. Behnam,

Mälardalen Real Time Research Center (MRTC)

Moris.behnam@mdh.se

Motivation

Motive winter school was held in Trento, Italy. The purpose of the school is to bring both young researchers who are working or want to work in modelling, validation, synthesis and performance analysis of embedded systems, and engineers from industry with a practical background in design, control and testing of embedded systems.

The main tracks during the five days were,

- Modelling and Design of Heterogeneous Systems
- Model Transformation and UML
- Static Analysis for Safety and Performance
- Schedulability and Controller Synthesis
- Testing and Run-Time Verification

Highlights

There were many interesting lectures such as,

- Contract-based Scheduling: An Overview of the Results of the FIRST EU Project by Giuseppe Lipari.
- UML for scheduling Analysis by julio Medina.
- Optimal Scheduling and Controller Synthesis by Kim Larsen.

In addition, it was interesting to listen to other lectures even though they were not related to my research.

I met many PhD students and researchers from different research centres and I think that was one of the most useful things in that school.

Unfortunately, some talkers were not well prepared to give their talks and other didn't attend!

Industry visit at Volvo 3P

Peter Wallin
Mälardalen University
SE-72123 Västerås, Sweden
peter.wallin@mdh.se

March 2, 2007

1 Introduction

During a week in June 2006 a visit at Volvo 3P in Gothenburg was done. Volvo 3P is a division within Volvo AB and is responsible for product planning, product development, purchasing and product range management for the three truck brands, Volvo, Renault and Mack.

2 Purpose of visit

The purpose of the visit was to get to know the company and also try to understand the complex automotive industry. To get this knowledge both about the industry and the company we met with employees from many different areas. We also made a one day visit at the production plant to see what and how vehicles are manufactured. Another purpose with the visit was to get to know persons within the company to get easier access to information and projects related to the research. This is important since much of the research will be based on interviews where the trust of the respondent is crucial to be successful.

3 Outcome of visit

We learned several things about the automotive industry that are hard or even impossible to accomplish without actually talking and meeting with people working there. The insight gained will prove valuable for upcoming research and motivate us even further. A more detailed report will be provided to the company.

ARTES Travel Report

ARTIST2 Winter School 2007

Andreas Hjertström
Mälardalen Real-Time Research Centre, Västerås, Sweden
andreas.hjertstrom@mdh.se

Introduction

ARTIST2 Network of Excellence organized a Winter School, this year held in Trento, northern Italy. Lectures on a selection of different topics were held by both industry and leading researchers. The five day Winter Schools aim was towards new researcher within the interesting areas of modelling, synthesis and performance analysis of embedded systems. There were a lot of interesting people from almost all parts of the world present.

Contents

The major areas presented during the lectures was,

- Modeling and Design of Heterogeneous Systems
- Model Transformation and UML
- Static Analysis for Safety and Performance
- Schedulability and Controller Synthesis
- Testing and Run-Time Verification

For me the highlights were,

- Kim Larsen from Aalborg University, presenting Optimal Scheduling and Controller Synthesis.
- Giuseppe Lipari from Sant'Anna Pisa, presenting Contract-based Scheduling: An Overview of the Results of the FIRST EU Project.
- Roberto Passerone Trento, presenting Interface and component-based design for heterogeneous systems.

I was looking forward to Joseph Sifakis presentation on Component-based Construction of Real-Time Systems, but he was unfortunately sick.

Accommodation and activities

The school was held in the very nice city of Trento is located in the northern mountain areas of Italy. The accommodation was excellent, based on the same place as the lectures high up on the mountain side with an enormous view of the valley. We made a joint trip to a local winery where we learned the basics about wine making and we also had a delicious dinner where we tasted different types of wine. To travel in Italy was no problem if you are not afraid of high taxi speeds.

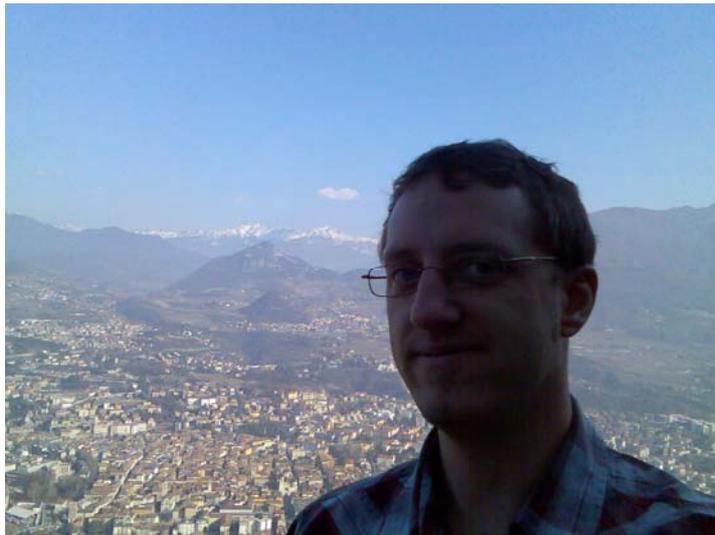


Figure 1 Not such a bad view from the balcony of my room

Report from industry visits at CC-Systems in Alfta

Niklas Lepistö
Mid Sweden University
niklas.lepisto@miun.se

Introduction

CC-Systems supplies control systems and computers for industrial applications with the main focus on onboard computers for heavy vehicles. During 2005 and 2006 I have made regular visits to CC-Systems in Alfta. The purpose of the visits has been to discuss the possibilities of using FPGA-technology in the CC-pilot vehicle computers and display units, and to present results related to this work.

The Project

The CC-pilot is a line of onboard computers for industrial vehicles and other rough environments. With a wide range of deployment platforms ranging from transport vehicles to forestry machines and military vehicles, the CC-Pilot computers are required to provide many different communication interfaces and other connection possibilities for external devices. In addition to the interfaces found on normal personal computers the CC-Pilot provide CAN-bus interfaces and analog video inputs.

The work conducted with CC-Systems has focused on using FPGA-technology to implement some of the communication and peripheral devices used in the CC-Pilot systems. During 2006 the work has mainly focused on the design of an FPGA based pre-processor and display controller for real-time video. The purpose of the video pre-processor is to allow display of multiple real-time video sources together with information provided by the CPU.

The work started with a design space exploration of the pre-processor, where the memory requirements for different implementation alternatives were investigated [1]. Recently the project has resulted in a video pre-processor implementation with limited support for scaling of the output video frame[2]. Future plans for the project involves design and implementation of a FPGA-based video enabled display unit for applications with relatively low computational requirements.

References

- [1] N. Lepistö, B. Thörnberg, M. O’Nils “Design Exploration of a Video Pre-Processor for an FPGA Based SoC”, Workshop on Applied Reconfigurable Computing , Delft , The Netherlands, March 2006
- [2] N. Lepistö, N. Lawal, M. O’Nils “Implementation of a Video Pre-Processor for an FPGA based SoC, **Submitted** to Workshop on Rapid System Prototyping 2007

Travel Report
MOTIVES Winter School,
February 19-23, 2007, Trento, Italy

Hüseyin Aysan
huseyin.aysan@mdh.se

MOTIVES Winter School

ARTIST2 Winter School on modelling, validation, synthesis and performance analysis of embedded systems, was held in Trento, Italy on February 19-23, 2007.

The 5-day winter school covered following topics:

- Modeling and Design of Heterogeneous Systems
- Model Transformation and UML
- Static Analysis for Safety and Performance
- Schedulability and Controller Synthesis
- Testing and Run-Time Verification

Even though some of these topics are not directly related to my research area, my overall impression for this Winter School is positive and it was interesting to see the research challenges in these areas. Furthermore I met many researchers from all around the world.

Day 4 (Schedulability and Controller Synthesis) was the most interesting day for me with the talks from Joost-Pieter Katoen, Kim Larsen and Guiseppe Lipari. Titles of their talks were:

- **Joost-Pieter Katoen** - Soft Real Time Scheduling and Quality of Service
- **Kim Larsen** - Optimal Scheduling and Controller Synthesis
- **Guiseppe Lipari** - Contract-based Scheduling: An Overview of the Results of the FIRST EU Project



View from the hotel where the winter school took place

ARTES++ Travel Report

MOTIVES winter school, Feb. 19 to 23, 2007 - Trento, Italy

Marcelo Santos¹, PhD. Student at MRTC, Mälardalen University

Purpose of Travel

The purpose of the trip was to attend the MOTIVES winter school. The MOTIVES (MOdelling, TestIng, and Verification for Embedded Systems) winter school is an ARTIST2 event and took place at the conference center Panorama, Trento, Italy, from February 19 to 23, 2007. The main topic for the school is modelling, validation, synthesis and performance analysis of embedded systems. Each day was dedicated to the following themes:

- Modeling and Design of Heterogeneous Systems
- Model Transformation and UML
- Static Analysis for Safety and Performance
- Schedulability and Controller Synthesis
- Testing and Run-Time Verification

Activities

As I have started the PhD research a few months ago, the themes were interesting to me as they are almost all related to my research proposal (worst case execution time analysis of component-based embedded systems). Some talks and sessions were particularly interesting. In the Model Transformation session, they talked about graph transformation systems and their application, but none to component embedded systems (I think it would be interesting to investigate how such techniques can aid the formal analysis of software composition). The other more interesting session for my research group (WCET) was static analysis session (where Prof. Wilhelm gave a very good view of the problems with cache memory and pipeline) and the program analysis session, where there were talks about applying this formalism for analysis in security, floating point operations and communication systems.

Travel support

The trip was supported by a grant from ARTES (approx. 10100 SEK).

¹Email: marcelo.santos@mdh.se

ARTES ++ Travel Report
MOTIVES Winter School,
February 19-23, 2007 Trento, Italy
Aneta Vulgarakis
aneta.vulgarakis@mdh.se

Motivation

The purpose of the trip was to participate in a MOTIVES winter school where lectures were given by leading scientific and industrial experts. The school covered a selection of different topics such as: modeling, validation, synthesis and performance analysis of embedded systems.

Each day of the 5-day school covered one of the following tracks

- Modeling and Design of Heterogeneous Systems
- Model Transformation and UML
- Static Analysis for Safety and Performance
- Schedulability and Controller Synthesis
- Testing and Run-Time Verification

Highlights

Although not all of the topics of the school were directly connected to my research area, I found especially interesting the first two days of the lectures.

For me the highlights were

- Roberto Passerone from University of Trento, presenting Interface and component-based design for heterogeneous systems
- Wang Yi from Uppsala University, presenting Schedulability analysis of Timed Systems
- Reiko Heckel from University of Leicester, presenting Foundations of Model Transformation

Activities

The lectures were taught in the conference center Panorama, which was located on a top of a hill, overlooking the city of Trento. The view up from there was breathtaking. During the stay it was as well organized a social dinner in a local winery where we could taste four types of wine.

ARTES++ Travel Report

MOTIVES Winter School, February 19-23, 2007, Trento, Italy

Leonid Mokrushin

Uppsala University

leom@it.uu.se

ARTIST2 Winter School on modeling, validation, synthesis and performance analysis of embedded systems, was held in Trento, Italy on February 19-23, 2007.

The 5-day winter school covered following topics:

- Modeling and Design of Heterogeneous Systems
- Model Transformation and UML
- Static Analysis for Safety and Performance
- Schedulability and Controller Synthesis
- Testing and Run-Time Verification

The topics of the school were rather interesting, though I particularly liked the first and the fourth days. Part of my work was presented by my supervisor, Wang Yi, during the second day. During the first day there were lectures about component based approach to modeling and verification of timed systems.

The fourth day concerned topics of my direct interest, namely schedulability analysis and controller synthesis. It was an interesting question session followed by an offline discussion on priced automata vs. arrival curves after the talk of Kim Larsen.

The venue of the school was very spectacular; the conference center is located on the top of the mountain right above Trento downtown. I have met many PhD students and we have had fruitful discussions during the breaks, over lunch and at the social dinner.



The view from the conference center terrace.

Report from ETAPS'07

I have attended ETAPS'07 (mainly FOSSACS'07 conference), which was held in Braga, Portugal, at the end of March 2007. I have presented the paper **Sampled Universality of Timed Automata** (joint work with Parosh Abdulla and Wang Yi) there. During the conference, there were many opportunities to discuss with the other participating members of the real time community. These discussions were very inspirational for my future research.

The presented paper in the real-time area were mainly focused on analysis of timed automata model (complexity, decidability), usually with restricted number of clocks. Another area was duration calculus, two papers presented by Martin Fraenzle (decidability results for extensions of the duration calculus) and Paritosh Pandya (sampling abstractions).

The most interesting invited talk presented a tool called Spec# (developed by Microsoft Research) which gives a support to a programmer while writing a program. The programmer can annotate the code with invariants, pre- and postconditions, ownership information, ... and the theorem prover checks (during the process of writing) whether some of the annotations are violated. A wide acceptance of such a programming standard supported by such tools would significantly improve the quality of the produced code.

Pavel

ARTES++ Travel Report

ETAPS Conference, Mar. 24 to Apr. 1, 2007 - Braga, Portugal

Marcelo Santos¹, PhD. Student at MRTC, Mälardalen University

Purpose of Travel

The purpose of the trip was to attend the European Joint Conferences on Theory and Practice of Software (ETAPS) and the satellite workshop about software composition (SC). The ETAPS event was established in 1998, is a confederation of five main annual conferences, accompanied by satellite workshops and other events and took place from March 24 - April 1, 2007, in Braga, Portugal. The goal of SC 2007 was to develop a better understanding of how we build and maintain large software systems, and thereby to build the body of knowledge and experience in software composition. It took place on on the first two days of the ETAPS event.

Activities

There were many interesting parallel seminars taking place, and it was hard to make a choice. The software composition workshop took place at the Minho University, and the conferences at the superb Teatro Circo. A new interesting topic in the SC event was Composition by Anonymous Third Parties (Farhad Arbab, CWI, The Netherlands) where Reo, a coordination language for composition, was presented. Several other seminars talking about some aspect of software composition were also presented. In the conference, the Compiler Construction session had several interesting seminars, like Program Analysis and Timed Automata in the session Foundations of Software Science and Computation Structures.

Travel support

The trip was supported by a grant from ARTES (approx. 11000 SEK).

¹Email: marcelo.santos@mdh.se

A short summary of my time at University of Virginia, VA, USA

05.30 on June 28th 2006 a very tired family consisting of Marcus, Ulrika, Rebecca and Alexander Brohede were done with the check in at the Landvetter airport. An approximately 12 hour long flight (including stops) to the big country in the west was about to get started. Once the plane was in the air, taking us towards London and then onwards to Washington DC my wife and I laughed and told ourselves that we were crazy to take to small children across the earth for a four month long stay. We had found a place to stay at on the Internet and the landlords would meet us at the airport. They had promised to sell us their old car, a Toyota mini van. Our only means to contact them was a cell phone number and if they did not show up we would be stuck at Dulles International Airport with two kids, 5 and 3 years old. Maybe it was not so strange after all to be nervous.

After the long flight with absolutely no problems at all we finally arrived to the US. Gary Pennet (the landlord) met us at the airport and he and his wife to great care of us. He bought us Pizza and told us all about the practical stuff we needed to know about the car we bought and the townhouse we were renting. It turned out that we really struck gold concerning accommodations and car purchase. The Pennets were very friendly and helpful throughout our entire stay in the US, for example, Susan Pennet bought a booster seat for Alexander, our youngest son, to use.



Pizza at the Pennets

The accommodation in Charlottesville was excellent. We had, for example, access to a swimming pool and Ulrika, Rebecca and Alexander went there almost every day. I tried to use the pool when I got back from work. The kids, who did not know any English, got friends quickly. We got especially close to one family, the Smiths. We will keep in touch with the Smiths long after this trip. It feels like a life long friendship. Rebecca can still ask us if we can go to see Ezri and Kira, the two Smith girls.



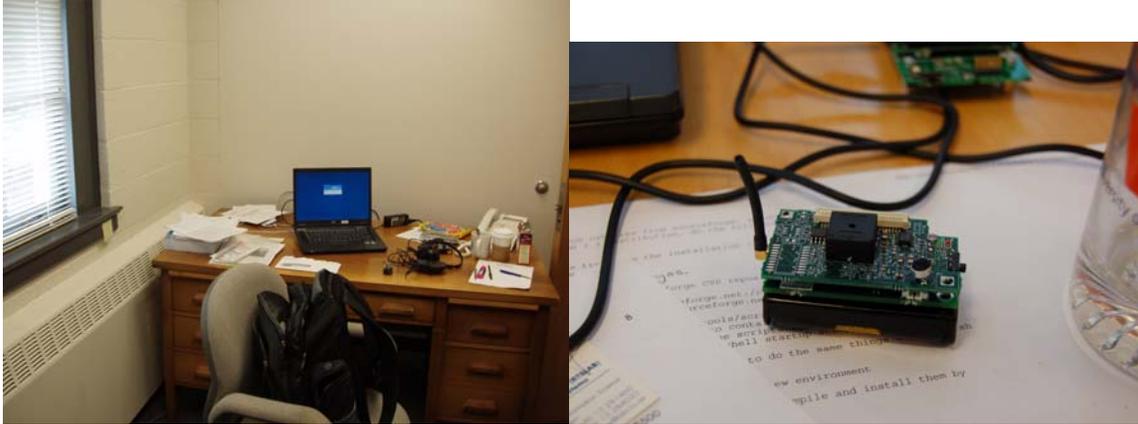
Alexander & Rebecca playing and swimming.

I shared office with Leo Selavo, a post doc from Lithuania, during my four month stay at the University of Virginia. Leo, Jim (a PhD student from China), Gilles (a post doc from France) and I spent a lot of time together both at the office and socially. We discussed different research projects and research questions and I tried to participate in theory lunches when ever I could. On weekends and after office hours we met and did sports activities together.



Beach volleyball with some friends from UVA.

The project I carried out was to use my database architecture to connect MICAz motes and real-time simulations. The principal idea was to take sensor readings from one sensor that measured oxygen level and pulse. All readings should be stored in the distributed database and the simulator should read from the database. The results from the simulations should then also be stored into the database. Finally, this result should be propagated by the database's replication protocol to another MICAz mote that would give a nurse feedback on the patients situation and any potential future risks as indicated by the simulation.



My office at University of Virginia & a MICAz mote.

To evaluate our design we have implemented part of it as a proof of concept. The key features of our design is present in this implementation, i.e., we show the ability to sense the environment and to react based on the sensed data and simulated results based on the sensors. First we have collected vital signs (heart rate and blood oxygen level) data from volunteer persons. We then use this data in a replay fashion to achieve a scenario where the data represents a patient under examination without any risk to any real patients and with the ability to reproduce the scenario any number of times. Under normal operation the simulation application reads the sensor values that reside in the database every 10 seconds. Should something out of the ordinary occur, for example a spike in the heart rate or if the blood oxygen level suddenly begins to drop, the frequency of read readings will double to allow for a more fine grained data collection that the simulation application then uses as input. Should the patient's condition continue to decline the read frequency will increase until the maximum sample frequency has been reached.

A fixed time after a detected change in the vital signs pattern the simulation application will produce a suggestion on how to change the treatment of the patient. A nurse (or doctor) then can use this suggestion on how to continue to treat the patient and will get an improved situation knowledge to base such decision on. The suggestion in this simplified proof of concept would be of three different types, increase, remain, or decrease the amount of IV feed to the patient. If the suggestion is to increase or to decrease a suggested amount will also be presented.

The suggestion is displayed on a SeeMote, which is a special peripheral equipment that can be put on a MICAz mote. The SeeMote has a small LCD that can display the best and the second best course of action (as calculated by the simulation). As an extra feature a buzzer on a sensor board connected to a mote nearby the patient sounds an alarm if the pulse drops below 50 or if the oxygen level drops below 90. This will help to attract the attention of any nurses in the vicinity of the patient.

I did not have enough time to finish the project on site in US, and I am still working on the final part of the implementation. I did all the critical work at UVA and have good contact with key people should I run into problems with the implementation. The

outcome of my work is intended for a conference paper, preferably in the wireless sensor network community or the information fusion community.

The opportunity to see another research environment I value highly. To be able to spend four months in rather large research group (approximately 20 PhD, 2 Post Doc and 2 Professors) has made an impression on me and I am confident that my continued PhD studies will benefit from this experience. In the specific project that I carried out during my time at the University of Virginia I was able to collect sensor reading that I later on can use as input to one of my simulations. Something that I hope will be a substantial part of my thesis. The possibility to work with sensors and the programming of sensors I find invaluable and I also see the potential for future projects, some of which I am already working towards.



The building where I worked.

Finally, I would like to thank my sponsors for making this trip possible. I have as a researcher been able to broaden my network of contacts and gained a deeper knowledge in one of my primary subjects for my thesis. Furthermore, my family and I have had an experience of a lifetime in the US and we cannot wait to go back.

/Marcus Brohede

ARTES++ Travel Report to Mentor Graphics in Göteborg

About the workshop

The four day workshop was conducted by Mentor Graphics at their site in Göteborg. The purpose was to train personnel from automotive industry about the new Flexray protocol and the Mentor Graphics automotive softwares i.e. In vehicle software (IVS) and Volcano Target Package (VTP). This was followed by an introduction to future softwares by Mentor Graphics.

Relevance

I am doing my research in automotive embedded systems and currently I am involved in tool evaluation and development for dynamic middleware services. This was an opportunity for me to learn about the level of abstraction covered by tools from Mentor Graphics as well as tools from other companies as the training also included comparison between their software and the others manufactured by their competitors.

Experience and Conclusion

It was great experience to get some hands on experience on new softwares along with sightseeing of a beautiful city like Göteborg. I was interested in the software dealing with different networks such as CAN, LIN as well as industrial standards such as AUTOSAR and I got a lot of information about these during the visit.

Tahir Naseer, Phd Student
Division of Mechatronics, Department of Machine Design
School of Industrial Engineering and Management
KTH - Royal Institute of Technology

ARTES++ Travel Report to SELSE 3

2007 IEEE Workshop on Silicon Errors in Logic – System Effects

Daniel Skarin
April 27, 2007

1. Introduction

The third Workshop on Silicon Errors in Logic – System Effects (SELSE 3) was held at the University of Texas at Austin. Modern electronic devices are becoming more susceptible to soft errors, caused by reduced dimensions, higher clock frequencies, and lower operating voltages. SELSE was started to provide a forum to discuss system effects of soft errors and techniques to deal with soft errors. SELSE had this year expanded the scope to also include other forms of silicon errors than soft errors, e.g., wearout faults.

2. Technical Program

The technical program of SELSE 3 consisted of papers covering topics such as soft error characterization, wearout, error detection in processors, soft errors in memory, and system-level architecture. Two interesting panel discussions were held in addition to paper and poster presentations. I found one of the panel discussions, with the topic “*Silicon Errors in Modern Electronics: What are the Main Threats?*”, especially interesting. Panelists from academia and industry presented their view on which type of faults they expect to become the dominant cause of failures in future electronic circuits.

My contribution to the workshop was a paper titled “*Impact of Soft Errors in a Brake-by-Wire System*”, a joint work with Martin Sanfridson and my adviser, Professor Johan Karlsson. I received several questions and comments during the 30 minutes available for my presentation, feedback that will be of great value in our future work.

3. Conclusion

SELSE 3 had a technical program consisting of interesting presentations from academia as well as industry. Besides providing me with feedback of my work, the workshop gave me a better knowledge of areas close to mine, e.g., circuit-level error detection. SELSE provided an excellent forum to discuss the effects of silicon errors and different techniques to deal with these errors.

ARTES++ Travel Report to NeRES 2007

Networks for Reconfigurable Embedded Systems

Workshop in Aveiro, Portugal, April 2nd

About the Event

The NeRES workshop was a one-day informal workshop arranged in Aveiro, Portugal with participants from all over Europe.

The topic of the workshop was reconfigurable embedded systems – of which several different aspects were covered, both from an academic viewpoint and from the industrial perspective.

Several subtopics were the main focus of the workshop: motivations, interests and challenges of reconfigurability in distributed real-time embedded systems; network requirements to support reconfigurability in a safe way, adequacy of existing protocols and middlewares; real-time communication (including deducing further requirements) in highly flexible networks.

Diverse areas related to these areas were covered by the presentations – everything from middlewares and component models enabling reconfigurable networked systems, over networking technologies to sensor networks and challenges in industry.

My Contribution and Experiences

One of the twelve presentations held at the workshop was mine - I introduced the research my research group currently is involved in with the presentation "Dynamically Self-Configurable Automotive Systems". This research is very closely related to the topic of the workshop.

To me this was my very first international academic event, and it was very nice to have a chance to learn more about other researchers' approaches to reconfigurability in networked embedded systems.

Conclusion and Outcome

The event was very interesting and gave me a lot of new viewpoints on the research I'm currently doing. All of the presentations have since the workshop been put online on the webpage for the workshop. A jointly authored report will also be written about the conclusions and joint experiences from the workshop and be put on the workshop webpage.

Additionally, it was very nice to get a chance to see the Iberian Peninsula for the very first time. As I flew down to Portugal one day early I had a chance to enjoy a sunny warm spring's day in Lisbon before the event.

Magnus Persson

magnus.persson@md.kth.se

PhD student, Division of Mechatronics

Department of Machine Design

School of Industrial Engineering and Management

KTH – Royal Institute of Technology

NeRES 2007 website: <http://www.artist-embedded.org/artist/Motivation-and-Goal.html>

ARTES++ Travel Report to DSN 2007

The 37th Annual IEEE/IFIP International Conference on
Dependable Systems and Networks,
June 25-28th 2007

Carl Bergenhem
July 6th, 2007

1 DSN

Industry, business, infrastructure and individuals rely more and more upon systems and networks that integrate digital devices and communications with complex software and humans. These systems must maintain safety and confidentiality, be resilient to malicious attacks and accidental faults – it is essential that they deliver a service that is **dependable** in all respects.

DSN (Dependable Systems and Networks) is *the* annual international conference that directly addresses the requirement of dependability; presenting research and solutions, and posing new challenges. In 2007 the DSN conference will once again incorporate the Dependable Computing and Communications Symposium (DCCS) and the Performance and Dependability Symposium (PDS), together with workshops, tutorials, student forum, fast abstracts and an exhibition of tools and technologies. This years DSN contained 80 papers and corresponding presentations in the DCCS and PDS tracks and also papers and presentations in the student forum, fast abstract and several workshops taking place.



Solving problems with the presentation

2 Venue

DSN 2007 was held at the Edinburgh International Conference Centre and organised by Newcastle University, U.K. Edinburgh is the capital city of Scotland, and one of the most attractive cities in the UK. The city is situated along the “Firth of Forth”; the estuary or firth of Scotland's River Forth, which flows eastwards into the North Sea.

Edinburgh has convenient travel connections with Gothenburg. My travel arrangements consisted of a cheap Ryan Air flight to Prestwick (on the west coast) and train via Glasgow. As a UNESCO World Heritage Site, Edinburgh offers a vast range of cultural and historical attractions. These include: Edinburgh Castle, the Royal Mile, the new Scottish Parliament building, and the Queen's official residence in Scotland - Holyrood Palace; art galleries and museums abound, and of particular significance is the Scotch Whisky Heritage Centre.

3 Impressions

My general impression of the various speakers and their 30 minute presentations is that they are of the highest quality; well spoken, excellent slides and pedagogically conveyed topic. It is really a pleasure to see these presentations and also to read the corresponding papers. After all, the acceptance rate for the two main tracks (DCCS and PDS) is around 20%. This level of quality is definitely something to strive towards. However, in many situations the actual technical contribution does not seem to be high. It may be a new angle or incremental advance based on a known problem.

This leads to the question of what the essence of research is. The following may be considered.

1. Either research is the deep investigation of a particular hot topic and must always lead to a high advance of technology compared to the current state-of-the-art.
2. Or, that research is related to the writing process itself, methodology to perform the research itself, no matter on which subject, and the pedagogical proficiency to convey the knowledge. The proficiencies that are learnt in this view are, of course, timeless and applicable in any area; as opposed to the first view.

My view is that research should be firmly based on the second view but must also include elements of the first in order for the research to also be relevant. The research contributions at DSN generally fulfil both these goals, but the first goal may be questioned occasionally.

4 Thoughts and Conclusion

There were several gains of my visit to DSN 2007. As stated above, the main gain is the high quality of the contributions to the conference. They give inspiration for my own research and show the current hot topics in the area of which many are highly relevant for my own research. Then there is the chance to get to talk to other PhD students in the same area. Finally I also had good talks with my professor who attended DSN as a program committee member and session chair. Back home at Chalmers, there seems to be too little time for this type of informal discussions.

Together, the above reasons made the visit to DSN successful, even though I did not present a paper myself. Many thanks to ARTES for giving the grant for the trip!



Myself at the Forth bridge

Travel Report
International Conference on
Dependable Systems and Networks (DSN)
June 25-28, 2007, Edinburgh, UK

Hüseyin Aysan
huseyin.aysan@mdh.se

DSN 2007

The 37th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN - 2007) was held in Edinburgh International Conference Centre, Edinburgh, UK on June 25-28, 2007.

There were several interesting presentations and workshops during the conference. However the conference was organized in many parallel sessions, therefore I could not attend all the interesting talks I wanted.

I attended some of the sessions of the Workshop on Architecting Dependable Systems (WADS) and some paper presentations in the main track. The following presentations were the most interesting ones for me:

On the Selection of Error Model(s) For OS Robustness Evaluation

Andréas Johansson, Neeraj Suri, Darmstadt University of Technology, Germany Brendan Murphy, Microsoft Research, Cambridge, UK

Foundations of Measurement Theory Applied to the Evaluation of Dependability Attributes

Andrea Bondavalli, Andrea Ceccarelli, Lorenzo Falai, University of Florence, Florence, Italy Michele Vadursi, University of Naples "Parthenope," Naples, Italy

As this conference is one of the most important ones in the broad field of *dependability*, this visit was a very good opportunity to meet and listen to the presentations of some of the world leading researchers in this area.

ARTES Travel Report to DSN 2007

The 37th Annual IEEE/IFIP International Conference on
Dependable Systems and Networks

Raul Barbosa

June 29, 2007

1 Introduction

DSN is *the* flagship conference in the field of dependable computing. As such, it attracts a large number of scientists from all over the world. This year's edition took place in Edinburgh, Scotland, June 25–28.

The 2007 edition of DSN counted with the presence of 365 delegates both from academia and industry. As usual, this edition incorporated the Dependable Computing and Communications Symposium (DCCS) and the Performance and Dependability Symposium (PDS). Additionally, several workshops and tutorials took place in parallel with the main tracks.

2 Conference Program

The topics of interest for this conference encompass all aspects of dependability in systems that integrate digital devices and communications with complex software and humans. Consequently, there is a wide range of publication areas which address these issues by presenting new solutions, ongoing research and posing new challenges.

The opening ceremony of the conference was followed by a keynote speech by Professor Tony Hoare. The presentation, titled “[Science and Engineering: a collusion on cultures](#)”, focused on the fruitful interaction between science and engineering. Though this interaction can be seen in almost all areas of research, the presentation illustrated the collusion of computer science and computer engineering on the research into program verification and systems' dependability.

Many interesting presentations took place during the following three conference days. Security protection, software and hardware fault tolerance, software assessment, distributed consensus, embedded systems and dependability modelling are a few examples

of the article sessions. Any researcher interested in this field should browse through the [proceedings of DSN'07](#) to find the contributions to this year's conference.

3 Conclusion

The 2007 edition of DSN was an interesting reunion of people working in the dependability field. It was a great experience to meet fellow researchers and exchange research ideas which will certainly contribute to my future work. Moreover, attending a great number presentations always has a positive impact on our own ability to make good presentations. When a presentation is very good, we are inspired to improve our own; when a presentation is less good, we are inspired to make better ones.

ARTES++ Travel Report to ICSE'07

Peter Wallin & Andreas Hjertström
Mälardalen University

Introduction

The International Conference on Software Engineering (ICSE) is the most prestigious software engineering conference with over 600 participants. This year the conference was held in Minneapolis, USA. Before and after the main track several interesting workshops and tutorials were arranged. The range of the conference is very wide and includes almost all topics within software engineering such as modelling, testing, maintenance, design and debugging. There was special track on the Future of Software Engineering where invited speakers presented their concerns and thoughts for different domains where software engineering will play an important role in the future.

Contribution

Peter presented a paper called *Making Decisions in Integration of Automotive Software and Electronics: A Method Based on ATAM and AHP* at a workshop called Software Engineering for Automotive Systems (SEAS). An interesting workshop with lots of industrial influences where wrapped up with a nice dinner at a stake house.

We attended several of the interesting workshops and tutorials organized and found them very interesting. Due to the large range of presentations careful planning were needed to find the topics that best suited our research.

Wrapping it all up

We had a nice time in Minneapolis and can recommend the ICSE conference. It suits everyone involved in the software engineering area due to the wide range of topics and the quality of papers.

Minneapolis is quite close to the Canadian border but lacks mountains. It is so flat that Skåne seems like the Alps. Otherwise it is a very nice and clean city with the Mississippi river running through it. A must see if you go there is the Mall of America that is the largest shopping center in the States. It even has an amusement park in the middle.

ARTES++ Travel Report
19th Euromicro Conference on Real-Time Systems (ECRTS'07),
July 3-6 2007, Pisa (Italy)

S verine Sentilles & Aneta Vulgarakis
severine.sentilles@mdh.se, aneta.vulgarakis@mdh.se

Motivation and Description

The purpose of this trip was to go to the 19th Euromicro Conference on Real-Time Systems (ECRTS'07) to present a paper in the Work-In-Progress session and also to attend the tutorial on MARTE. ECRTS is forum aiming at covering state-of-the-art research and development in real-time computing including applications, infrastructure and hardware, software technologies, and system design and analysis.

This conference week started with three satellite workshops and a tutorial done in parallel sessions:

- The Worst Case Execution Time Analysis workshop (WCET 2007).
- The Real-Time Networks workshop (RTN 2007).
- The Operating Systems Platforms for Embedded Real-Time Applications (OSPERT 2007).
- The Tutorial on MARTE: A New Standard for Modeling and Analysis of Real-Time and Embedded Systems.

Then the remaining of this week was split in eight sessions:

- Scheduling and schedulability Analysis
- Multiprocessor scheduling
- Control and energy management
- Wireless network scheduling
- Timing analysis
- Quality of service management
- Scheduling in networks and multicore platforms
- Fixed-priority scheduling

The main conference was held in the Scuola Superiore Sant'Anna, located in the heart of Pisa (in Italy) and, the workshops and the tutorial were in the RETIS Lab around 20min walk from the centre of Pisa.

Contributions

During the Work-In-Progress session, S verine presented a paper entitled “*A Model-Based Framework for designing Embedded Real-Time Systems*”. This paper describes a work-in-progress which aims at getting a common definition of what real-time components are as well as having a common structure (done as a Model-Based Framework) to specify and design those real-time components.

The Work-In-Progress session ended with an hour Poster session, which gave us a very good opportunity to have useful talks and comments on our work.

Highlights

As ECRTS is one of the leading conferences in Real-Time computing, many papers were very good and relevant. Among those and as our work is more focused on modeling, in our point of view, some talks were really interesting to listen to:

- The invited talk, “*From Model-Driven Development to Model-Driven Engineering*”, by Brian Selic in which he presented a state-of-the-art of the system development and the Jazz Platform, a scalable and extensible platform for collaborative development.
- The Tutorial on “MARTE: A New Standard for Modeling and Analysis of Real-Time and Embedded Systems” by Sébastien Gérard, Julio Medina and Dorina Petriu. This tutorial described in details this UML-profile which one of the main concerns addresses the modelling of time.

Conclusion and Personal Impression

In our opinion, our participation to ECRTS’07 was a very positive experience. Apart from being in a full of history environment (such as the nearby Piazza dei Miracoli with the famous Leaning Tower), this conference allowed us to meet many researchers of the Real-Time community, to listen to interesting talks and to get useful feedbacks on our work.

ARTES++ Travel Report

ECRTS 2007 July 4-6, 2007 Pisa, Italy

Moris Behnam & Hüseyin Aysan

Mälardalen Real Time Research Center (MRTC)

moris.behnam@mdh.se, huseyin.aysan@mdh.se

ECRTS 07 conference

19th Euromicro Conference on Real-Time Systems (ECRTS 07) is a forum aimed at covering state-of-the-art research and development in real-time computing including applications, infrastructure and hardware, software technologies, and system design and analysis. The conference was held in Pisa, Italy.

In parallel with the conference there were 3 additional workshops and tutorials;

- WCET 2007: Worst Case Execution Time Analysis.
- RTN 2007: Real-Time Networks.
- OSPERT 2007: Operating Systems Platforms for Embedded Real-Time Applications.
- Tutorial on MARTE: A New Standard for Modeling and Analysis of Real-Time and Embedded Systems

We planed to attend the OSPERT 2007 workshop, but unfortunately due to a flight problem we missed some presentations, however the presentations that we attended were interesting.

Contributions

Moris' contribution to this conference was a work in progress paper titled **Independent Abstraction and Dynamic Slack Reclaiming in Hierarchical Real Time Open Systems**, and he gave a 5 minutes presentation. In this paper they showed the consequences of supporting independent abstraction on the CPU utilization. Independent abstraction is suitable for open systems where subsystems are developed and validated independently. They present their work in progress on dynamic slack reclamation, which keeps track of extra CPU allocations at run time. They are also investigating how to utilize those extra resources for supporting soft real-time tasks.

Huseyin's contribution to this conference was a work in progress paper titled **A Generalized Task Allocation Framework for Dependable Real-Time Systems**. This paper presents a framework which performs task allocation to the nodes of a distributed hardware under a wide range of allocation criteria.

There were many interesting papers and works, especially the following papers;

- **A Delay Composition Theorem for Real-Time Pipelines** by Praveen Jayachandran and Tarek Abdelzaher. This paper was selected as the best student paper. In this paper, they bound the end-to-end delay of a job in a multistage pipeline as a function of higher-priority job execution times on different stages.
- **The Global Feasibility and Schedulability of General Task Models on Multiprocessor Platforms** by Nathan Fisher and Sanjoy Baruah. In this paper, they derived near-optimal sufficient tests for determining whether a given collection of jobs can feasibly meet all deadlines upon a specified multiprocessor platform assuming job migration is permitted

- **On Controllability and Feasibility of Utilization Control in Distributed Real-Time Systems** by Xiaorui Wang, Yingming Chen, Chenyang Lu and Xenofon Koutsoukos. In this paper, they use the control approaches such as controllability and feasibility in to control multi-processor utilization of distributed real-time systems.

Our observation was that the following research topics “**Real time scheduling**” and “**multiprocessor scheduling**” are still popular in ECRTS while **wireless network scheduling** is getting more important.

Overall impression is that this conference was very good and useful and we have received many valuable comments during the poster session.

ECRTS is one of the most important European conferences in real time computing so it was a great opportunity to meet many researchers from several well known research groups.

ARTES ++ Travel Report
**Federated Events on Component-Based Software Engineering and
Software Architecture (CompArch),**

July 7-14, 2007 Boston, Massachusetts, USA

Aneta Vulgarakis & Séverine Sentilles

aneta.vulgarakis@mdh.se , severine.sentilles@mdh.se

Motivation

The purpose of the trip was to participate in the Federated Events on Component-Based Software Engineering and Software Architecture (CompArch) which took place in Boston, MA USA. The 5-day long CompArch 2007 brought together the 10th Int. Symposium on Component-Based Software Engineering (CBSE 2007), the 3rd Int. Conference on the Quality of Software Architectures (QoSA 2007) and the 3rd edition of a series of events investigating the Role of Software Architecture for Testing and Analysis (ROSATEA 2007). The aim of this federated event was to study the relationship between Software Architecture, Component-based Systems and Analysis, Quality and Testing. During CompArch 2007 it was as well organized a special industrial day where prominent industrial development managers and architects in Software Architecture and Component-based Software Engineering discussed and presented the latest trends in software modeling and design in leading software and software-intensive companies.

Highlights

As our research is in the CBSE field and the Int. Symposium on Component-Based Software Engineering is one of the most important events in the CBSE community, this visit was a very good opportunity to meet and listen to the presentations of some of the world leading researchers in this area. For the presentations there were allocated 20 min for longer papers and 10 min for shorter papers.

Activities

During the stay there were as well organized a social dinner and a night boat cruise. It has been a wonderful experience for us to see the night lights of the Boston skyscrapers from the ocean.



Travel Report from COMPSAC 2007

Hongyu Pei Breivold
Department of Computer Science and Engineering
Mälardalen University
hongyu.pei-breivold@mdh.se
20th Dec 2007

COMPSAC 2007 conference

COMPSAC is a major international forum for researchers, practitioners and managers interested in computer software and applications to discuss the state of art, new advances, and future trends in software technologies and practices. It was first held in Chicago in 1977. COMPSAC 2007 was held in Beijing from 23rd to 27th of July.

The conference program includes:

- 3 keynotes and 7 panel sections
- 6 tracks including 25 research and industry sections
- 2 doctoral symposium sections and 2 fast abstract sections
- 2 tutorials
- 14 workshops

Contribution

Ivica and I gave a tutorial entitled Emerging Technologies in Industrial Context: Component-Based and Service-Oriented Software Engineering. Component-based software engineering (CBSE) and service-oriented software engineering (SOSE) are two similar but distinguished approaches in software engineering. In this tutorial, we compare CBSE and SOSE and analyze them from different perspectives. We discuss the possibility of combining the strengths of the two paradigms.

ARTES++ Travel Report

Marcelo Santos¹, PhD. Student at MRTC, Mälardalen University

Purpose of Travel

The purpose of the trip was to attend ACACES 2007, the third International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems, from July 15 to July 20, in L'Aquila, Italy. The school has a broad scope and courses range from low level technological issues to advanced compilation techniques.

Activities

The school offered twelve courses, four lectures per day, with three courses running in parallel, so that each student could take four courses. I took the following:

1. Advanced Program Analyses for Object-oriented Systems, given by Barbara Ryder from Rutgers University, USA. This course presented program analysis (static and dynamic) for compilation and optimization, mainly analyzing the execution call structure of object oriented programs. The course covered some methods, with their costs and application domains;
2. Compilation Techniques for Embedded Systems, given by Jack Davidson from University of Virginia, USA. This course presented optimization needs for compilers for embedded systems, such as runtime performance, code size, memory performance, etc. It emphasized performance for speed, memory, energy and security requirements (for embedded systems);
3. Embedded VLIW Architectures and Compilers, given by Paolo Faraboschi from Hewlett Packard Laboratories, Spain. This course focused on low level issues involved in VLIW (very large instruction word) like cost, time to market, organization and design of the architecture, compilation, etc;
4. Memory Architecture Aware Compilation, given by Peter Marwedel from University of Dortmund, Germany. This course described the problem "memory wall", where the system speed is limited by the speed of the (slow) memory. The focus of the course was on how to optimize compilation to improve time-predictability and energy efficiency when the compilation is aware of the memory hierarchy. The focus was on scratch-pad memories.

Travel support

The trip was supported by a grant from ARTES (approx. 13000 SEK).

¹Email: marcelo.santos@mdh.se

Travel Report: RTCSA07 in Daegu, Korea

Gunnar Mathiason
School of Humanities and Informatics
University of Skövde
gunnar.mathiason@his.se

A Travel Report in four "C" headings.

1 The Cause

The IEEE RTCSA conference is one of the leading conferences for Real-Time Systems, usually located in Asia. Many Asian researchers go to this conference, but also many Europeans and Americans participate. Me and my co-authors decided to submit our paper about a scalability approach for distributed real-time databases, "Virtual Full Replication by Adaptive Segmentation", and the paper was accepted as a full paper at the conference. A trip from Europe to Korea is quite expensive, compared to a trip to the US or a trip within Europe, why I applied for ARTES mobility support for this trip. The paper was finalized during my five-month visit in 2007 to University of Virginia, a visit that was co-financed by another grant from ARTES mobility support, and for which another Travel Report is available at ARTES.

2 The Country

The people in Korea seem to be very polite. The usual greeting when you meet unknown people is to quietly bow your head, not saying 'Hello', 'How are you?' or similar. In places that offer any kind of service, like hotels, shopping centers and at the railway, there are always employees just waiting to greet you. There is no tipping, but instead all service fees are included.

Korea develops very fast. In the conference I talked to a Korean man who lives in the US, and he claimed that the country changes every year. The country is densely populated, and it seems that many people in urban areas live in small flats in high buildings.

RTCSA07 was held in Daegu, in the south-east of Korea, and with high-speed train it's only 2 hours from Seoul in the north-west. The railway system seems very well organized in Korea, and fares are reasonable.

3 The Conference

The conference was held in a large conference center, "Hotel Inter-Burgo", large enough to host other conferences as well during the week, as well as wedding parties and a fashion show. This conference center has two different hotel buildings and offers as much as twelve different restaurants.

This year RTCSA offered three different tracks: Real-Time Systems, Ubiquitous Computing, and Embedded Systems. The track sessions were organized into two concurrent sessions, while the Keynote and Invited sessions were in common.

Many interesting papers were presented at the conference. Resource scheduling is still a popular subject in the real-time community. With the advent of multi-core processor a whole new branch of the subject has developed. This includes new scheduling approaches for processes, and new models for memory management. Power management is getting more important, and in particular for limited processors, such as used in wireless sensors. Being a real-time conference, RTCSA'07 also included presentations about analysis of real-time systems, distribution and collaboration, middleware and integration issues, fault tolerance approaches, and also had one session on real-time databases. Several papers in the conference had work connected to the medical domain.

At the Banquet, the Director of display applications at Samsung gave a long talk about the background and the upcoming technologies they intend to use. Much of it is about personalized media, both for tailored media consumption, but also for creation of personal content. Samsung is highly respected as a company in Korea, and the people seem very proud of having such a major consumer electronics company in the country.

At the last evening, conference participant could choose from a number of tours around Daegu. I went to the national museum and to a Buddhist temple area. We also had a visit to a cave with a Buddha statue, and finally a traditional Korean meal with many, many dishes.

4 The Conclusion

The RTCSA of 2007 was very nicely located and contained many interesting papers. It is an important conference to visit, if you regard yourself a part of the real-time community. Quite a few of the RTCSA visitors also went to the ECRTS real-time conference in Pisa, Italy, a month before this conference. I am happy to have presented my work at this conference, and I am also very satisfied with the feedback I got.

(Pictures are available at
<http://picasaweb.google.com/gunnarmathiason/20070823DaeguRTCSA07>)

ARTES++ Travel Report to RUNES Summer School at University College London 9th – 11th July, 2007

About the summer school

The purpose of the summer school was to disseminate the technologies developed in the RUNES (Reconfigurable Ubiquitous Networked Embedded Systems, <http://www.ist-runes.org/>) project to scientists and engineers across Europe. The RUNES Summer School took place over three consecutive days in July 2007, with the first two comprising technical lectures and related hands-on programming seminars, while the third is self-contained and structured around the RUNES applications and the demonstrator. The aim was to broaden the students' appreciation for and interest in the field of networked embedded systems, while also extending their technical skills. In bringing students together from different parts of Europe, the RUNES Summer School also played an important role in strengthening the community in this field.

Relevance

I am doing my research in automotive embedded systems. Although at different platform and technology, the RUNES project addressed similar problems and constraints that we have in automotive embedded systems.

Experience and Conclusion

The hands on experience with wireless nodes and detailed knowledge of RUNES middleware will help me in my project, where I am involved in developing a middleware for dynamically reconfigurable automotive systems. Introduction to Contiki OS was also beneficial.

Security for better and secure utilization of communication resources is an important aspect of automotive systems as well. At the summer school, I also learned new security mechanisms to avoid the use of extra processing capabilities by a particular node in a network for power saving.

ARTES++ Travel Report to RUNES Summer school

Reconfigurable Ubiquitous Networked Embedded Systems

University College London, July 9-11

About the Event

The purpose of the RUNES summer school was to disseminate the technologies developed in the RUNES project (www.ist-runes.org) to scientists, engineers and students across Europe. The event took place over three days in July, the first two focusing on technical lectures combined with hands-on programming classes, while the third day was devoted to the usage of RUNES applications and demonstrators (and also targeted at a broader group than just computer engineers).

The program contained many different items – everything from information on the RUNES architecture and component model, via introduction to the Contiki OS used, to usage of encryption on embedded devices using hardware acceleration and data fusion. On the third day the presentations covered the applicability of wireless sensor networks to firefighting, an introduction to how firefighting is done, and finally a panel discussion on the opportunities and drawbacks of deploying technology like RUNES widely was held.

My Contribution and Experiences

I went to the event together with one of the other PhD students at my department, Tahir Naseer Qureshi, to learn more about the RUNES project and its results.

The RUNES summer school was a very interesting event for us to attend, even though the research I do isn't directly related to the research done within the RUNES project. Even though the RUNES project is more targeted on wireless sensor networks (and not automotive networks, as the two of us work on), the work they have done is still very relevant, as it is one of few embedded systems design from bottom up with reconfigurability in mind. This is an important common point of the area even if the application areas differ.

On the second day of the event, there was an opportunity for the participating students to present their own work. Together with Tahir, who also participated in the event, I introduced the work we do within the DySCAS project.

Conclusion and Outcome

All of the presentations, together with photos, have been put online on the webpage for the summer school (http://www.ist-runes.org/summer_school/). The event was very interesting and gave me a lot of new viewpoints on the research I'm currently doing, and I had the opportunity to meet a lot of PhD students from other parts of Europe involved in related research, mainly within the wireless sensor network community.

Magnus Persson
PhD student, Division of Mechatronics
Department of Machine Design
School of Industrial Engineering and Management
KTH – Royal Institute of Technology
magnus.persson@md.kth.se

Travel Report: University of Virginia

Gunnar Mathiason
School of Humanities and Informatics
University of Skövde
gunnar.mathiason@his.se

1 Motivation

In the spring of 2007 I was given the opportunity for a five month visit the Department of Computer Science at University of Virginia (UVA). The Control Research Group has a long history of research in real-time databases, which is also the area of my thesis. Professor Sang H. Son acts as my thesis work co-advisor, and when the opportunity for a long stay came up, I was not late to respond to it. The aim of the visit was to continue pursue scalability problems in distributed real-time databases, to get extended advisor time, and to apply constraints given by Wireless Sensor Networks to my scheme for Virtual Full Replication in distributed real-time databases.

2 Research

The Control group is currently one of the strongest research groups in the world working with Wireless Sensor Networks (WSNs). The group consist of about 30 people, with three faculty people, a small group of post-docs, and PhD students.

The PhD students in the Control group work hard and long hours, although my impression is that they start later in the day compared to Europeans. The pressure to publish is very strong, and the support from the group in doing so is very elaborate. All known potential submission sites and dates are clearly communicated in the weekly meeting, and faculty is very direct and clear with which people may submit at the proposed dates. It is then up to the individual to take action to participate in tasks and work groups to get publications. In such groups, collaboration and effectiveness is emphasized. The work is shared and everybody is expected to contribute.

Faculty and advisors are highly involved in details of each student's work, and very distinct and supportive in their feedback. The feedback I got helped me a lot in focusing my research issues, approaches and evaluations. It is clear in the group that scientific work need to be highly interesting and bring novelty to excel in the competitive research world. Thus, both substance and presentations are usually of very high quality.

Often project work is connected to concrete usage scenarios, where the funding points the research in some direction that is useful for the funder. Projects and funding have a shorter time span, and requires more clear concrete results in terms of demonstrators and solutions. My impression is that American pragmatics plays a central role here. American PhD student conduct experiment and write papers. They are lightly or not at all involved in other department tasks or teaching. It is always a Professor that lectures at all course levels.

My impression is that every person need a very high personal motivation for his own success for driving his own progress forward. This is of course true for every PhD project, but the American self-made man attitude is very present, and also necessary. The PhD work is probably harder in the US, but also more rewarding. It is hard to think that US PhD student have much family life during their PhD project years.

3 Environment

University of Virginia has a long history and was founded by President Thomas Jefferson. People are, and should be, very proud of his heritage. The University and the surroundings are very nice and Charlottesville has been appointed the best place to live in the US, for several years. UVA is a large University with their own Police corps, Daily newspaper, and a Bus system. The transport and parking organization is large, since parking is an important issue due to limited parking space and the fact that most people drive to work. Living at the city border, commuting by bus from home was not possible for me. I got a parking permit for 'Blue parking' a mile away from the office, with a free 15 minute bus ride both in the morning and in the evening.

Americans are encouraging people. Most people in Virginia are very nice and open to others. Attending a church is very common and also quickly gives a social network that brings much good, in particular for me who went without my wife and children.

4 Results

During my stay I wrote two papers, which were accepted at RTCSA'07 and ECRTS'07 (WiP). The latter gave a de-tour to the ECRTS conference in Pisa, Italy, on the way back home from the visit. The papers published will be an important part of the substance of my Thesis.

During my stay I also got help in forming the Thesis layout and how to best use the content. The extended advisor time helped me found out the remaining work needed, and the time frame for it.

At the end of the visit I got the opportunity to visit George Mason University in Fairfax VA, to present the Information Fusion profile at University of Skövde together with Per Gustavsson from SAAB/University of Skvde. The presentation was well appreciated and is now available online (a pointer is given

on request).

5 Conclusions

The visit to University of Virginia has been very useful for me. The cost of administrative time to fund, setup, and actually carry out the trip with all the practical issues involved has been well spent in my opinion.

I have got a good time in Charlottesville, giving me many new friends, time to polish my (American) English, and invaluable experiences of seeing the American culture from the inside. I have learned to appreciate the US more, and I have seen how focused hard work pays off well in that society.

Finally, this trip gave my PhD work a good push forward, with two new publications accepted, and a good Thesis structure. The effort and the funding spent was well used and payed off for me.

Travel Report from Euromicro SEAA 2007

Hongyu Pei Breivold
Department of Computer Science and Engineering
Mälardalen University
hongyu.pei-breivold@mdh.se
20th Dec 2007

Euromicro SEAA 2007 conference

EUROMICRO SEAA conference brings together people from business, industry, research, and academia who are working in software engineering and information technology. The aim is to focus on innovative and advanced applications of software engineering. The conference was held in Lübeck, Germany from 28th to 31st of August.

The Conference offers several highlight keynote speeches:

- Semiconductor and EDA Challenges by Dr. CHI-FOON CHAN (President and Chief Operating Officer for Synopsys)
- Software Components and Software Architecture: Software Design on its Road to an Engineering Discipline By Prof. Dr. Ralf Reussner
- Grid Computing: Operating Large Distributed Infrastructures for Advanced Applications by Dr. Christian Grimm
- Design Without Borders by Prof. Jan M. Rabaey
- How good is a process: Evaluating Engineering Processes' Efficiency by Tom Gilb

There are three main conference tracks:

Component-Based Software Engineering (CBSE)

Multimedia and Telecommunications (MMTC)

Software Process and Product Improvement (SPPI)

Contribution

My contribution to the conference was to present a paper titled 'Component-Based and Service-Oriented Software Engineering: Key Concepts and Principles' which was written together with Magnus Larsson. In this paper, we present a comparison analysis framework of component-based and service-oriented software engineering and analyze them from a variety of perspectives. We discuss as well the possibility of combining the strengths of the two paradigms to meet non-functional requirements. The contribution of this paper is to clarify the characteristics of CBSE and SOSE, shorten the gap between them and bring the two worlds together so that researchers and practitioners become aware of essential issues of both paradigms and utilize them in a reasonable and complementary way.

ARTES++ Travel Report

First European-South American School for Embedded Systems

Hüseyin Aysan
huseyin.aysan@mdh.se

Purpose of visit:

The purpose of the visit was to attend the First European-South American School for Embedded Systems that took place in Buenos Aires, Argentina between August 21 and 24 in 2007. The purpose of the school was to bring together the researches from Europe and South America in the field of embedded systems in order to establish and strengthen the relationships among these researchers.

Activities during the school:

Each day there was a lecture for two hours per lecturer for a total of 24 hours. The lectures were given by Joseph Sifakis, Gerhard Fohler and Luis Almeida in the following subjects:

- **Joseph Sifakis** - Component-based modeling of heterogeneous real-time systems:
The topics covered in this lecture were:
 - Modeling Heterogeneous Real-Time Systems
 - Component-Based Construction
 - Composition of heterogeneous systems
 - Correctness by Construction
 - The BIP component framework
 - Applications: MPEG Video Encoder, Wireless Sensor networks
 - Research Directions and Open Issues
- **Gerhard Fohler** - Adaptive Real-time systems
The topics covered in this lecture were:
 - Real-time, real-time systems
 - Types and properties of real-time systems
 - Scheduling of single and multiprocessor systems
 - Periodic and non periodic activities
 - Time triggered systems
 - QoS Management
- **Luis Almeida** - Networks for embedded control systems
The topics covered in this lecture were:
 - Introduction to real-time communications
 - Issues on real-time communication
 - Paradigmatic protocols
 - The perspective of Control Applications
 - Trend towards flexible control systems

I have presented my ongoing research during allocated time for student presentations and exhibited a poster during the school. I have received valuable comments from other researchers.

ARTES Mobility Support Travel Report

RTCSA August 21-23, 2007, Daegu, Korea

Moris Behnam,

Mälardalen Real Time Research Center (MRTC)

Moris.behnam@mdh.se

RTCSA 07 conference

The 13th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications, tries to bring together researchers and developers from academia and industry for advancing the technology of embedded and real-time computing systems and applications. Three tracks were offered in this conference including Real time systems, Ubiquitous Computing and Embedded systems. Two parallel sessions were organized.

Contribution

My contribution to this conference was a paper titled **Real-Time Control and Scheduling Co-Design for Efficient Jitter Handling**. In this paper we propose an integrated approach for control design and real-time scheduling, suitable for both discrete-time and continuous-time controllers. It guarantees system performance by accepting a certain minimum value of jitter for control tasks and feasibly schedules them together with other tasks in the system. Results from comparison with other approaches from real-time and control theory domains underline the effectiveness of our method.

The following papers were interesting;

- **Contract-Based Reusable Worst-Case Execution Time Estimate.** (*selected as a best paper*)
Johan Fredriksson, Thomas Nolte, Mikael Nolin, and Heinz Schmidt
- **An Approach to the Timing Analysis of Hierarchical Systems**
Marco Panunzio and Tullio Vardanega
- **Networked Control Systems : Definition and Analysis of a Hybrid Priority Scheme for the Message Scheduling** *Guy Juanole and Gerard Mouney*
-

My overall impression is that this conference was good. The acceptance ratio for long papers is (29.6%) and for short papers (14.8%) out of 142 submitted papers, which shows that this conference is getting more important in real time community. More than halve of submissions where from Asia, so there were many Asian researchers at this conference.

ARTES ++ Travel report – ARTIST2 / UNU-IIST summer school 2007

Aug. 1st to 10th, 2007 – Suzhou, China

By Yue Lu¹, PhD student at MRTC, Mälardalens University, Västerås

Purpose of Travel

To attend the ARTIST2 / UNU-IIST 2007 summer school and seminars was the main purpose of the trip. The annual event is prompted by the ARTIST2 and UNU-IIST in order to provide the excellent opportunity of intercommunications and research collaborations between the Chinese academic and the European academic communities. The graduate courses are given by the European researchers. This year (2007), it took place on the 1st Aug and finished on the 10th Aug, in Suzhou, one beautiful and famous city in China. The department of Computer Science & Technology, at SooChow University was the host of this event.

Activities

Professors Luca Benini, Karl-Erik Arzen, Paul Caspi and Kim G.Larsen separately gave very interesting courses related to their research. Moreover, professors Wang Yi from Uppsala University (Sweden), Liu, Zhiming, John-Koo from China gave the talks about their relevant research on the seminars. I had some interesting discussions with Paul Caspi, e.g. computer theorem about the problem complexity of buffer optimization, Kim G.Larson e.g. heuristic verification, optimal scheduling related to Uppaal CORA etc. On the sixth day at the school, Mr. Zhou Chaochen, who is the Chinese academician, gave his presentation about sub-algebra and program verification before his 70 years birthday comes. Mr. Zhou showed us his professional and his enthusiasm to the research. At last, he gave the sincere encouragements to all the professors, researchers and PhD students joined the summer school. During my stay at Suzhou, I also had some interesting discussions with the local Chinese PhD students and abroad. Hopefully, there will be a number of collaborations among us in the future.

City

Suzhou is a very nice city, which was the capital of the Chinese South dynasty in the ancient time. It is famous for the silk and pearl necklace. I had dinner with friends at the Suzhou newly developing technology area, “Yuan Qu” which is besides the “Jin Ji” lake, where the Chinese movie ceremony (Chinese Hollywood) will be hold from next year to the endless. Enjoying the one of the most delicious food and beautiful landscape at night is the greatest moment in the life! It is a very nice place to visit after the hot and humid period passed, e.g. spring, autumn, even winter is preferable.

Travel Support

The trip is supported by the grants from ARTES++ (approx. 10,000 SEKs) and ARTIST2/UNU-IIST 2007 network of excellence.

¹ Email: yue.lu@mdh.se

ARTES++ Travel report
Håkan Gustavsson, Mälardalen University



11th International

Software Product Line Conference (SPLC 2007)

Sept. 10-14, 2007, Kyoto, Japan



In brief

The main purpose of the conference was to present the paper “Coping with Variability in Automotive Product line Architectures Using Real Options” and to gain knowledge in the concept of software product lines. A software product line (SPL) is a set of software-intensive systems sharing a common, managed set of features that satisfy the specific needs of a particular market segment and that are developed from a common set of core assets in a prescribed way. This was the theme of the conference, which was discussed during one week at the Kyoto Research Park just outside Kyoto.

The conference

The visitors of the conference were a mixture of people from academia and Industry, even though most academic visitors had a strong industry coupling. Companies such as IBM, RICOH, Toshiba, NEC, Omron, Phillips and Mitsubishi had a strong presence; the automotive industry was represented by Bosch, Cummins and Scania. The author visited two tutorials, an introduction to SPL and one on the theme how to predict product line payoff with the method SIMPLE (see reference section). They were both very interesting, even if the SIMPLE method leaves a lot of open issues it is a good start. The paper was presented during the workshop “managing variability for software product lines” and was well received with interesting questions asked. During offline discussion it turned out that both SEI and Phillips medical are pursuing in the same research track and will publish a paper during SPLC2008.

Personal comments

The conference suited my field of interest very well and because of its small size (250persons) it provided an open atmosphere. I also believe the mix of industry with similar problem was very fascinating and stimulating.

References on the topic

Conference website:

<http://sec.ipa.go.jp/SPLC2007/>

<http://www.lero.ie/SPLC2008>

Introduction to product lines

<http://www.sei.cmu.edu/productlines/>

Tutorial to product lines similar to the one made by Linda Northrop at SPLC2007:

<http://www.sei.cmu.edu/productlines/SPLKeynote.pdf>

The simple website

<https://simple.sei.cmu.edu/>

Automotive project

<http://www.esk.fraunhofer.de/projekte/automotive/mobilSoft2007.jsp>

ReSIST Summer School 2007

Mikael Asplund
mikas@ida.liu.se

December 21, 2007

1 Introduction

ReSIST is a European network of excellence with the objective “Towards a global dependability and security framework”. On 24th-28th September 2007 the network members organized a summer school on the French island Porquerolles just outside Toulon that I attended. I was drawn by the excellent speakers such as Jean-Claude Laprie and Paulo Verissimo as well as the nice location in the Mediterranean Sea as a contrast to the cold Sweden at that time of the year.

2 Topic highlights

Resilience The summerschool started very interesting with an introduction by Laprie on the term “Resilience”. Apparently this was still a topic of debate among the network partners as not everyone agreed. In my view resilience seems to be more or less the same thing as dependability but with a slightly fancier image. But the distinction that Laprie wanted to make was that resilience also embodies the concept of change. His definition was as follows: “the persistence of dependability when facing functional, environmental, or technological evolutionary changes”.

The human role A most interesting talk by Alberto Pasquini discussed the importance of having a socio technical view when designing safety-critical systems. His example was the Uberlingen accident in 2002 where two airplanes crashed in mid-air despite technical systems to prevent such events.

Design of resilient systems Paulo Verissimo who now works mostly with security in distributed systems gave a nice tutorial on design. Again, I people were not entirely agreeing on the importance of malicious failures. Where Verissimo was arguing that the byzantine fault model was the only reasonable one, Laprie had earlier said that too much focus is on malicious fault on the expense of the much more common non-malicious faults.

Routers Michael Behringer from CISCO gave a lecture on the challenges in adding security to routers. Apparently there is little one can do on high speed routers as there is such a vast amount of data that even the simplest algorithm takes so much processor resources that heating is a major problem.

3 Lessons learned

Overall the summer school was very rewarding in terms of insights and connections. There were many interesting and nice people there and I hope to meet them again in conferences. One thing that might be interesting for fellow ARTES students is that a grant program was announced that was designed to allow young researchers in Europe to travel and start cooperations in a small scale.

Travel report

Visiting Scuola Superiore Sant'Anna in Pisa

Kaj Hänninen

The visit

In September-07 I visited the group of Giuseppe Lipari and Giorgio Buttazzo at Scuola Superiore Sant'Anna in Pisa, Italy. Mr. Lipari gave a general presentation of Scuola Superiore Sant'Anna. He then presented some research performed by the group specializing on real-time systems. Lipari also presented his work on GRUB-PA, a resource reservation algorithm for power-aware scheduling of periodic and aperiodic real-time tasks. Paolo Gai gave an interesting talk about a spin off company called Evidence. Evidence develops firmware for embedded real-time systems.

I really enjoyed my visit to SSSA.

ARTES++ Travel Report

EMSOFT October 1-3, 2007, Salzburg, Austria
Moris Behnam,
Mälardalen Real Time Research Center (MRTC)
Moris.behnam@mdh.se

EMSOFT 07 conference

EMSOFT is an annual ACM Conference on Embedded Systems Software sponsored by ACM. EMSOFT aims at covering all aspects of embedded software with focus on principles of embedded software development. EMSOFT07 was held in Salzburg, Austria, Oct. 1 – Oct. 3, 2007, within the Embedded Systems Week, which contains two other leading research conferences in embedded computing: CASES, CODES+ISSS. Besides, there were a number of workshops and tutorials affiliated with the main conferences.

In addition, there were two very interesting panels;

1. Grand Challenges in Embedded Software
2. Automotive Networks – Are New Busses and Gateways the Answer or Just Another Challenge?

Contribution

My contribution to this conference was a paper titled **A Synchronization Protocol for Hierarchical Resource Sharing in Real-Time Open Systems** in this paper we present a protocol for resource sharing in a hierarchical real-time scheduling framework targeting real time open systems. The protocol and the scheduling framework significantly reduce the efforts and errors associated with integrating multiple semi- independent subsystems on a single processor.

My overall impression

This conference was different from the other conferences that I have attended because the participants were from several different research communities. It was a great opportunity for me to meet researchers from other research communities who have different views and experience. I learned from this conference to be careful when discussing technical issues and specially using terms that have different meanings in different research communities. It was very good experience for me and I will submit a new paper to EMSOFT next year.

Från: pavelk@it.uu.se
23 okt 2007 14.28.36

Report from ESWEEK'07

I have attended ESWEEK'07 (EMSOFT'07 and FORMATS'07 conferences), which was held in Salzburg, Austria, at the beginning of October 2007. I have presented the paper Multi-Processor Schedulability Analysis of Preemptive Real-Time Tasks with Variable Execution Times (joint work with Martin Stigge and Wang Yi) at FORMATS. The EMSOFT conference deals with the development of embedded systems with the strongest focus on the correctness (or safety) of the software. The panel discussion presented the grand challenges in this area: mainly to find appropriate abstraction layers for the development of embedded systems; a concrete challenge is a verified sensor network. The FORMATS conference is a smaller event for the formal methods community in real time systems, mainly timed automata community. It is a perfect opportunity to meet the people dealing with very similar problems as I deal with.

The most interesting tutorials presented the real-time calculus (Lothar Thiele) and the abstract interpretation based verification (Patrick Cousot). The real-time calculus provides a uniform framework for schedulability analysis of multi-processor (multi-resource) systems based on abstraction of the computation requests and resource availability by arrival and service curves, respectively. The main advantage of this approach is its uniformity and scalability. If the arrival/service curves abstraction suffices for our purposes then this method is definitely worth considering. An abstract interpretation of a program gives it a finite state semantics, which can be analyzed algorithmically. Choosing the abstractions such that they satisfy some properties allows us to conclude some properties about the original system.

Pavel Krcaľ, Uppsala University

ARTES++ Travel Report

Marcelo Santos¹, PhD. Student at MRTC, Mälardalen University

Purpose of Travel

The purpose of the trip was to attend the 19th International Symposium on Computer Architecture and High Performance Computing, held at Serra Azul Hotel (Gramado, RS, Brazil), from 24th to 27th October 2007.

Activities

The symposium, promoted by the Brazilian Computer Society, had several sessions about computer architecture in general and related issues, like benchmarks, grid computing, communication, etc. More interesting to my research were the sessions *Microarchitecture* and *Cache and Memory Architectures*, with some seminars about applications to embedded systems (soft real-time). Some of the presentations were about multicore for embedded applications (multithreaded processors and thread-level parallelism), while others were about energy optimization related to memory hierarchy. Less related to my research, but still in the area of embedded applications, were presentations about function optimization for DSP architectures and mobile computing. The *Mobile and Pervasive Computing* session was part of the WSCAD workshop held in parallel with the symposium.

The City of Gramado

Gramado is a small city in the south of Brazil, about 100km from Porto Alegre, the capital of the state of Rio Grande do Sul. It is situated in a mountainous region and was populated mainly by German immigrants. Because of this, it has a German architectural style and good wine. Some pictures of the city center and coffee break:

¹Email: marcelo.santos@mdh.se



Travel support

The trip was supported by a grant from ARTES (approx. 15000 SEK).

ARTES++ Travel Report

Stefan Bygde

December 21, 2007

NWPT Workshop

NWPT is the Nordic Workshop on Programming Theory and was held in Oslo October 10-12 2007. NWPT is a annual workshop on programming theory mainly for nordic countries. Topics for the workshop includes for example, semantics of programs programming logics, program verification, and formal specification of programs. The workshop accepts works that previously has been published as well as work in progress. It was a very nice workshop with interesting topics.

Contribution

This was my first presentation at a workshop and I was presenting my paper "Analysis of Arithmetical Congruences on Low-Level Code". This work is an extension of the arithmetical congruence domain which is used in abstract interpretation. The purpose was to be able to use the domain in analysis of low-level code. The workshop was divided into sessions and I presented at the session "hardware and low-level models" which was during the second day.

Travel Report

Progress trip to Pisa-Viareggio, October - 2007, Italy

Hüseyin Aysan, Stefan Bygde, Aneta Vulgarakis, Séverine Sentilles,
Farhang Nemati, Yu Lue, Moris Behnam
{huseyin.aysan, stefan.bygde, aneta.vulgarakis, severine.sentilles,
farhang.nemati, yu.lue, moris.behnam}@mdh.se

Introduction

PROGRESS is a project involving around 30 researchers including professors, senior researchers and PhD Students. It is dedicated to research on using software components in engineering of embedded systems. Research includes theories, methods, and tools for predictable embedded software development from software components and legacy code and adopting and applying real-time modeling and analysis techniques across all stages of the component-based design and development chain. Most of the PROGRESS members went to this trip.

The main purposes of this trip were,

- having internal meetings and workshops for the ultimate goal of writing roadmaps for the research directions within PROGRESS,
- having meetings and a joint workshop with the groups of
 - o Antonia Bertolini at Software Engineering Research Laboratory at ISTI,
 - o Guiseppi Lipari and Giorgio Butazzo at Scuola Superiore Sant'Anna,

Scientific activities during the trip

The Internal Presentations of the PROGRESS People

Hans Hansson presented the draft version of the road map of the PROGRESS project. He discussed the outlines of the activities within each group of PROGRESS and the program of the week in Pisa.

During the week each group within PROGRESS project presented their road maps and plans for research:

Paul Pettersson and Cristina Seceleanu presented the concepts and road map for analysis and formal verification of real-time components and also resource modeling of components. The research area of this group includes verification of PROGRESS components and resource models of the components.

Mikael Nolin presented the road map and the research direction of the platform synthesis group. He also presented concepts of real-time applications and platforms in the automotive industry.

Ivica Crnkovic presented the top-down component model framework and its levels. Jan Carlson presented the PROGRESS real-time component model and its design in the low level and future research that should be done around that.

Johan Fredriksson presented a contract-based technique to achieve reuse of known worst-case execution times (WCET) in conjunction with reuse of software components.

Johan Kraft presented the road map and the activity plan of the Legacy cluster in PROGRESS. He talked about the model extraction and model validation, and simulation concepts related to the complex real-time legacy systems and application of the models. Thomas Nolte also presented componentization of the legacy systems and reusing the components in the PROGRESS component model.

Tomas Bures had a presentation about the Integrated Development Environment (IDE) for design, implementation, and verification of the PROGRESS components and component model.

Kristina Lundqvist who has recently got the professor position in MRTC presented her research area which has been within avionics. She also introduced her plans and projects for research within MRTC.

At the end, the PhD students presented their individual research plans and road maps.

Meeting with the real-time group at Scuola Superiore Sant'Anna

The meeting with real-time group was held at Scuola Superiore Sant'Anna, Pisa. Giuseppe Lipary presented the Scuola Superiore Sant'Anna which is a school for advanced studies for graduate students and professionals. Then, he talked about the **ReTiS Lab (Real Time System Laboratory)** which focuses on real-time operating systems, real-time schedulability analysis (especially in the area of adaptive real-time systems and reconfigurable real-time systems), security and wireless networks. He gave a short introduction about the projects that have been carried out at RETIS lab which are

- FRESCOR project Framework for Real-time Embedded Systems based on COntRacts
- The RI-MACS project, Radically Innovative Mechatronics and Advanced Control Systems
- ART DECO project, Adaptive Infrastructures for Decentralised Organisations

Paolo talked about a company called Evidence. Evidence was established at the end of 2002 as a spin-off of the ReTiS Lab of the Scuola Superiore Sant'Anna (Pisa, Italy). Evidence provides innovative software solutions for the design and the development of real-time embedded systems, with a special focus on multi-core hardware platforms.

Later, Lipary presented the paper "Using resource reservation techniques for power-aware scheduling" in details. This paper presents GRUB-PA, a new scheduling algorithm for power-aware systems. The algorithm can efficiently handle systems consisting of hard and soft real-time tasks. The algorithm reclaims the spare bandwidth caused by periodic tasks that execute less than expected or by sporadic tasks that arrive less frequently, and use this information to lower the processor frequency.

Meeting with the Software Engineering Research Laboratory at ISTI

The workshop was held in the Software Engineering Laboratory at the Istituto di Scienza e Tecnologie dell'Informazione (ISTI) in Pisa. It started with Antonia Bertolino, the head of the lab. She made a general presentation on the software engineering group and on their past and ongoing research activities. *Their goal is to foster the application of sound and systematic methods in software production, focusing especially on software quality and reliability chased from process definition, to testing, to validation and certification of both software processes and products. The emphasis of this effort is in the applicability of results, and therefore the research activity is conducted in cooperation with industrial partners applying both engineering and scientific approaches on real projects.* The research topics they are dealing with are:

- Software requirements analysis,
- Software process evaluation,
- Software product evaluation,
- Reliable assembly and validation of component-based software,
- Testing in the large and integration testing approaches,
- Methods and tools for improving white-box testing,
- Evaluation of software reliability, testability, test effectiveness
- Application of Software Engineering to telecommunication systems.

Then Ivica Crnkovic presented the PROGRESS Centre for Predictable Embedded Software Systems.

And the workshop ended with 2 more presentations: one from Guglielmo De Angelis and the second one from Jingua Gao. Guglielmo, who freshly defended his thesis (2 days before) gave us an interesting talk on a "Model driven approach to embedded systems". Jinghua Gao presented a testing tool called TAXI (Testing by Automatically generate XML Instances) and showed how to use it.

Meeting with Felicita Di Giandomenico in the Dependable Computing Research Laboratory at ISTI

Three PROGRESS members met Felicita Di Giandomenico in the Dependable Computing Research Laboratory at ISTI. Giandomenico presented the research being conducted in her group as well as briefly stated some of their industrial collaborations. The research topics they are focusing on are:

- Mechanisms for fault tolerant systems to improve availability and efficiency of systems
- Development of generic architectures for fault tolerant real-time systems based on COTS components
- Model based dynamic reconfiguration of complex critical systems
- Methods for early validation and evaluation of system designs

Later Sasi Punnekkat presented the current status of PROGRESS research with respect to dependability. The meeting was very interesting and important for finding out the common interests in research and will hopefully provide a basis for future collaboration.

Outcome

The discussions led to more common understanding of the goals, terminology and the concepts of the PROGRESS project. This, together with the individual roadmaps of each research direction was later refined to a common roadmap and the concept paper for PROGRESS.

Social Events

During this wee we also had some fun. The social events we participated in, include but are not strictly adherent to:

- Pisa-Viareggio 10k Run
- Joint dinners
- PROGRESS photo contest
 - o The winning photo:



Budget

Budget per person (approximate sum of 10 800 kr)

- flight: 2 500kr
- hotel: 3 000kr
- bus transfers 500kr
- allowance for expenses 8*600kr

Travel report

Visiting Scuola Superiore Sant'Anna in Pisa

Kaj Hänninen

Introduction

This report describes my visit to Scuola Superiore Sant'Anna in Pisa, Italy. I visited the real-time systems laboratory (ReTiS lab) in September 2007. The ReTiS lab is well known for their excellent research in design and analysis of real-time embedded systems. Since my research concerns design and analysis of real-time systems, I found it very interesting to visit the lab.



Pisa

Pisa is a city in Tuscany Italy, with a population of ~100.000 people. Pisa is well known for the bell tower also referred to as the leaning tower. Pisa is also known for being the birth place of Galileo Galilei, an important early physicist, mathematician, astronomer and philosopher.

Visit to ReTiS lab

Mr Lipari, associate professor and coordinator of ReTiS, welcomed us to SSSA. He showed us the lab and gave a general presentation of Scuola Superiore Sant'Anna. He also presented some research performed by the ReTiS group. The ReTiS lab have a prominent position in the area of real-time systems. The research at ReTiS addresses real-time scheduling, real-time operating systems, quality of service for real-time systems, data security and wireless sensor networks. The lab has been involved in many research project throughout the years, for example, the FRESCOR project (aiming at developing a framework with flexible scheduling techniques), RI-MACS (defining a manufacturing control open architecture), ART DECO, ARTIST2, etc. During my visit, I got the opportunity to listen to Mr.Lipari when he presented GRUB-PA, a resource reservation algorithm for power-aware scheduling of periodic and aperiodic real-time tasks. GRUB-PA is a scheduling algorithm based on a resource reservation technique. I also met Mr Gai whose research focus on development of hard real-time architectures. He gave an interesting presentation about a spin off company (Evidence) that he founded at the end of 2002. Evidence develops firmware for embedded real-time systems. The company also provides consulting and technical support for development of embedded devices. Mr Gai also talked about E.R.I.K.A, an embedded real-time kernel architecture. It was a very interesting since my research focus on adding support for different execution models in a commercial real-time operating system called RubusOS.

I really enjoyed the visit to the ReTiS lab. I met a lot of interesting people and got a better understanding of the research performed at ReTiS.

ARTES++ Travel report
Håkan Gustavsson & Peter Wallin, Mälardalen University
Anders Sandberg, KTH

Electronic Systems for vehicles

10-11 October 2007, Baden-Baden, Germany

In brief

The hottest topics of the conference were Flexray, Autosar and the environment. Many persons talked about how the new technology will change the roles of suppliers and OEMs, both how business and development is done.

The number of independent OEMs was predicted to be decreased to 9 in 2015 and in the same time the different segments in each brand will increase rapidly. The different segments for Volkswagen have increased from 9 in 1987 to 36 in 2007.

The fair

This is a large gathering of mainly men in dark blue suits. Some 1000-1500 visitors were present and the presentations took place in four different halls concurrently. At the same time there are four stories of exhibitions from the major and minor actors in the German auto-industry; Daimler, BMW, Audi, Skoda, its main Tier 1 suppliers, Bosch; Delphi; and many large and small development tool vendors, Telelogic; Mathworks; dSpace; National Instruments; Vector; TTTech.

It was very well organised and for the main part the presentations, even if the speaker was speaking German, was translated to English through earphones. The proceedings were only available in the language of the presentation though.

Observed trends

There is a clear trend of standardisation and co-operation, not just Autosar, but also CE4A (<http://www.ce4a.de/>), HIS (<http://www.automotive-his.de/>) and AESAS (<http://www.aesas.de/>).

There was a large environmental focus, everybody is working hard on the issue and moving more into details. Examples of such are how Bosch together with Blaupunkt presented a new type of navigation optimized for the environment with an additional 'green route' option. This would give the user a chance to choose from fastest, shortest and most environmental friendly route. In a keynote by Volkswagen it was presented how the user must be informed about that also electrical energy increases the emissions. This was shown with an example showing how a 100W audio system increases the CO₂ emissions with 2g/km (100W=12V x 8A -> 0,1L/100km -> 2g/km CO₂). Electric Power steering (ZF) and tire pressure monitoring system (Wabco) are examples of features that were presented with a more environmental angle.

The architecture tools for analysis are becoming more and more mature. Many suppliers (see references) showed examples of tools and some OEMs also presented active usage (BMW, Mercedes, MAN etc.). On this aspect GM spoke of reducing the number of global vehicle platforms to 6, by for example trying to

separate electronics from presentation. One choice to increase flexibility and still add volume was to make the radio free from user interface, which enables the same radio to be used in all vehicles.

One main topic was driver support systems development with many presentations on applications but also on development support frameworks, Audi; BMW. Having these frameworks supports application development by making bench testing and rapid prototyping tests in real vehicles of the same function seamless. They also supported logging of sensor data and replay of logged sensor data through a function. One of the supporting ideas behind this was to standardize the interfaces of a function within the OEM, without this effort the seamless operation is virtually impossible.

References on the topic

Vehicle architectures

<http://www.chevrolet.com/electriccar/>

Architecture tools:

http://www.aquintos.info/de/produkte/preevision_architekturbewertung.php

<http://www.mentor.com/solutions/automotive/>

<http://www.pacelab.de/>

<http://www.symtavision.com/symtas-architect.html>

Autosar articles in english:

<http://www.elektroniknet.de/home/automotive/autosar/english/>

Next conference www.fisita2008.com

Travel Report from RTCSA 2007

Johan Fredriksson
Department of Computer Science and Engineering
Mälardalen University
johan.fredriksson@mdh.se
15th Oct 2007

RTCSA is one of the leading conference that is usually held in Asia; hence, the 13th instance of this conference was held in the city of Daegu in South Korea. Thanks to competitiveness of this years version if the conference the quality of the presented papers was quite high. The conference was a three day event with three parallel sessions with 20 papers in each session. The three sessions were focused on real-time, ubiquitous computing and embedded systems. I attended most of the real-time track but also attended a few presentations in the other tracks. The papers in the real-time track was a rich mix between among others, resource sharing, the mandatory scheduling, multi-processor and multi-core issues, and finally a database session.

The conference was well organized with a very spiritual keynote held by Prof. C.L Liu talking about the conceptual size reduction of the earth. The keynote was ended with a joint singing session where Prof. Liu urged the audience to join him in a song regarding that we live in a small world :-)

The second keynote was given during the banquet by one of the CTOs of consumer electronics in Samsung. This keynote was mostly about future use of media applications.

THIS years version of RTCSA was very special for my part since my paper "Contract-Based Reusable Worst-Case Execution Time Estimates" was chosen for the best paper award in the real-time track. I was the first presenter in the real-time track during the first day of the conference. I received interesting questions and good feedback on the presentation. In the following days I could relax and only to the other presentations.

The most interesting part of the conference was, as usually, to meet and talk to fellow researchers. I met several fellow researchers from previous conferences, with whom I continued some rather interesting discussions. That is one of the very rewarding parts of returning to the same conferences and joining the same people. Of course it was also very special to receive the best paper award plaque during the conference banquet.

THE trip to Daegu started at 12am from Arlanda, via Frankfurt where we changed planes to a Lufthansa Airbus that was going to take me and a colleague I travelled with all the way to Seoul. When we arrived in Seoul we went with a bus for one hour to the Seoul train station, from where we took the 300km/h bullet-train to Daegu. Finally at 5pm local time (10am Swedish time) we arrived in the hotel in Daegu. The first evening in Daegu we spent

down-town trying to find a nice place to eat. After a few hours of walking we finally found a really nice small Korean style fish restaurant, shown in figure 1. Overall the food during the trip was excellent, ranging from raw meat and fish to exotic vegetables and fruits.

In the last day of the conference we joined a tour to a preserved Korean village. At the village we experienced traditional paper-making and soju-making. Soju is a very strong type of wheat-rice spirit. All participants of the tour got to make their own sheet of paper, and got to try some Soju.

The overall stay in Korea was very nice and very different from what I am used to. The people, the culture, the food and the cities is everything but European; but in a nice way. People are very friendly and constantly try to help. The food is quite spicy and it is common to share the food among several people, meaning that several people are eating from the same plate - also quite uncommon in Europe. All these things together with a well organized and interesting conference made our stay very exciting.



Figure 1. Korean traditional style fish restaurant.

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<http://www.syntavision.com/syntas-architect.html>

Autosar articles in english:

<http://www.elektroniknet.de/home/automotive/autosar/english/>

Next conference www.fisita2008.com

Visit to:
Center for Multisource Information Fusion /
International Conference on Scalable Uncertainty
Management

ALEXANDER KARLSSON
University of Skövde
School of Humanities and Informatics

`alexander.karlsson@his.se`

November 15, 2007

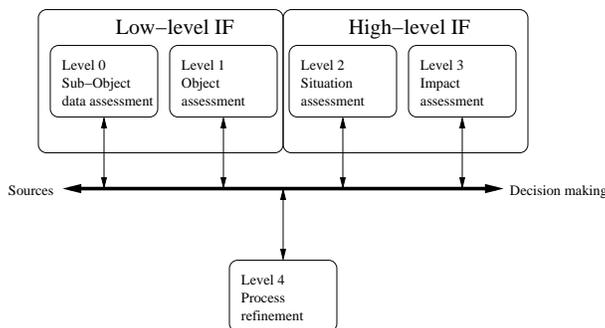


Figure 1: The revised JDL model, adapted from [6]

1 Center for Multisource Information Fusion

Center for Multisource Information Fusion (CMIF), located in the state of New York at University at Buffalo, is one of the leading research centers within the information fusion (IF) community, with well-known and renowned researchers in the field.

1.1 Information fusion

IF has mainly been a research field tightly coupled to defense applications, however, in recent years researchers in other fields, e.g., *manufacturing* and *precision agriculture*, have started to recognize the potential benefits of IF. IF can be depicted as follows [3]:

“Information fusion encompasses the theory, techniques, and tools conceived and employed for exploiting the synergy in the information acquired from multiple sources (sensor, databases, information gathered by human, etc.) such that the resulting decision or action is in some sense better (qualitatively and quantitatively, in terms of accuracy, robustness and etc.) than would be possible, if these sources were used individually without such synergy exploitation.”

A “...decision or action...” is most often related with *uncertainty*, thus *uncertainty management* is crucial to IF. Most often the decision or action must be taken within a specific period of time, thus, methods for uncertainty management need to be able to meet certain time constraints. There is a well-known model for the research field IF which is denoted as the *JDL* model [5] (see Figure 1). One usually refers to Level 0, 1 as *Low-level IF*, where *Kalman filtering* is a common method [4], and Level 2, 3 as *High-level IF*, where *Bayesian networks* are often utilized [2].

1.2 Researchers I met

I met a number of researchers with whom I discussed IF-topics of common interest, e.g., *high-level information fusion*, *uncertainty management*, and *imprecise probability*.

1.2.1 Professor James Llinas, Executive Director CMIF

Professor James Llinas is one of the front figures in the IF domain and was the first president of the International Society of Information Fusion [1]. He is one of the editor's of the well-known "Handbook of Multisensor Data Fusion".

I had interesting discussions with Professor Llinas where we primarily discussed the concept of *imprecise probability* and its relation to *decision effectiveness*. Imprecise probabilities is a family of theories that uses a set of distributions for representing uncertainty and information related to that uncertainty.

1.2.2 Dr. Galina Rogova

Dr. Rogova is a well-known researcher in the fusion community who has several published papers about *high-level IF* and *decision making*. We had a meeting where we discussed *high-level uncertainty*, i.e., uncertainty about uncertainty. Basically such uncertainty concerns how reliable an estimate of something of interest is.

1.2.3 Dr. Kedar Sambhoos

Dr. Sambhoos is a research scientist at CMIF who has been involved in a number of different projects there. Amongst other things, Dr. Sambhoos has performed research about high-level uncertainty, high-level IF, and performance of IF systems. We discussed the notion and interpretation of high-level uncertainty and we talked about maybe writing a joint paper about this topic in the future.

1.2.4 Alan Steinberg

I met Dr. Steinberg during a dinner. We had a short discussion about high-level IF. Dr. Steinberg has written a chapter about high-level IF, which will appear in the new edition of the "Handbook of Multisensor Data Fusion".

2 International Conference on Scalable Uncertainty Management

I attended a conference on *Scalable Uncertainty Management* which was held at the University of Maryland, October 10-12. This was the first time the conference was held and intended to bridge the gap of research between databases and uncertainty management.

2.1 Reflection

The conference covered a range of different topics, e.g., inconsistency management in databases, information retrieval, description logics, probabilistic databases, and probabilistic logic programs, however, from my perspective it seems like the *uncertainty management* part was somewhat neglected in many of these presentations. It would have been interesting to see contributions with a more elaborate view on uncertainty management. Some of the interesting presentations, from my point of view, had also been cancelled. My overall impression of this conference is that it was primarily aimed at database researchers and that the conference felt a little bit unfocused maybe due to that it was the first time it was held.

3 Conclusions

The visit was very inspiring for me and I met several researchers with interesting ideas about imprecise probability and high-level information fusion. The conference *Scalable Uncertainty Management* was a little bit of disappointment, since I expected it to include more about uncertainty management.

Acknowledgement

I wish to thank ARTES for the grant that made this visit possible. I would also like to thank my primary supervisor Dr. Ronnie Johansson and main supervisor Sten F. Andler. Lastly, thanks to Professor James Llinas for such great hosting during the visit.

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ARTES++ Travel Report from IECON'07

Peng Cheng
Department of Information Technology and Media
Mid Sweden University, Sweden

IECON'07

IECON'07 was held in The Grand Hotel, Taipei, Taiwan from 5th to 8th of November 2007, and was the 33rd annual conference of the IEEE industrial electronic society. It was an international conference of industrial applications of electronics, control, robotics, signal processing, computational and artificial intelligence, sensors and actuators, instrumentation electronics, computer networks, internet and multimedia technologies. The objectives of the conference were to provide high quality research and professional interactions for the advancement of science, technology, and fellowship. The conference was rather big in paper contributions where approximately 650 papers were accepted for the final program. Because of that, the topics for the presented papers were spread among different research areas. Some of the conference main topics included:

- Control Systems & Applications
- Electrical Machines & Drives
- Power Electronics
- Sensors, Actuators and Systems Integration
- Signal & Image Processing
- Industrial Informatics
- Intelligent Robotics
- Hands-on Intelligent Mechatronics and Automation

Contribution

My contribution to the conference was a full paper titled *Joint Angular Sensor Based on Distributed Biaxial MEMS Accelerometers*. The paper was presented during one of the 20 minutes oral presentation sessions.

The conference gave me opportunity to meet other researchers in my field, and discuss shared research problems.



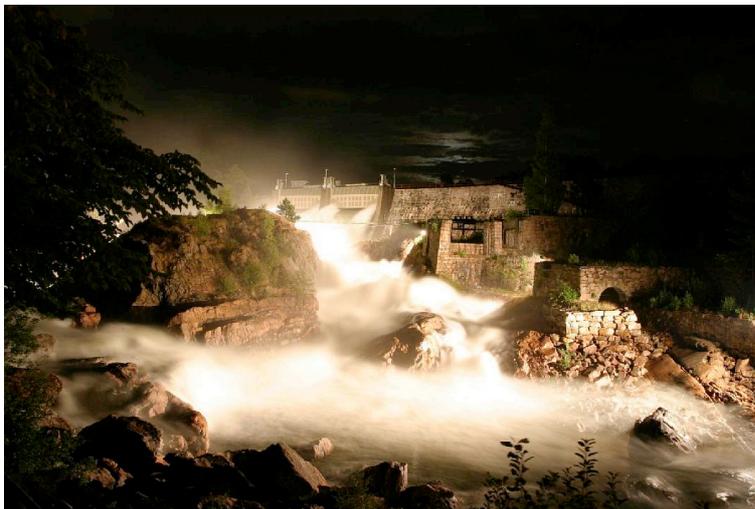
ARTES++ Travel Report to ISSRE 2007

The 18th International Symposium on
Software Reliability Engineering,
November 5-9th 2007

Carl Bergenhem
November 20th, 2007

1 ISSRE

ISSRE focuses on the theory and practice of Software Reliability Engineering. The conference scope includes techniques and practices to (1) verify and validate software, (2) estimate and predict its dependability, and (3) make it more tolerant/robust to faults. The conference has grown steadily, attracting about 200 participants on a regular basis and is big enough to represent major topics in software reliability engineering, but small enough to provide an in-depth representation of theory or practice in these areas. Industry participation has also increased over time, leading to a healthy mixture of theory and practice.



Fabulous Trollhättan Water Falls by Night

2 Thoughts

There were several keynote speeches, among others by Martin Nilsson, Volvo Cars. The subject was: “Efficient system verification using model based techniques for a heterogeneous distributed real-time system”. The message was that there is an increased need for research in this area. Here are some facts from the talk:

- Of the 60 computing nodes that are used in high-end cars, roughly 5 nodes contain software which is mostly model based. This implies the software is build with tools such as simulink or SCADE as opposed to being hand-coded.
- Roughly 30% of all software in a (Volvo) vehicle is related to diagnostics. Even so my impression is that industry is far behind research here. Mr. Nilsson gave the impression that the diagnostics strategy is still rather ad hoc and an add-on to nodes rather than being an intrinsic part of the architecture. New technology such as time-triggered busses and AutoSAR will hopefully bring this area forward.
- Tools for the different stages of development play an increasingly important role. An example is tools for configuration management of different variants of software to be placed in a vehicle with a specific market requirement.

- If the (Volvo) vehicle detects a failure in its system, it will degrade its functionality, e.g. by restricting top speed, and still enable the driver to safely get it to a workshop.

I also had the opportunity to speak to some people at the conference about various research issues. These persons also held fine presentations of their area. In System Reliability Engineering at Alcatel-Lucent in Canada, they consider the “five 9s” or 10^{-5} to be industry standard of reliability. This may be enough for telecom, but in not so for dependable systems where 10^{-9} .or better is adopted. Thus other methods are needed.

I discussed a method called capture-recapture which is used in software inspections for estimating the number of faults not found after the inspection. This subject was previously unknown to me but definitely interesting. A thought that occurred was how to put the good ideas to use in an industrial setting. This could leverage the knowledge and usefulness of companies which do third-party inspection (often mandated by embedded systems standards) of software in e.g. critical systems.

Despite being a conference of software reliability engineering (even in the title of the conference), there was a lack of papers using or on the subject of formal methods. This was slightly odd since it is a common subject at other conferences on reliability.

Together, the above reasons made the visit to ISSRE successful, even though I did not present a paper myself. Many thanks to ARTES for giving the grant for the trip!

Travel Report from Visiting UT Arlington

Qinghua Wang

Department of Information Technology and Media
Mid Sweden University, Sundsvall, SE 85170, Sweden

Qinghua.wang@miun.se

Dec. 4, 2007

1. Introduction

I spent the whole November of this year at University of Texas at Arlington (UTA) as a visiting researcher. I mainly worked with a research group called iSec at the department of computer science and engineering, and also had some wonderful discussion with another research group called CReWMaN, which was in the same department. This trip was financially supported by ARTES.

2. Motivation

My current research interest is wireless sensor network (WSN), with a particular interest in solving security problems for WSN. The university I visited has a huge amount of people engaged in wireless sensor network research. Thus, I could get a good expertise by having discussions with experts there.

3. Research Experience

A good example about the things I learned was the importance of attack model (i.e., an infinite set of all possible attacks defined based on the assumptions of the attackers' ability) in security research. I already got used to focusing providing security solutions for a single type of attack, as it was usual the case in Internet security research. But experts in WSN said you should always provide a well-defined attack model, before any solution is given. Otherwise your paper won't get published.

Another expertise was about the intrusion detection methodology in WSN. Before I went to UTA, I got confused why there are so few people involved in providing intrusion detection system in WSN compared to its counterpart in Internet. The answer given by UTA experts was "Because it's so difficult to convince people using an intrusion detection methodology in WSN". Why it's so difficult? People interested in this can also visit UTA or simply drop in me (since I understand this question now) for the explanation.

4. Culture Experience

America is a really serious country. That's my first feeling about this new continent. Why was I asked so many questions on the custom place? There was no way I looked like a terrorist!

America is a really "colorful" country. That's my second feeling about America, because there are so many different face-looking people on its domestic flights and on its roadsides.

Oh. I was back in China again. That's my third feeling about America. I bought foods in Taipei or Hong Kong market. There were so many Asian foods. For most of them, I cannot buy in Stockholm's Chinese store. I ate in different Chinese restaurants. There were three Chinese

restaurants around my living place. All were managed by Taiwanese. On the campus, there were so many Chinese students who did not know each other. Almost one third of the faculties and PhD students in the department of computer science and engineering were Chinese, with another big portion coming from other countries like India, Korea. Even the refectory on the campus was mainly serving Chinese food, with a very Chinese name called Panda House. Of course, Sandwich and Pizza were also very popular.

5. Summary

Generally, it was a wonderful experience. Thanks ARTES for its generous support. Finally, I would like to share some pictures taken at USA.



Fig. 1 Visting UTA



Fig. 2 My working place

ARTES Travel Report – APLAS 2007

Viktor Leijon (leijon@csee.ltu.se)

December 17, 2007

I attended the *Fifth ASIAN Symposium on Programming Languages and Systems* (APLAS) 2007. It took place in Singapore from the 29th of November to the 1st of December 2007. The program is available at <http://www.comp.nus.edu.sg/~aplas07/program.html>.

The conference provides a very high quality forum for the programming language community, with a focus on the underlying theories and principles.

One very interesting talk was the invited talk by Sriram Rajamani from Microsoft Research titled "Static and Dynamic Analysis : Better Together" which discussed the combination of test case generation tools and static verification (in the form of the Microsoft SLAM software model checker) to be able to perform faster and more efficient verification of software properties. Their focus is on untimed systems, which means that while they can check for temporal ordering of events it cannot check for general time properties. But undoubtedly timed properties could be added to the system, if that was desired. In general all three invited speakers gave very good overviews of their areas.

When it comes to the research that comes closest to mine, which more directly applies to real-time programming, the most interesting contribution was *Timed, Distributed, Probabilistic, Typed Processes* by Martin Berger and Nobuko Yoshida. They introduce a typing discipline extending the linear type discipline to distributed timed processes, something that assures certain kinds of safety for the distributed timed processes.

I was very happy with the conference, even if I was more afflicted by jet-lag than I usually am, so I had to limit my social activities in favor of the scientific program. Singapore is a great country to visit though, with warm weather and good food. I would definitely go to APLAS again if I get the chance, and the same goes for Singapore.

ARTES++ Travel Report: ACM SenSys 2007 and a research visit to CSIRO

Australia, November 2007

Summary

In November 2007, I attended the prestigious wireless sensor networking conference ACM SenSys 2007 in Sydney, Australia. After the conference I had the pleasure of visiting the Australian research institute CSIRO for a few weeks. The trip was partly funded by ARTES++.

This travel report summarizes the major events of the trip, as well as my personal reflections.

Fredrik Österlind

ARTES++ student

Swedish Institute of Computer Science

December 2007

ACM SenSys 2007

SenSys is a highly selective, single-track conference in the area of networked embedded systems and wireless sensor networks. The conference is widely regarded as one of the top conferences in the area. This year the conference was in Sydney, Australia, and 25 papers out of 149 final submissions were accepted.

Apart from listening and learning from interesting and state-of-the-art paper presentations, the purpose of attending the conference this year was three-fold. I attended the Doctoral Colloquium (DC), where PhD students present and get their research topics evaluated by a panel of experts within the research area. For me, the feedback obtained by attending the DC this year was very helpful. The second purpose was presenting our demo on our On-line Energy Estimation approach in Contiki OS. The demo attracted lots of people, and definitely demonstrated the benefits of our approach. The final and main purpose of attending SenSys 2007 was presenting our paper: *“An adaptive communication architecture for wireless sensor networks”*.

In summary, the conference was very good. I learned a lot but, perhaps most importantly, I met and discussed research ideas with some of the leading researchers in the area.



Conference dinner view: Sydney CBD including the famous opera house

CSIRO and QCAT

Commonwealth Scientific and Industrial Research Organization (CSIRO) is Australia's national science agency. CSIRO has more than 6500 staff at 56 sites in and outside Australia. I visited Queensland Center for Advanced Technologies (QCAT), located in Brisbane, for 3 weeks. The purpose of the visit was to increase the research collaboration between their sensor networking group and my group at SICS. More specifically, I had two major outputs during my stay. Firstly, I ported our sensor networking operating system Contiki to CSIRO's hardware platform FLECK. The research group is currently performing more extensive evaluations before deciding whether to start using Contiki as their main sensor networking OS. Secondly, I developed and evaluated a new reliable bulk transport protocol for use in sensor networks. We expect to submit a conference paper on the topic within soon.

Final remarks

Visiting other research groups is very beneficial. Not only did I make new friends and valuable contacts, but the experience of working in another research group (if only for a few weeks) did broaden my understanding of the research performed in this area as well as research in general. The fact that the location happened to be Australia was of course also nice: November is one of their hottest months (28 degrees C in the sea!) so off-work activities included both surfing and diving.

ARTES Travel Report
**Visit to Computer Architecture Group (LRA) at
Albert-Ludwigs-Universität of Freiburg**

November-December 2007

Viacheslav Izosimov
IDA/SaS/ESLAB, Linköpings Universitet
E-mail: viaiz@ida.liu.se

During the period from 21st November to 5th of December, I was visiting Dr. Ilia Polian and Prof. Bernd Becker from the Computer Architecture group at Albert-Ludwigs-Universität of Freiburg. The purpose of my visit was to establish research cooperation with the group, formulate joined research problems, and present my research.

About LRA and Albert-Ludwigs-Universität of Freiburg

The Computer Architecture group is called Lehrstuhl für Rechnerarchitektur (LRA) in German. Previously, they used to be called Institut für Rechnerarchitektur or “IRA”, which is a little bit provocative. Their topics of research are model checking and verification, computer-aided design, testing techniques, some theoretical computer science problems, online real-time scheduling and many others. The head of the group is Prof. Bernd Becker.

Albert-Ludwigs-Universität of Freiburg is one of the oldest universities in Germany (dating to spring of early 1455), currently known the most for its medical school, research in biology, and nanotechnology (physics). Their computer science and electrical engineering departments are also well-established. The number of students in total is around 22.000 with many campuses distributed over the city of Freiburg, ranging from sociology and history to medical school (university hospital) and computer science.

Possible Joined Research Problems

Initially, the topic of cooperation was formulated as “I will digest error-detection techniques and will try to incorporate them into my scheduling and design optimization frameworks”. During many discussions with Ilia, we have formulated and elaborated the following problem formulations:

1. Hardening of functional units in software/hardware co-design;
2. MPSoC (Multi-Processor System-on-Chip) hardening;
3. Integrating testing into static scheduling to increase quality-of-service;
4. Integrating testing into static scheduling to reduce power consumption.

Hopefully, many of these problems will result in conference and journal publications in the field of real-time embedded systems and low-cost fault tolerance against transient and intermittent faults.

Feedback to My Research

During my visit, I gave a talk based on my licentiate thesis “Scheduling and Optimization of Fault-Tolerant Embedded Systems” and my recent research on fault tolerance for soft real-time embedded systems. The talk was appreciated and several questions were discussed afterwards. Possibly, some of my techniques will be incorporated into LRA’s work on online real-time scheduling and computer-aided design.

Social Activities

Although the weather in Freiburg was not perfect, mostly raining, during that time, I was exploring the city, which is very beautiful, especially the cathedral in the middle of the city and small shopping streets. The Christmas atmosphere was already there with the Christmas market and illuminating city lights. During one of the weekends, I went to the winter opening of “EuropaPark” – the famous Deutschland Disneyland with a lot of exciting attractions represented cultural differences in Europe, including Viking Land, Russia and Switzerland. I was also in Baden-Baden, which is a very interesting city with famous thermal aqua parks, such as “Caracalla Therme” and “Friedrichsbad”. The ultraviolet-light bath, mineral water swimming pools, and various saunas helped me to recover from the Swedish late-autumn sadness.

Summary

Despite the short duration, my visit was very productive with formulating several real-time research problems, which will result in conference and journal publications. I have learnt about the work that researchers in LRA had been doing on computer-aided design and testing. I have also presented my real-time research and received a positive feedback.

20 dec 2007

Industrimöte Trollhättan, Volv Areo

Introduktion

Volvo Aero är en tillverkare av flygmotorer samt detaljer till flyg- och rymdindustrin. Företaget samarbetar med de stora flygmotortillverkarna Rolls-Royce, Pratt & Whitney och General Electric. Man tillverkar även delar till de raketmotorer som används på ESAs Ariane 5-raket.

Bakgrund

Företaget befinner sig nu i en fas där produktionsvolymerna blir allt mer prioriterade och har därför blivit tvungna att i större grad satsa på automatisering av sina produktionslinor. I och med detta har dom insett att graden av automatisk övervakning av produktionsmaskiner och förlopp måste ökas.

Möte

Vi (Peter Funk och Erik Olsson) träffade sex personer från Volvo Aero och diskuterade ett framtida samarbete angående erfarenhetsåteranvändning inom produktion i Volvo Aeros produktionslinjer. Volvo Aero och vi drog några korta presentationer för varandra och vi fann flera upplägg för framtida samarbeten. Volvo Aero var främst intresserade av vad vår forskning inom tillståndsbaserat underhåll av industrimaskiner och vår erfarenhet och kunskap att kombinera fallbaserat resonerande (CBR) och sensordata för effektiv produktionsfeedback och processkontroll.

Fortsättning

Fler möten planeras efter nyår och vi ser fram emot ett givande samarbete! Volvo Area är "comittade" och kommer driva processen att få till stånd samarbete så att finansiering säkerställs då de ser stora ekonomisk potential i vår forskning, ett fel i tillverkningen hos dem kan kosta miljoner.

Erik och Peter

ARTES++ Travel Report to PRDC 2007

The 13th IEEE Pacific Rim International Symposium on
Dependable Computing (PRDC'07)
7-19 December, 2007, Melbourne, Australia.

Carl Bergenhem
January 7th, 2008

1 PRDC

PRDC 2007 is the thirteenth in this series of symposia started in 1989 that are devoted to dependable and fault tolerant computing. PRDC is now recognized as the main regular event of the Pacific area that is covering the many dimensions of dependability and fault tolerance, encompassing fundamental theoretical approaches, practical experimental projects, and commercial components and systems. As applications of computing systems have permeated in every aspects of daily life, the dependability of computing system has become increasingly critical. This symposium provides a forum for countries around the Pacific Rim and other areas of the world to exchange ideas for improving the dependability of computing systems. This years conference accepted around 30 full papers out of 100 submissions.

The symposium is returning to Melbourne in 2007 and will be held in one of the centrally located inner city hotels. Melbourne is a vibrant cosmopolitan city that has frequently been awarded one of the world's most "liveable" cities. Melbourne offers an excellent location for this Symposium with numerous local arts, cultural, architectural and sporting attractions. It also provides an excellent hub for many of the tourist attractions throughout Victoria and Australia.



Melbourne Central Business District,
close to the Yarra River

2 Thoughts

My presentation was alright and I received questions afterwards and valuable comments. As observed before, research into the membership problem differs depending on whether a synchronous or asynchronous system is targeted. The problems associated with each, target application and uses are largely different.

Several interesting keynote speeches were also held. Among others Paulo Verissimo held a keynote titled: "Computers meet the real world - Challenge of architecting dependable and secure CII (Critical Information Infrastructure)". Critical infrastructure is for example gas fired furnace water works, electricity generation. All of these types of utilities are commonly geographically distributed and sites are interconnected via both internal corporate networks but also the Internet. Because of the distributed nature and not least that communication over the Internet is used, there are a number of threats.

There are several real examples of incidents.

*2003: Ohio, USA. Slammer worm causes shut-down of monitoring system of nuclear plant. The plant firewall prevented worm, but it penetrated the supplier network and then plant through backdoor network. Worm propagated to SCADA network, then overload control-network. Could have caused a serious incident.

*2002: Australia. An angry ex-employee at a sewage management plant remotely caused a control system disruption which lead to raw sewage being disposed into nearby river. This was possible despite hardwired logic - safety interlocks in the control system.

The road to CII security is taking a new approach. Securing individual component is not solution. It must be possible to build secure systems of out of insecure embedded components. No system can be completely free from intrusions, rather it must be made to be Intrusion tolerance – i.e. enough resources to meet the safety goal, despite attacks. Replicas of infrastructure components, e.g. distributed voting firewalls will be attacked but must also have recovery mechanism.

More information on this can be found in the EU FP6 project CRUTIAL.

The visit to the conference; to participate and contribute with a presentation of my paper was a success. It is inspiring to talk to other people and get new influences and ideas for new approaches to the research at hand. Many thanks to ARTES for giving the grant for the trip!

ARTES++ Travel Report to PRDC'07

The 13th IEEE Pacific Rim Symposium on Dependable Computing

Raul Barbosa

March 20, 2008

1 Introduction

The 2007 edition of PRDC was the thirteenth symposium in this series dedicated to the field of dependable and fault-tolerant computing. The symposium was organized by Deakin University, Melbourne, Australia.

2 Conference Impressions

As a conference which aims to establish itself as the main regular event in the Pacific area covering the field of dependability and fault tolerance, PRDC attracts a very broad spectrum of scientists from all over the world. The accepted papers encompassed distributed algorithms, dependable networks and security; the research approaches were also broad in the sense that both theoretical analysis and benchmarking/measurement could be found in those papers.

The keynote speeches – by Prof. William Sanders and Prof. Paulo Veríssimo – targeted mostly computer security. Though the conference focuses mainly on dependability, the two fields are very interdependent. A system must be secure to be dependable and a system must be dependable to be secure. In fact, the two keynote sessions were particularly interesting because both speakers have a background on dependable computing.

As usual in PRDC, there were two parallel tracks for the paper presentations. The track on dependable networks focused on large-scale systems (*e.g.*, the Internet) and mobile environments. The concerns with the dependability of these communication networks are increasing due to the fact that users now rely on them to transfer sensitive information. Several presentations discussed wireless networks and the challenges involved in making them robust and fault-tolerant.

I also found the distributed systems track good to attend. The presentations focused on diverse topics, ranging from intrusion detection/tolerance to distributed real-time

scheduling. The common theme was how to address the many threats to dependability arising in distributed systems. My presentation took place in this track. It was, as usual, extremely gratifying to hold the presentation and answer the questions from the audience, which will definitely help in the development of future work in this area.

3 Accommodation and Surroundings

I was accommodated at the Rydges Melbourne, where the conference took place. Melbourne is well known for the quality of life and for being the sports capital of Australia. The good weather allowed everyone to enjoy nice walks around the city's skyline, which is crowded with tall buildings. During the days that followed the conference I had also the opportunity to travel south, along the Great Ocean Road, and to visit many other interesting places. Definitely worth the visit.

ARTES++ Travel Report to RTAS'07

Andreas Hjertström

Mälardalen Real-Time Research Centre, Västerås, Sweden

andreas.hjertstrom@mdh.se

Introduction

14th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) conference had about 80 participants this year and was held in Seattle, USA. Several interesting workshops and tutorials were arranged. The range of the conference is very wide and includes almost all topics within the area. CORE AREA: Real-time and Embedded Systems. Other areas were development, Verification, and Debug Tools for Real-Time and Embedded Systems, Real-Time and Embedded Applications/Benchmarks, Embedded Systems Hardware/Software Interaction/Co-Design. There was special track for work in progress (WiP).

Contribution

I presented a paper (my first) at the WiP session called

INCENSE: Information-Centric Run-Time Support for Component-Based Embedded Real-Time Systems

The session was as General Chair: Steve Goddard, University of Nebraska, Steve Liu, Texas A&M University said, the most important session with a look into the future.

Wrapping it all up

We had a nice time in Seattle and can recommend RTAS as a really good conference. It suits everyone within the real-time area since they have a wide range of topics and a high quality of papers. Seattle is quite close to the Canadian border with wonderful nature surrounding the city. We visited Microsoft's head office and were allowed to do some shopping for employee discount, which was very nice. We also made an interesting trip to Boeing factory with its enormous building, the largest in the world and a trip to a volcano. I'm sorry to say that we never saw the volcano once we got there due to bad weather.

Ps: According to my supervisor it was the first time ever that they served beer during WiP session presentations =)

Travel Report:

Two-day visit at Department of Computer Science and Technology, School of Computer Science and Engineering at Beihang University (BUAA)

Beijing, China

Yue Lu

Department of Innovation, Design and Product Development (IDT)

Mälardalen University

yue.lu@mdh.se

1. Motivation

In the summer of 2007, I was given the chance of joining **ARTIST2 / UNU-IIST** summer school at Suzhou, China. At that moment, I met some friends from the department of Computer Science and Technology, school of Computer Science and Engineering at Beihang University (BUAA) and there were some interesting talks among us. At the end of the summer school, they asked me if there would be an opportunity for my short-term visit comes up in the near future. Thereby, I planned this two-day visit trip as the late response to them. As the time was quite short, i.e. only two days, the aims of the trip were to contact one of the best Computer Science and Technology department in Chinese academic field in the first step, which includes presenting the research activities in my group that are mainly concerning on the timing analysis in maintenance of complex embedded system to the staffs at the Dep., have a look at what they are doing, and explore the possibility of having further communications, for instance a formal visit to them with more colleague(s) from my group, then start some kinds of collaborations in the future.

2. Research

The school of Computer Science and Engineering at Beihang University holds the 3rd place in the rank of the best institutions in Computer Science and Technology era in China. There are five sub-units, Department of Computer Science and Technology, Department of Computer Application Engineering, Department of New Media Art, Computer Teaching Experiment Center, Software Engineering Institute (SEI), and Network Research Center. Within the school, there are many collaborations with the industries, e.g. Microsoft Research Asia (MSRA), IBM, Lenovo China, Nokia-Beihang Series60 united lab, Joint Network Lab & Network School with Hua Wei Company, and many international visits from University of Cambridge, Nebraska University, USA etc. The place that I visited is Computer Science and technology department, of which part of the research is embedded real-time system and distributed system.

3. Environment

BUAA locates in Beijing which is the capital of the country as you may know. Beijing is a big city with the huge population, i.e. more than 17 millions from the 2007 June Population by-census. In this city, you can of course find out quite lots of different styles of foodies. One of my favourites is sushi, which I am most living on, an amazing Japanese food with a great price-performance ratio in Beijing.



As the 2008 Summer Olympic Games, which is from 8th Aug 2008 to 24th Aug 2008, is approaching, the city is changing every day in order to be ready for the Olympics and the life there is encouraging.

4. Results

During my visit, I had a presentation about our research works in the group, e.g. timing analysis in maintenance of complex embedded systems including model extraction, model validation and model analysis, the existing results from the above research activities, relevant papers accepted and future plans. Mr. Yang, Zhibin, a PhD student at the department of Computer Science and Technology, also introduced his research work on using AADL (An Architecture Analysis & Design Language for Developing Embedded Real-Time Systems) for analysis of complex embedded real-time system; For instance, what is AADL, why to use AADL (due to the complexity of formal methods in his application), what are the drawbacks of AADL, AADL behaviour annex, and his future research plan about AADL complex component composition. From his presentation, it showed that he had many discussions with the people from IRIT, Université Paul Sabatier where is the main contributor to AADL, and now he is formulating the research topic in more detailed level. What is more, I also had a guided tour at the university, e.g. visit to weight lifting gymnasium for 2008 Olympics games and its featured biggest office building in China which is shown as follows.



5. Conclusions

The two-day visit to the department of Computer Science and Technology at BUAA has been very useful for me since not only both of us had a better understanding about each other's research topic, but also I can see the chance of some further activities, e.g. further visit to the department at BUAA in the higher level (professor level) this coming summer, and the possibility of developing some collaborations.

The cost of the trip with all the practical issues involved has been well spent according to my plan.

Last but not least, I am very grateful for this kind support by ARTES, and become a witness of her successful "ringing down the curtain".

Travel Report: Internship at Google.

Martin Thuresson martin@ce.chalmers.se

At the end of 2007, I spend 12 weeks as an intern at the platforms team in Google, Mountain View, CA, USA. I was happy to escape the cold weather in Sweden and in early September I set my foot for the first time in North America.

Why internship?

I was introduced to Google and their internship program by a colleague of mine and once I had applied I was soon contacted by a recruiter. After a series of steps we found a location that suited my background and interests. There were several factors that made me apply for an internship. It is a great way to increase my professional network and find out how working in the United States in general, but also at a company with such ambitious goals.

Impressions and practical issues

Since it was my first visit to America, I did not know what to expect. California is very multicultural, and I found people to be very friendly and helpful. I lived in Mountain View, but I tried to visit the neighboring areas when I had the opportunity. Unfortunately not everything is accessible with public transport and since I do not have a drivers license, I had a somewhat smaller selection of things to see and do. The weather around San Francisco is very pleasant, even during the winter months. Most of the times I did not even need a jacket, though nighttime was often cold, sometimes even below zero degrees. Since many houses in California were not built for cold weather, I had to wear lots of clothes to stay warm at night.

Google have lots of experience with hosting interns. We were treated very well and I felt that I could really contribute. It was also nice to spend time with other interns who were in the same situation like me. This way we could help each other with practical issues or social events. I also had the opportunity to present my research and get feedback from an industrial perspective.

Martin Thuresson, martin@ce.chalmers.se

Reports by ARTES Real-Time Graduate students from Conferences and Industry visits 2006

Travel reports by Real-Time graduate students

- Johan Lindhult reports from The International Workshop on Compilers for Parallel Computers (CPC).
- Martin Kero reports from POPL (Principles Of Programming Languages), SPACE (Semantics, Program Analysis and Computing Environments for memory management) and PEPM (Partial Evaluation and Program Manipulation), January 2006.
- Ewa Hansen reports from International Symposium on Wireless Pervasive Computing January 2006.
and from The Fifth Annual Mediterranean Ad Hoc Networking Workshop (Med-Hoc-Net 2006).
- Alexander Karlsson reports from "The 9th International Conference on Information Fusion, 2006" in Florence, Italy, 10-13 July 2006.
- Jerker Bengtsson reports from RTCSA06 "12th IEEE conference on Embedded Real-Time Computing Systems and Applications", 16th to 18th of August in Sydney, Australia.
- AnnMarie Ericsson reports from First international Workshop on Event-driven Architecture, Processing and Systems (EDA-PS 06), September 2006, Chicago.
- Christer Gerdman rapporterar från "Svenska Läkaresällskapets Riksstämman" Göteborg, 29 november - 1 december, 2006.
och från European Medical and Biological Engineering Conference (EMBEC 05)
- Viacheslav Izosimov reports from a visit to DTU and describe the "Paper Pipeline".
- Carl Bergenhem reports from "The 12th IEEE Pacific Rim Symposium on Dependable Computing".
- Raul Barbosa reports from "The 12th IEEE Pacific Rim Symposium on Dependable Computing".
- Moris Behnam reports from RTSS 2006 conference in Rio.
- Kaj Hänninen reports from RTSS 2006 conference in Rio.

Location: <http://www.artes.uu.se/mobility/reports/>

Industry visit reports by Real-Time graduate students

- Johan Lindhult visited Ericsson in Älvsjö 2006

Location: <http://www.artes.uu.se/mobility/industri/>

Travel Report from CPC'06

Johan Lindhult
Department of Computer Science and Electronics
Mälardalen University
johan.lindhult@mdh.se

The International Workshop on Compilers for Parallel Computers (CPC), is a series of workshops which covers all aspects of parallelism and optimizations; from embedded systems to large scale parallel systems and computational grids. This year, the workshop (CPC'06) was organized by the Computer Architecture Group of the University of A Coruña, Spain, and was held between the 9th and 11th of January (2006) in A Coruña.

A Coruña, also called "*a balcony overlooking the Atlantic*" is a town on the Atlantic seaside, located in the Northwest of Spain, and part of the Galicia community. Among things worth seeing in the city is the Tower of Hercules, a two thousand year old lighthouse that is still in use. A Coruña is not far (approximately 60 km) from Santiago de Compostela where, according to the legend, the holy relics of Saint James are kept in the cathedral. A guided visit to the cathedral, Fig. 1, was included in the workshop program.

I had no paper to present at this workshop, instead the purpose with my trip was to get to know the "parallel community" and see if any of the work presented could be of interest for my own research (which up til now has been in the area of programming language semantics).

Although I didn't find any of the presentations directly applicable on our own work there were a lot of interesting presentations and discussions; besides work on different hardware issues (such as cache prediction e.g.) there were presentations on subjects such as instruction scheduling, speculative parallelization, and loop transformations, to name a few.

A reflection I made is that there are a number of projects/research groups working on different aspects of concurrent execution of Java (something that is also emphasized by a special journal issue [1]), ranging from attempts to minimize the actual number of necessary locks in an application, to adapting an existing model (OpenMP) for parallel Java programming. My impression is that the interest for Java (i.e., for parallel execution of Java programs) is due to the fact that the language is explicitly multi-threaded.

A second observations is the usage of genetic algorithms in attempts to generate optimal executables (i.e., as optimal as possible).

A final remark is that there seems to be a lack of existing, suitable applications that can take full advantage of modern, parallel hardware (something that was underlined by some of the speakers).

My overall impression is that it was a very well organized workshop at a very pleasant location. All in combination with a lot of interesting people.



Figure 1: The cathedral of Santiago de Compostela. (Photo by the author.)

References

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ARTES Travel Report

2006-01-23

POPL / SPACE / PEPM 2006

Martin Kero
Luleå University of Technology
Department of Computer Science and Electrical Engineering
EISLAB
SE-97187 Luleå, Sweden
www.csee.ltu.se

The 33rd ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages[®] (POPL) was held January 11 – 13, 2006, in Charleston, South Carolina, USA. POPL is *the* major conference for the programming language research community. The call for papers attracted a total of 167 submissions, of which only 33 were accepted. In addition to POPL, we visited two affiliated workshops, SPACE (Semantics, Program Analysis and Computing Environments for memory management) and PEPM (Partial Evaluation and Program Manipulation).

Among the presentations (at POPL), I found the invited talk by Tim Sweeney from Epic Games the most exciting one. The title of the talk was "The Next Mainstream Programming Language: A Game Developer's Perspective". He mainly addressed the shortcomings of the current mainstream language family (C/C++/Java/C#), to wit scalable framework for componentization and concurrency as well as the challenge of writing very complex software with real-time performance requirements.

At SPACE I found the presentation of the paper "Separation Logic for a Higher-Order Typed Language", by Neelakantan Krishnaswami, most interesting. Separation logic is an extension to Hoare logic which adds a conjunction operator that separates the propositions to hold in disjoint parts of the heap. This logic enables *local reasoning* about programs and their heap usage behaviors. The main contribution of this paper is, as the title reveals, a definition of separation logic for a higher-order typed language. It has previously only been used for low-level programs, which intrinsically have been first-order. The main problem he encounters is that the triple (precondition, command, postcondition) is not sufficient enough to assure that the specification is true since the command might contain free-variables that are bound to functions. He solves it by describing the specification as the triples as functions of their environments. He derives inference rules for *universal specifications*, i.e. the specification is true for all type-correct environments.

At our stay, we had the chance to spend one whole day devoted to sightseeing. Charleston, SC, is one of the oldest and most significant *southern* cities. Among many other historic events, the civil war began here, at Fort Sumter. We visited the world war 2 carrier U.S.S. Yorktown at Patriots Point Museum. Last but not least, the market streets offer a broad variety of dining.

Report from The Fifth Annual Mediterranean Ad Hoc Networking Workshop (Med-Hoc-Net 2006)

Lipari, Sicily (Italy) - June 14-17, 2006

Ewa Hansen
Department of Computer Science and Electronics
Mälardalen University, Sweden

1 Conference

MedHocNet 2006 was an international workshop for researchers, from academia, research labs and industry, to present results, discuss new ideas, as well as interacting with colleagues in the field of wireless multihop networking. Several nationalities were represented on the conference e.g. Europe, Asia, USA.

On the first day, not included in the conference, a full day tutorial was held by Professor Ian F. Akyildiz (Georgia Institute of Technology) on *Wireless Sensor Networks*. The tutorial was very fruitful for the knowledge of wireless sensor networks. The conference also included a panel discussion about *Dependable Coordination in Ad Hoc Networks*.

On the second day of the conference there was a conference dinner at the best restaurant on Lipari. We had two different antipasti dishes, one main course and dessert, wine was also served.

I went to this conference together with my college to present a paper, *Energy-Efficient Cluster Formation for Large Sensor Networks using a Minimum Separation Distance*, and I was also a co-author of a poster, that my college presented.

In this paper we investigate the usefulness of enforcing a minimum separation distance between cluster heads in a cluster based sensor network. We performed initial simulations in order to determine how much we can lower the energy consumption in the sensor network by separating the cluster heads. We also investigated how the number of clusters affect the energy consumption for a given minimum separation distance. The results show that our sensor network performs up to 150% better when introducing a minimum separation distance between cluster heads, comparing the number of messages received at the base station. The simulations also show that the minimum separation distance resulting in the lowest energy consumption in our network varies with the number of clusters.

2 Venue



Figure 1a: Hotel Tritone



Figure 1b: The view from Hotel Tritone

The MedHocNet workshop was held on the wonderful island Lipari. Lipari is the largest of the Aeolian Islands, a group of seven small islands a few miles from the Sicilian coast. Lipari is also one of the most famous touristic resorts in Sicily. To reach Lipari we had to take the train all the way to Milazzo port, to catch the speedboat to Lipari. Since the flight, train/bus and boat timetables did not mach each other we had to spend one night in Catania both on the way to Lipari and on the way back to Sweden. On the way to Italy my luggage got lost i Milano, the *black hole* according to some Italian people on the conference. I got my luggage on the second day of our stay.

The conference took place at hotel tritone, Figure 1a, located on the hill only a short distance from both the sea and the city center. The view from the hotel was amazing, Figure 1b. One afternoon we went on a boat trip to Stromboli. Stromboli is also one of the Aeolian Islands and is one of the most active volcanoes on earth. It has been in nearly continuous eruption for about 2000 years. The trip to Stromboli, to see the eruptions is something that I would really recommend. In Figure 2a there is some smoke coming from the volcano, later in the evening we could also see when lava was thrown out from the top. It was just amazing!!



Figure 2a: Stroboli Island

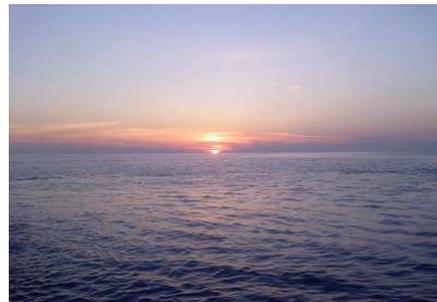


Figure 2b: Sunset

The 9th International Conference on Information
Fusion, 2006

ALEXANDER KARLSSON
University of Skövde
School of Humanities and Informatics

`alexander.karlsson@his.se`

December 8, 2006

1 Introduction

Dasarathy [1] depicts information fusion as:

"Information fusion encompasses the theory, techniques, and tools conceived and employed for exploiting the synergy in the information acquired from multiple sources (sensor, databases, information gathered by human, etc.) such that the resulting decision or action is in some sense better (qualitatively and quantitatively, in terms of accuracy, robustness and etc.) than would be possible, if these sources were used individually without such synergy exploitation."

The information fusion conference is "the" conference within the information fusion community. It covers different types of fusion techniques from low-level, such as sensor fusion, to high-level information fusion. The conference contains special sessions on different topics as well as tutorials. It was held in Florence, Italy, 10-13 July 2006.

2 The conference

The conference had quite many sessions about high-level information fusion, situation management, and belief theory. This is interesting since most of the previous research has been concerned about low-level information fusion such as multi-sensor fusion in target tracking. The large number of sessions about belief theory reflects the importance of uncertainty management in the context of information fusion. Fault diagnosis, image processing, tracking and different types of combination rules are some of the topics which were covered in these sessions. Another special topic was category theory and how this formalism can be applied in high-level information fusion.

I attended a tutorial "*Fusion of quantitative and qualitative information using DS_mT*", which covered the problem of how one can fuse conflicting and uncertain information. The tutorial encompassed the foundation of DS_mT (Dezert-Smarandache theory) and a set of different combination rules.

3 Conclusions

The conference is a good source for information about low-level sensor-data fusion as well as for high-level information fusion and it is also a good place to meet other researchers.

References

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Travel Report from RTCSA'06

Jerker Bengtsson
Centre for Research on Embedded Systems
Halmstad University
PO Box 823, SE-301 18 Halmstad, Sweden
Jerker.Bengtsson@ide.hh.se

The 12th IEEE conference on Embedded Real-Time Computing Systems and Applications was held 16th to 18th of August. The location was at the 4 points Sheraton Hotel at Darlington Harbour in Sydney, Australia. The RTCSA conference is one of the main conferences on practical oriented and applied real-time computing. I had no paper myself submitted to this conference. My work had so far been mostly focused on parallel programming and compilation for multicore processors. Therefore I found this conference to be an interesting opportunity to get an updated view of possible related real-time work and, new ideas to bring into the work.

I expected the topics on this conference to be somewhat collected but the sessions were quite wide spanning; everything between "power aware computing", "ubiquitous computing" to "scheduling and timing analysis". I was more interested in the latter topic. In my opinion, the scope of sessions was a bit too wide for this conference. A pity is that the discussion related to the papers in some cases became more or less absent.

Despite the far conference location, there were quite a few papers with authors and representatives from Sweden; Halmstad, Mälardalen and Linköping. One of the observations that I made during the presentations is that there in general seem to be a more close connection in these works (from Sweden and other European representatives), between academia and industry.

A growing application trend in the real-time research community is wireless sensor networks. I was a bit surprised that there were not so many papers directly related to this topic. I also observed that there was not so much work related to multicore processors. It is a bit notable since such emerging processor architectures are motivated mainly by real-time applications of some kind.

The best paper award was selected to be "Rate Monotonic Schedulability Conditions Using Relative Period Ratios". This paper presents work which improves the quite pessimistic Liu and Layland schedulability bound, by taking relative task periods into account.

In conjunction with the conference there was a banquet dinner and a guided boat trip. The boat trip originated in Darlington Harbour and took us out on a tour in- and outside the harbour of Sydney. We were lucky with the weather



Figure 1: Report author outside the opera house in Sydney. The roof tiles are Swedish-made ceramic, from Höganäs, Sweden

and it was nice to see Sydney from the seaside. The highlight on the banquet was the live didgeridoo concert, performed by two aboriginals.

To summarize, although it was a long and quite tiresome trip it was a successful trip - many interesting people and a nice location.

ARTES Travel Report

First international Workshop on Event-driven Architecture, Processing and Systems (EDA-PS 06)

September 2006, Chicago

AnnMarie Ericsson
University of Skövde
annmarie.ericsson@his.se

Introduction

The first international workshop on Event-driven Architecture, Processing and Systems were held in Chicago 18 September 2006. My paper “Detecting design errors in composite events for event triggered real-time systems using timed automata” was accepted for publication and I was asked to have a 20 minutes presentation of the content of the paper in the workshop.

Workshop

The workshop contained presentations of papers as well as panel discussions and a poster session. People both interested in event-stream processing (ESP) and complex event processing (CEP) attended the workshop. The areas of ESP and CEP are related and the exact difference between the areas is still under debate. In short, much of the research going on in these areas is about processing and reacting to event streams as fast as possible as well as to combine event occurrences in a way that enables high-level knowledge to be extracted from the low-level event stream.

My contribution to the workshop is within the area of CEP. CEP can be used for building and managing information systems such as event-driven architectures, business monitoring and different kinds of middleware. The goal of CEP is to extract information coming from low-level events to higher level knowledge. Based on information carried by the events in form of parameters and information about the order and timing in which the events occurred, higher level knowledge is extracted and can be acted upon in time.

The techniques included in CEP are, for example, detection of complex event occurrences, event streams processing, event hierarchies, and relationships between events such as causality.

Conclusion

The main goal for my trip to Chicago was to attend the workshop, present my paper and hopefully meet interesting people. My impression was that the audience of the workshop seemed very interested about my work and I got a lot of questions and valuable feedback. Additionally, I met people who were interested in cooperation in some form. In short, I got a lot of feedback from my trip and invaluable new contacts.

EMBEC'05

Om EMBEC

EMBEC står för European Medical and Biological Engineering Conference. EMBEC konferenser hålls var 3:e år och detta var den tredje konferensen sedan starten 1999. EMBEC är en konferens om medicinsk teknik. Eller som värdorganisationen skrev:

“The scientific program represents the most relevant subdisciplines of our field, the healthcare challenges, the emerging technologies, and the most advanced methods.”

Konferensen

Det är en ganska stor konferens med cirka 1200 talare som höll på i 5 dagar. Konferensen spänner över ganska många ämnesområden inom medicinsk teknik. Så det är både en fördel och nackdel då man kan hitta intressanta saker inom väldigt varierande forskningsområden. En nackdel för min del var att det ibland var ganska så ointressanta ämnen långt från mitt forskningsområde.

Jag upplevde organisationen som väldigt professionell då man skulle skicka in papper och liknande. De gav även ut en PowerPoint-mall med mera som underlättade för de med muntlig presentation. Det märktes vilka som var nya doktorander, ty de, liksom jag, använde sig av mallen.

När det sedan kom till själva tillställningen var det inte lika lyckat. Jag tyckte schemat inte var det bästa, samt CD:n man fick ut med alla kompletta forskningspapper hade en del att önska i sökväg. Gick inte att söka på det ID-nr som alla accepterade papper fick. De använde sedan ID-nr för schemat, så ganska svårt hitta rätt. Schemat var dessutom uppbyggt enligt ett SSxx (Special Session nr xx). Föreläsningar inom samma område fick nummer efter varandra, även om föreläsningarna kom på olika dagar. Det började med SS01 sedan kom föreläsningarna i ett lagom oorganiserat stegrande system, typ SS05, SS10, SS03, SS07 osv. Gick inte att leta på ett vettigt sätt.

En sak som gjorde mig irriterad var att det var 5 inlämnade papper inom mitt område, inklusive mitt. De skulle alla presenteras samma tid i 3 olika lokaler. Så de mest intressantaste föreläsningarna för min del missade jag.

De hade även en postersavdelning där alla posters stod i samma rum. Posterna stod i 8 rader med 8 stycken posters i varje rad, dvs inget mellanrum mellan olika posters. Dessutom kom följande 8 på baksidan med cirka 1,5 meters mellanrum till nästa rad. Ganska trångt med andra ord. För att bättra på trängseln så delade de gärna ut nummer efter varandra istället för att ta varannan även om det bara var hälften av postersplatserna som användes. De hade även en falsk poster tävling varje dag för att öka på intresset för postrarna.

Så sammanfattningsvis kan man säga att konferensen var väl planerad, men inte så genomtänkt i genomförandet.

Om Prag

Jag var där i November och det var ganska kallt. Minusgrader och snöfall vissa dagar, så inget väder man springer runt i direkt. Jag var väldigt mycket på konferanscentret och såg inte så mycket av staden, även om jag han med en rundtur en dag, samt de flesta kvällarna. Ganska likt Sverige i många avseenden. Mycket glas och träleksaker. Annars var det inget som var värt att köpa, förutom den goda tjeckiska ölen förstås.

Centrala Prag är rena turiststråket. Väldigt dyrt och många turister tyckte jag. Jag blev dessutom förvånad över alla negrer som kvällstid arbetade som inkastare på olika striplubbar. De pratade bra engelska, bättre än tjeckerna faktiskt, så kanske därför de arbetade som inkastare.

Vill man uppleva det mer äkta Prag får man leta sig till någon vanlig pub en bit bort från centrala Prag. Vi hittade en sådan 500 meter från hotellet. Deras dyraste maträtt kostade cirka 30 svenska kronor och en stor stark, av bra sort, cirka 5 kronor. Helt och fullt uthärderligt. Enda nackdelen är att tjeckerna röker som borstbindare hela bunten. Så man är rena stinkbomben då man kliver ut från

puben. Men vad gör man inte för billig god öl.

Det var ganska sterilt på de flesta ställen jag var på. Däremot såg de ganska nyrenoverade ut, så Prag verkar vara en stad på frammarsch. Men det kanske är den tjeckiska kulturen som gillar det sterila.

En sak som verkar vara typisk med hotellrummen i Prag är att de är rökiga, varma, har megakuddar och konstiga täcken. Verkar vara samma på olika hotell. Man kunde dock vädra och stänga av elementen. När det är minusgrader ute ville de gärna ha närmare 30 grader inuti rummen. Täckena kunde man löra sig stå ut med, men kuddarna var helt hopplösa. Cirka 1 meter breda, en halv meter långa och 2-3 dm höga. Helt hopplösa, så ett tips kan vara att ta med sin egen kudde om man vill sova skönt.

Min erfarenhet och upplevelse

De flesta tjeckerna pratar engelska mer eller mindre. Däremot verkar de inte förstå engelska lika bra som de pratar engelska. Därför inträffade några dråpliga situationer, tex på hotellet ville de att vi skulle lämna in kortnycklarna så vi sa våra rumsnummer, vilket receptionisten inte uppfattade. Efter en stunds repeterande förstod receptionisten att vi bodde i olika rum, och sa: "Varför sa ni inte det direkt?". Var ungefär det vi sagt. Man fick även ut speciella frukostkort, (som de aldrig tittade på). En person i sällskapet frågade om man behövde visa kortet varje frukost och fick till svar "Breakfast, breakfast" och viftande med kortet. Inte lönt fråga mer.

Tjeckerna upplevde jag som ganska tystlåtna. Jag kan inte påstå att de var direkt serviceinriktade, men de var inte heller ovänliga eller ohjälpsamma. Ett mellanting. Till och med tiggarna var mycket harmlösa. De låg på knä som om de bad till Mecka med kepsen i handen så folk kunde lägga pengar i mössan deras. Enda som jag upplevde man ska se upp med är taxichafförerna. Bestäm priset innan resan. Dessutom kör de som biltjuvar, så säkerhetsbälte är en självbevarelsesdrift ta på sig. Annars fungerar de allmänna färdmedlena utmärkt.

Jag tyckte det var ganska skönt få gå runt i fred. Enda gången någon var på en var då man gick på turiststråken, annars en lugn och behaglig vistelse.

/Christer Gerdman
IDE, Mälardalens Högskola

Visit to Technical University of Denmark (DTU), Dept. of Informatics
and Mathematical Modeling in October 2006

ARTES++ Travel Report

by Viacheslav Izosimov, Linköpings Universitet, IDA/SaS/ESLAB,
viaiz@ida.liu.se

2006-11-22

This report presents some details of my visit to DTU in Denmark in October 2006. I spent there about two weeks from 15th to 29th of October, contributing to establishing cooperation between our laboratory, Embedded Systems Lab (ESLAB), in Linköpings Universitet, and the research group with a similar name that is emerging at Dept. of Informatics and Mathematical Modeling in DTU. One of my research advisers, Dr. Paul Pop, who moved to Copenhagen from Linköping in the last spring, is involved into creating this research group.

The main purpose of my visit to DTU was to renew my “adviser – PhD student” connection with Paul, discuss journal papers based on our previous research, some ideas for future work and possibilities for cooperation. Unfortunately, the visit was shorter than it had originally been planned due to certain constraints such as printing deadlines for my licentiate thesis and teaching. However, we have managed to meet the agenda, at least partially. Some deep thoughts were given to our previous research on fault-tolerant embedded systems. As the result, two joint journal papers are in pipeline. We have also discussed several problem formulations for our future joint work on fault tolerance and design optimization of embedded systems. The joint work will be done in two main dimensions: (1) joint master thesis projects for both Swedish and Danish students supervised by me or Paul, respectively, and (2) joint conference papers on fault tolerance and design optimization.

I have found quite interesting some aspects of how the research is organized at DTU. One thing that can be useful to many research groups in Sweden is the “paper pipeline” that was recently introduced there. The “pipeline” is a wooden-made board attached to the wall. On this board several stages of paper publishing process are graphically depicted, such as “in-progress”, “submitted”, “accepted”, and “presented”. Everyone should attach a piece of paper with the title of their research work to the board. Then, as the work is being progressed, the piece of paper is moved from stage to stage. Another interesting aspect is that researchers there do not use desktops anymore. Instead, everyone should have a laptop (and only laptop) bought by the department, which is supposed to be carried home after work. As the result, not so many people stay after 5 p.m., they prefer to work while traveling home or while staying at home.

Of course, during my visit not only research aspects were in the focus. I spent some time in Copenhagen downtown looking around, doing some jogging and sightseeing. One Sunday, I went to Halloween in Tivoli Garden, which was quite cool and exciting.

ARTES++ Travel Report to PRDC'06

The 12th IEEE Pacific Rim Symposium on Dependable Computing, December 18-20th

Carl Bergenhem
December 29, 2006

1 PRDC

PRDC 2006 is the twelfth in this series of symposia started in 1989 that are devoted to dependable and fault tolerant computing. PRDC is now recognized as the main regular event of the Pacific area that is covering the many dimensions of dependability and fault tolerance, encompassing fundamental theoretical approaches, practical experimental projects, and commercial components and systems. As applications of computing systems have permeated in every aspects of daily life, the dependability of computing system has become increasingly critical. This symposium provides a forum for countries around the Pacific Rim and other areas of the world to exchange ideas for improving the dependability of computing systems. (The above passage has been copied from the PRDC 2006 website)

This year's symposium was held at and organised by the University of California, Riverside. The city is located on the west coast of USA; a 1 hour drive from Los Angeles.

2 Contribution and Topics

My contribution to this conference was a short paper titled *Implementation Results of a Configurable Membership Protocol for Active Safety Systems*. This gave me the opportunity to give a short presentation (10mins) and to put up a poster presentation. Due to the absence of some other presenters, there was plenty of time for discussions and questions.

At the conference there were researchers from several well-known groups that presented their results. Of main interest to me was the research done on the consensus problem (Andre Schiper et al. working at EPFL in Lausanne, Switzerland) and failure detection (Antonio Fernandez, Sergio Arevalo et al. working at Univ. Rey Juan Carlos in Madrid, Spain). Both these research topics are in the context of asynchronous systems with communication networks with a mixed topology and where communication links may suffer failures. I have previously read some of the work from the different groups and have been inspired by the work. The general research task of writing well specified and understandable work is of course in common. The general layout of the research, e.g. what aspects of a problem are important, how a proof is formulated, how an algorithm is presented, thoroughness etc., is important to learn and take inspiration from and can also be used in my own work. It is always an experience to listen to presentations where both the work being described and the presentations themselves are of high quality.

The membership problem, which I study, is a subset of the consensus problem. Further, the environment for which my work is targeted is "nicer" in that it is basically synchronous and static. Also real-time properties are achievable in this environment and are of importance for the envisaged application; distributed real-time control systems.

3 Relevance and Conclusion

The topic of this conference (and the PRDC series) seems to be correct and right for my own research interests. The quality of the other contributions is generally very high. PRDC'06 accepted 42 regular papers and 20 short papers out of the total 117 submissions with about 35% and 17% acceptance rate for full papers and short papers respectively. The conclusion is thus that this conference would be the relevant forum to publish research work at, again in the future.

However, submitting short papers do not directly bring me closer to attaining my PhD. The return for submitting a full paper is much greater in the eyes of the follow-up group. Despite this, it has been a good experience to visit the PRDC-06 conference.

ARTES++ Travel Report to PRDC'06

The 12th IEEE Pacific Rim Symposium on Dependable Computing

Raul Barbosa

December 28, 2006

1 Introduction

The 2006 edition of PRDC was the twelfth symposium in this series dedicated to the field of dependable and fault-tolerant computing. The symposium was organized by the University of California, Riverside, a city on the west coast of the US, about one hour drive from Los Angeles, California.

2 Conference Program

As a conference which aims to establish itself as the main regular event in the Pacific area that covers the area of dependability and fault tolerance, the PRDC attracts a very broad spectrum of scientists from all over the world. The accepted papers (42 out of 117 submissions) encompassed both theoretical analysis and experimental approaches, including commercial projects, in the dependability field. There were several interesting presentations from the software testing, security and intrusion detection communities. Some interesting ideas were also discussed in the short paper tracks.

The keynote speeches targeted a very broad audience. The topics under discussion included the challenges in dependability of future networked systems, software testing and software reliability, and some reflections on the development of nano-technologies and *reliability* as a fundamental attribute for the success of nano-fabrication.

My presentation of the paper entitled *Flexible, Cost-Effective Membership Agreement in Synchronous Systems* was scheduled for December 18th (the first day of the conference). This paper is joint work of myself and my adviser – Professor Johan Karlsson. It was, as usual, extremely gratifying to hold the 30 minutes presentation and to answer the questions from the audience, which definitely help in the development of our future work in this area.

3 Accommodation and Surroundings



Figure 1: Pictures from the conference area

I was accommodated at the Courtyard by Marriott, in Riverside. Figure 1 shows several photographs taken in the Riverside area. One hour north we found the Big Bear Lake with a lot of snow whereas one hour south we found the sunny Laguna Beach. Yes, the two pictures on the right hand side were taken 1 day and 200 km apart.

4 Conclusion

The trip to this year's edition of PRDC was quite interesting. The questions after my presentation provided me with some feedback which will certainly affect the direction of the future work (and future presentations). It was also interesting to listen to other presentations within my area (but not only). I think I learned a bit about the more general *consensus problem* (which has *membership agreement* as a sub-problem) and about some other research areas such as database transaction management and intrusion detection.

ARTES++ Travel Report

RTSS 2006 December 5-8, 2006 Rio de Janeiro, Brazil

Moris H. Behnam,

Mälardalen Real Time Research Center (MRTC)

Moris.behnam@mdh.se

RTSS 06 conference

RTSS 2006 is the top international symposium of the real-time systems research community. The conference was held in Rio, Brazil. The scope of the conference is to provide a forum for the presentation of high quality, original research in several areas of real-time computing, including scheduling; control and adaptive RT systems theory; testing and debugging; modeling; formal methods; communications (wireless, wireline, and sensor networks); power, thermal and energy management; embedded systems; sensor and implantable devices; robustness; fault tolerance and robustness; intelligent behavior; time-sensitive robotics; emergency/disaster management; embedded real-time systems and infrastructures; QoS support; real-time systems middleware.

There were three additional sessions,

- 1- Workshop on Model and Analysis Methods for Automotive Systems.
- 2- Work in Progress session.
- 3- Special Activity (Cyber robotic competition).

Contribution

My contribution to this conference was a working in progress paper titled **Real-Time Subsystem Integration in the Presence of Shared Resources**, and I gave a 5 minutes presentation. In this paper we addressed the difficulties when integrating independently developed real time subsystems with sharing logical resources problem. We proposed a two-level hierarchical framework that allows for an easier integration process without violating the timing requirements.

My overall impression is that this conference was very good and useful with so many interesting papers and works, especially the following papers which are close to my research area,

- RESOURCE SHARING IN HIERARCHICAL FIXED PRIORITY PRE-EMPTIVE SYSTEMS by Robert Davis and Alan Burns. This paper focus on resource sharing in hierarchical fixed priority preemptive systems.
- RESOURCE SHARING IN EDF-SCHEDULED SYSTEMS: A CLOSER LOOK by Sanjoy Baruah. This paper takes a closer look at EDF-scheduled systems in which access to logical shared resources is synchronized by the stack resource policy SRP.

Rio de Janeiro

Rio is a very wonderful city with its beaches, mountains and historic past. We visited the Corcovado, which is the big statue of the Christ, overlooking the city with a great view. We also went to Jardim Botânico the botanical gardens of Rio de Janeiro and the most exciting activity was the jeep tour in Rio “Enter the Tijuca Rain Forest on an open jeep where is possible to see the contrast between the Stone jungle and a tropical forest in the middle of a big city”. And of course I didn’t miss the Samba show.



Travel report
The 27th IEEE Real-Time Systems Symposium (RTSS06)
December 5-8, 2006, Rio de Janeiro, Brazil
Kaj Hänninen

The conference

The RTSS'06 conference was held in Rio de Janeiro (at the Marina Palace hotel) Brazil. It is considered as the flagship real-time conference. According to the program co-chair the conference received 173 submissions (43 papers were accepted). In addition to the main conference, it also included a WiP session.

This was the first time I attended the RTSS conference. I presented a paper about shared stack analysis. I found the conference really nice with a lot of interesting presentations. The conference included papers about embedded systems, languages, multicore platforms, distributed real-time systems, schedulability, OSes, applications, energy management, sensor networks and timing constraints.

My overall impression is that the conference is worth visiting, even if you don't have a paper accepted, mainly because most of the papers concern state of the art research within the real-time community.

Rio de Janeiro

Rio de Janeiro is a place with the famous beaches Copacabana and Ipanema. There's also a large statue representing Jesus standing with outstretched arms on top of Corcovado mountain.

Industry Visit Report: Ericsson AB, Stockholm

Johan Lindhult
Department of Computer Science and Electronics
Mälardalen University
johan.lindhult@mdh.se

Introduction

During 2006, I have spent approximately 1-2 days/week at Ericsson AB in Älvsjö, Stockholm. The site in Älvsjö is, among other things, responsible for the development and the maintenance of the software in the AXE exchange system. Ericsson as a company shouldn't need any further introduction.

The project that I am involved in, deals with adapting software written for sequential architectures to parallel hardware. This is carried out together with people from Ericsson, and I also have two of my (assistant) supervisors at the company.

The purpose of my visits

My visits to Ericsson started 2004 with the purpose to document (by a formal semantics) the language PLEX, which is used to program the functionality in the AXE system. This work was carried out together with my supervisors at Ericsson, and described in a previous Industry Visit Report ¹.

The visits has continued during 2006, with inspection of the current software in order to get an opinion on how well the existing code is suitable for parallel processing, i.e., by trying to identify those parts of the software that are suitable candidates for concurrent processing. To determine this, we have looked at how the shared variables in the system are used, and if there are any potential problems/conflicts. A previous master thesis project [1] discussed this in general terms, but did not perform the necessary inspections.

The result of our studies was planned to be published during this fall, but the inspection has been far more time-consuming than we first expected, and the planned Technical Report (and a corresponding conference/workshop paper) has been postponed until this spring.

References

- [1] B. Lindell. Analysis of reentrancy and problems of data interference in the parallel execution of a multi processor AXE-APZ system. Master's thesis, Mälardalen University, 2003.

¹http://www.artes.uu.se/mobility/industri/ind_ericsson-2005_JL.pdf

Report from 5th ARTES Graduate Student Conference

Mälardalen University, February 22-23, 2005

Jianlin Shi

PhD student at Mechatronics, KTH

jianlin@md.kth.se

Motivation

“The main idea with the ARTES Graduate Student Conference is to provide a forum for technical presentations and discussions among the Swedish graduate students active in the real-time area. For newly recruited graduate students it will provide an opportunity to experience ‘a real conference situation’ (maybe) for the first time. For everyone, the conference will be an excellent opportunity to, in a relatively short time, get an overview of the current state of the national research.” (By ARTES)

Presentations

11 ARTES PhD students from different universities introduced their research work. Among these 8 presentations are available in the proceeding on the ARTES website. I introduced my project “model-based development and competence integration within mechatronics”.

Interesting Lecture

Dr. Wolfgang Weck from Switzerland gave an interesting lecture about the Eclipse Integration Framework “How is Eclipse coming along as a component framework”. This is a conjunction with ARTES graduate course “Advanced Component-Based Software Engineering”. The slides are available on the course website.

Activities

February 22, we visited the ABB at västrås. That night we had dinner at STRIKE, where offered good meal and free blowing.



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Travel Report from DATE 2005

Viacheslav Izosimov

Linköpings universitet, IDA

viaiz@ida.liu.se

25th October 2005

This year, *Design, Test and Automation in Europe (DATE)* conference was organized in Munich, the capital of Bavaria, from 7th to 11th March. DATE is the most prestigious conference in the area of design automation in Europe. The conference is always complemented with the *Exhibition*, where companies across the Europe can seek for cooperation with each other and research institutes. The total number of participants in both the exhibition and the conference was more than 3.000. DATE is known among the companies working in electronic design automation (EDA) and testing for automotive, consumer electronics, aerospace, medical equipment, and other industries. Researchers from the companies also presented their outstanding contributions to the area during special sessions in a framework of the *Designers' Forum*. Only the best papers and the best contributions can be presented at DATE, which is also known for a low acceptance rate (less than 25%) and a great number of paper submissions (more than 800 this year).

My colleagues and I presented a full paper in the track of *Electronic Design Automation (EDA)* during a special automotive day. Our paper "*Design Optimization of Time- and Cost-Constrained Fault-Tolerant Distributed Embedded Systems*" was nominated for the **Best Paper Award** in the EDA. Despite tense competition, we won the Award and were later notified as the winners. This prize should indicate a strong position of Swedish research and industry in the area of electronic design automation.

The invited keynote speakers were covering different aspects of electronic system design. Dr. Jeong-Taek Kong from Samsung Electronics introduced the area of nanotechnologies and pointed out on challenges that Samsung is facing. He named two main challenges as "design for low power" and "design for fault tolerance". The second keynote speech was given by Harald Heinecke, Manager System Design Architectures from BMW. He emphasized the importance of designing reliable vehicles and creating architectural paradigms that can reduce costs and increase functionality for satisfying customers. Harald mentioned that at most 90% of all last innovations in cars were due to electronic components. The framework being developed within the AUTOSAR project can solve the problem of complexity and lowering costs.

I found the conference very exciting and was trying to communicate with researchers and companies' representatives. However, none of my discussions resulted in any cooperation or joined projects, at least not yet.

Munich is quite an interesting place to visit. Even though Munich is a city population wise, it has a feeling of an old town. The downtown accommodates many museums including the Deutsches Museum, which was the most interesting from my point of view. It is possible to taste Bavarian food at almost every place; particularly, sausages were the most special.

Travel report - CSMR '05

By Johan Andersson, Mälardalens University, Västerås

johan.x.andersson@mdh.se

The European Conference on Software Maintenance and Reengineering (CSMR) is the premier European Conference on Software Maintenance and Reengineering. The 2005 conference was the 9th so far, and was held from the 21st to the 23rd of March at the Weston Conference Centre in Manchester, UK. I went to the conference as co-author of the paper “*Model Synthesis for Real-Time System*”, together with Joel Huselius. This was our first visit to a conference related to reverse engineering, so it was very interesting and gave a good overview of the area. We also got the opportunity discuss our research with Prof. Tarja Systä, from Tampere, Finland, who have been doing related research, although not for real-time systems. Most paper presented at the conference discussed information extraction from “legacy” code, but (obviously) not for real-time applications but for “desktop” OO applications or web services.

The city of Manchester is the third largest city in the UK, after London and Birmingham, and has a population of about 2.5 million. It was a positive surprise. I had never been to Manchester before and had a bit of a negative image, consisting mainly of football hooligans, criminality and old industrial buildings. I was wrong. I experienced it as a very nice, vibrant city, with a lot of shopping, culture and pubs. The old industrial buildings had a certain charm, and there are many modern buildings as well. We didn't see any football hooligans, or even football fans. Criminality may be a problem in Manchester, there is (or at least used to be) problems with criminal gangs, but mainly in the suburbs. However, we didn't have any problems. I can recommend a visit to Manchester.

Travel Report from ICSE 2005

Johan Fredriksson

Mälardalen University, Department of Computer Science and Engineering

johan.fredriksson@mdh.se

5th Dec 2005

This year, the jazzy city of St. Louis, USA, hosted the **ICSE** conference from 15th to 21st May. ICSE is one of the largest and most prestigious conferences within the area of software engineering. I had a long paper accepted at the 8th international Symposium on Component-Based Software Engineering (CBSE) which was held in conjunction with the ICSE conference. ICSE is a very large conference with almost 1000 participants, more than 70 papers on the main conference, four adjunct and co-located events and almost 20 workshops and fifteen tutorials. During the conference there are also many industrial sessions and events.

It was very exciting to participate in the conference and even more exciting to present my paper at CBSE. CBSE8 was a two day event with 23 papers and about 70 participants. As usual the symposium was very discussion oriented, and many of the senior researchers within the community participated in the discussions. One of the hot discussions of this year was regarding the direction of component-based software engineering. Several of the senior researchers within the community expressed the need for 'real results'. The symposium featured an invited talks by Dave Thomas, IBM OTI Labs. Dave talked about the implications and necessity of component-based engineering. The talk was very interesting and just the right amount of provocativeness expected from a good keynote.

The invited keynote speakers of the conference were overall good, though the topics and quality of presentation were in my opinion a bit varying. The topics were a bit to specific and not as provocative as I would expect from a keynote at such a big conference. None of the keynotes could measure up to last years invited talk by Richard Stallman.

The most interesting part of the conference was, as usually, to meet and talk to fellow researchers. I met several fellow researchers from last year's conference, with whom I continued some rather interesting discussions. That is one of the very rewarding parts of returning to the same conference and joining the same people.

St. Louis is a rather typical mid/south city with many small RnB-pubs and restaurants. The atmosphere in the smaller neighbourhood's bars is very bluesy and jazzy. One performance that I and a few colleges went to was a guy that played excellent blues guitar; half way through the performance he was clearly inspired by something and started playing with the guitar behind his neck, behind his back, on the floor with his teeth, and finally with his tongue. A night well worth remembering.





ARTES Travel Report

2005-11-24

REALWSN 2005

Martin Kero
Luleå University of Technology
Department of Computer Science and Electrical Engineering
EISLAB
SE-97187 Luleå, Sweden
www.csee.ltu.se

The first workshop on Real-World Wireless Sensor Networks (REALWSN) was held June 20 – 21, 2005, in Stockholm, Sweden. The main purpose of the workshop was to bring together researchers and practitioners, with focus on real-world experiences such as experiments and deployments of WSN.

The presented papers covered deployment experiences in different real-world settings. In particular, localization issues was a hot topic. I presented a paper at the workshop with the title “*Timber as an RTOS for Small Embedded Devices*” [2]. The subject of the paper is somewhat far from the main topic of the workshop, i.e. real-world experience is not really the paper’s main contribution. Nonetheless, the idea of uniting programming language semantics and operating system features as one part is interesting when aiming towards robust WSN.

Among the other papers, the most interesting one according to me was “*Using Protothreads for Sensor Node Programming*” [1]. The main contribution of the paper is to exploit some (fancy) features of C to describe a state machine in the form of a sequential order of actions. At the first glance, it seemed like a reckless misuse of a faulty attribute in the language C. However, used properly, encoding state machines as sequential actions can be accomplished by Protothreads.

We (the attendees) were invited to a boat-trip to Vaxholm, an island in the beautiful archipelago of Stockholm. At Vaxholm, we were served a fabulous dinner.

References

- [1] Adam Dunkels, Oliver Schmidt, and Thiemo Voigt. Using Protothreads for Sensor Node Programming. In *Proceedings of the first workshop on Real-World Wireless Sensor Networks REALWSN’05*, 2005.
- [2] Martin Kero, Per Lindgren, and Johan Nordlander. Timber as an RTOS for Small Embedded Devices. In *Proceedings of the first workshop on Real-World Wireless Sensor Networks REALWSN’05*, 2005.

Travel report
International Conference on
Embedded Systems and Applications (ESA)

Kaj Hänninen
Arcticus Systems, Sweden

ESA-05

The 2005 international conference on embedded systems and applications (ESA) was held in conjunction with the 2005 international multi-conference in computer science and engineering at Monte Carlo resort in Las Vegas, Nevada USA, during June 27-30.



According to the ESA chair, the conference received a large number of submissions from Asia Pacific, Europe and North America. Totally 38 papers (including poster papers) were accepted for presentation.

I presented a paper in the real-time session (totally nine papers were presented in the real-time systems session). The contributions and presentations were varying very much. The presentations were held in rather small rooms, which created a nice atmosphere for questions and further discussion.

My overall impression of the conference is quite positive. I met many interesting researchers from all over the world.

The weather in Las Vegas was very dry and extremely warm (approx. 107°F). Stores were open 24 hours a day.

Travel report
17th Euromicro Conference on Real-Time Systems (ECRTS)

Kaj Hänninen
Arcticus Systems, Sweden

ECRTS-05

The 17th Euromicro Conference on Real-Time Systems (ECRTS) was held in Palma de Mallorca, Spain, during July 6-8.

ECRTS is one of the leading European conferences for real-time researchers. According to the program chair, the conference received 145 submissions out of which 26 were presented at the conference. Eight main sessions and two Work in Progress sessions (WiP) were organized. Keynote talks were held by representatives from Ericsson, ENEA and the European Commission.

I presented our ongoing work on industrial requirements in development, in a WiP session.

The day before the opening of the main conference, four different workshops were organized:

- WCET 2005 – International Workshop on Worst Case Execution Time Analysis
- RTN 2005 – International Workshop on Real- Time Networks
- RTC 2005 – International Workshop on Real-Time and Control
- OSPERT 2005 – International Workshop on Operating Systems Platforms for Embedded Real-Time applications

I attended the OSPERT workshop, which I found very interesting. The workshop addressed kernel/RTOS architectures and real-time in general purpose OSes. Three invited speakers presented views on flexible scheduling and Linux as a real-time OS.

MINEMA summer school 11-15/7-2005 Klagenfurt

Av Erik Kuiper

I juli 2005 höll MINEMA en sommarskola i Klagenfurt (Österrike) med temat "wireless and mobile computing". Nedan följer en sammanfattning av de föreläsningar och ämnen som jag fann mest intressanta.

Mads Haahr – Middleware for Mobile Computing

Det jag fastnade för i Mads presentation var de fjorton utmaningarna som finns i en mobil omgivning (se tabellen nedan). Utmaningarna är en sammanställning av utmaningar Mads har hittat i olika paper han har läst.

Mobile Device Challenges	Mobile Networking Challenges	Physical Mobility Challenges
Battery Power Data Risks User Interface Storage Capacity Processing Power	Networking Heterogeneity Disconnection Low Bandwidth Bandwidth Variability Security Risks Usage Costs	Address Migration Location Dependent Information Migration Locality

David B. Johnson – Introduction to Ad Hoc Network Routing

David är en av skaparna av ad-hocroutingprotokollet DSR. Han sade att problemet med routing i ad-hocnätverk är att routing informationen alltid kommer att vara inkomplett och gammal. Med DSR som exempel beskrev hur han sedan ett sätt att försöka skapa ett fungerande routingprotokoll för mobila nätverk.

Charles E. Perkins – Ad Hoc Networking in the IETF

Charles är en av skaparna av ad-hocrouting protokollet AODV och han sitter med i IETF MANET working group. Han började med att gå igenom processen inom IETF för att standardisera och godkänna protokoll. Som mycket annan standardisering så är det en långsam och tidskrävande process. Sedan diskuterade han olika problem med routing i ad-hocnät och poängterade speciellt att den metrik som främst används vid evaluering av routingprotokoll, hop count, inte är en bra metrik. Problemet är att den ger preferens för länkar med långa nodavstånd. Problemet med långa nodavstånd är att den fysiska kommunikationskvaliteten är sämre och att det är troligt att den totala vägen kommer att brytas strax på grund av nodernas förflyttningar.

PANEL: Ad hoc networking among vehicles

En panel av representanter från olika företag diskuterade vad för nytta man kan ha av ad-hockommunikation mellan fordon. Den mest intressanta slutsatsen var att om trådlös kommunikation skall användas för säkerhetstjänster så måste minst 90% av fordonen stödja tjänsten. Om det idag skulle bli obligatoriskt för alla nya bilar att stödja en tjänst så dröjer det mer än 5 år innan en penetreringsgrad på 90% uppnås.

Travel Report from MPSoC'05

Najeem Lawal
Mid Sweden University
najeem.lawal@miun.se

Introduction

The 5th International Forum on Application-Specific Multi-Processor SoC (MPSoC'05) took place in Relais de Margaux, France from 11 to 15 July 2005. The forum was organised by Ahmed Terraya, Techniques of Informatics & Microelectronics for Computer Architecture (TIMA) Laboratory, France, Hannu Tenhunen, School of Information Technology, KTH, Sweden and Wayne Wolf, Department of Electrical Engineering, Princeton University, USA. The forum serves as summer school for PhD students in SoC related research and discussion platform for industrial researchers in the field. This year's edition was sponsored by European Design & Automation Association and the IEEE Computer Society, IEEE Circuits & Systems Society and IEEE Council on Electronic Design Automation. I attended the Summer School with a colleague, Niklas Lepistö.

The Forum

The forum started with two keynote speeches, "**Digital Media: The New Frontier for Supercomputing**" by Lisa Su, IBM, USA and "**Nomadik: an MPSoC Solution for Advanced Multimedia**" by Alian Artieri, STMicroelectronics, France. There were tutorial sessions on Hardware and Software Challenges in MPSoC. Afterwards there were twelve technical sessions and two business sessions on MPSoC-related issues. The technical sessions focused on hardware/ software programming models and their applications in SoC/ MPSoC, design methods and tools and their applications to SoC, MPSoC and network-on-chip (NoC). My interest in this forum is the focus on hardware development and multimedia applications. The most informative contribution I received at this edition of the forum was the presentations on the IBM Cell Architecture.

The Summer School

At the summer school I met other PhD students. We interacted and discussed many issues, share ideas and exchange addresses. During the coffee sessions discussed politics, culture differences, issues relating to international securities and of course MPSoC research issues. We enjoyed the swimming pool, took pictures and explored the city on bicycles.

Conclusions

It was exciting to be able to dine and wine with the leading researchers in my field. Reading their publications is very informative and educating. But much more than that is to be able to listen to them in a relax atmosphere and be able to discuss the key issues of their research. The summer school provided the opportunity while the French hospitality provided the most conducive platform. There was more than enough wine! It was difficult to disagree with the saying "When in Rome do like the Romans". I had to drink wine like the French while I was in Margaux. To complete the forum we were taken to a wine brewery where we were taught the art of application-specific wine brewing!

Travel Report from MPSoC'05

Niklas Lepistö
Mid Sweden University, Sundsvall

In July 11-15 2005 I attended the 5th International Forum on Application-Specific Multi-Processor System on Chip (MPSoC). MPSoC is a multidisciplinary forum which brings together world class R&D speakers from academia and industry to discuss issues related to Multi-Processor SoC design, and naturally also people like me who are just there to listen and learn. MPSoC 2005 took place at Relais de Margaux near the city of Bordeaux in France.

The trip to Bordeaux went without any problems, but at Bordeaux airport I had to take a taxi to the hotel since I was too late for the bus transport that had been arranged. The taxi driver did not know any English but he seemed to understand where I was headed. I guess Margaux, which was a relatively small village, had already gotten more than its usual share of visitors that day.

Margaux was slightly further from Bordeaux than I had imagined, and the hotel where the event took place was located 3 km from the village centre, so there was not that much to see or do around the hotel. On the other hand, there wasn't really that much time left after the sessions that started at 8.30 and ended 17.00 each day, followed by a dinner which usually rendered one incapable of any further activities other than discussing more or less MPSoC related matters.

Generally each day was divided into four sessions separated by lunch or coffee breaks. There were two types of sessions, either with two or three longer presentations or five short 12-minute presentations. The sessions with the short presentations proved to be very interesting and varying, although some speakers had some difficulty to squeeze in everything they had to say in 12-minutes. The first day was started off with two keynotes. The first one was by Lisa Su from IBM, who discussed digital media as the new frontier for supercomputing. Su explained the problems and limitations of today's semi conductor technology and stated that in the future increased performance will depend on innovation rather than technology, presenting the Cell processor as an example. The second keynote was presented by Alain Artieri from ST Microelectronics and described the Nomadik Multimedia Processors from ST. The rest of the first day included tutorial sessions, which focused on HW and SW challenges of MPSoC design.

One of the most interesting sessions during the week was entirely dedicated to the IBM Cell processor and included two presentations describing the architecture and implementation of the processor. Another interesting presentation was given by André DeHon on Sub Lithographic Semiconductor Computing Systems, which seemed slightly more futuristic than the other presentations. Many of the presentations during the week pointed out the increasing need for software development tools and programming models for multi processor systems.

The week proved to be very interesting although it was somewhat difficult to stay focused at the end of the week.

Report from RTiS 2005 and ARTES summer-school

Högskolan i Skövde, August 15-19, 2005

Jianlin Shi

PhD student at Mechatronics, KTH

jianlin@md.kth.se

Motivation

“ARTES summer-school and RTiS is a place to meet Swedish researchers and industry involved in Real-Time and Embedded systems research and development. Real Time in Sweden (RTiS) 2005 is a conference intended to bring together industry and academia in an effort to put together and share information about essential and urgent topics in embedded systems and real-time.” (By ARTES and SNART)

I came to the present one paper “A brief evaluation and overview of UML2.0 from the viewpoint of embedded control systems”, which is a short summary of a technical report.

Highlights

In the first day, Dr. Mike Hinchey from NASA Goddard Space Flight Center (USA) introduced “Autonomic Computing for Real-Time Systems” from his experiences. Dr. Chenyang Lu from Washington University in St. Louis gave a lecture of “Real-Time Issues in Wireless Sensor Networks”.

The second and third days are SNART conference time. There are two special sessions 1) Special research sessions on real-time databases and information fusion, testing of event-triggered real-time systems, and sensor networks, 2) Special industrial experience session “Embedded Software for Mobile Terminals”

In the following days, four tutorials (CBSE, Fault tolerance, Execution time analysis, and sensor networks) and the future of IT are presented.

Social event

August 18, we visited Läckö castle and took Boat to Navens Light house. Although it was little chilly, Prof. Sten showed his swimming skill. Beautiful pictures made by Anita, Sten F. Andler, Paul Pettersson and Roland Grönroos are available on the ARTES and RTiS website, where newscasts by TV4 are also provided.

Travel Report from FPL'05

Niklas Lepistö
Mid Sweden University, Sundsvall

Introduction

During 24-26 August I attended the International conference on Field Programmable Logic and Applications (FPL), which is the first and largest conference focused on programmable logic. This year the conference took place in the city of Tampere in Finland and was hosted by the Institute of Digital and Computer Systems of Tampere University of Technology. The venue of the conference was Tampere Hall, a conference centre that was claimed to be the largest one in the northern countries. Tampere Hall was conveniently located, just a few hundred metres from our hotel. Tampere seemed to be a very nice city, especially at night with all the lights and the river flowing through the city. I got some really nice photos.

The conference

The conference lasted for three days and had three parallel sessions. There were also four poster sessions during the conference. Totally 128 papers were presented, many the presentations were in some way related to my area of interest which often made it difficult to choose which session to attend. A keynote presentation with the title "Computing Platform Requirements for Future Mobile Devices" was given by Misha Burich from Altera describing the possibilities with current FPGA technology and design tools. During the last day Peter Alfke from Xilinx gave a tutorial presentation on recent progress and future trends of FPGA technology which complemented the keynote in a great way.

The First day my colleague Najeem Lawal presented his paper on "Address Generation for FPGA RAMs for Efficient Implementation of Real-Time Video Processing Systems".

Generally the conference had many interesting presentations, several presentations involved use of the Handel-C design language which I was very unfamiliar with. The most useful presentation for me was a poster presentation on an instruction set extension for the Xilinx Microblaze Processor.

Representatives from different FPGA and design tool vendors, such as Xilinx, Altera, Synopsys and Mentor Graphics were present during the poster sessions which resulted in many interesting discussions; I also had the chance to find out more about Handel-C from Celoxica, who were there to display their design tools.

Travel Report from FPL 2005

Najeem Lawal
Mid Sweden University
najeem.lawal@miun.se

Introduction

International Conference on Field Programmable Logic and Applications (FPL) is the largest conference in the area of field-programmable logic. Developments in field-programmable logics have made them applicable for implementing large systems and accelerators. They are now employed in environments where hard real-time constraints must be guaranteed and for complex reconfigurable computing. The topics covered include reconfigurable architectures, applications, design methods and tools. Conference discussions usually include industrial applications, advanced electronic design automation (EDA) tools, research applications, novel systems architectures and educational experiences.

The Conference

The 15th edition of the International Conference on Field Programmable Logic and Applications tagged FPL 2005 took place in Tampere, Finland from August 24 to 26, 2005. It was organised by the Tampere University of Technology and co-sponsored by IEEE Circuits and Systems Society, IEEE Finland Section and Academy of Finland. There were two keynote addresses, "Computing Platform Requirements for Future Mobile Devices" by Yrjö Neuvo, Nokia, Finland and "Directions in FPGA Architectures and Design Methodologies" by Misha Burich, Altera, USA. There were ten presentation sessions, three poster sessions and one PhD forum. The most beneficial to me were sessions on Logic Synthesis, Video Processing Applications, Architectures and Systems, Multidimensional Processing and Compilation.

The Presented Paper

In this conference I presented a paper "Address Generation for FPGA Block RAM Accesses enabling Efficient Implementation of Real-Time Video Processing Systems". This paper described two approaches on accessing on-chip FPGA Block RAMs based on the global memory object architecture. A comparison of the experimental results obtained using the two approaches on real-time image processing systems design cases was included in the paper. There were two questions which were well answered and a comment.

Conclusions

I attended the conference with a colleague Niklas Lepistö and we had the opportunities of meeting many FPGA technology researchers. We discussed with both Altera and Xilinx representatives about FPGA memory architecture. Altera offers FPGAs with different memory sizes of a single chip while Xilinx offers only one memory size on-chip depending on the product family. The major reason for this difference is that Altera tends to provide a hardware platform that is more software friendly while Xilinx is dedicated to technology optimization by using single memory architecture per chip. This difference gives room for research opportunities: flexible memory architectures effectively optimised for process technology.

We had an excellent dinner after a nice Viking boat cruise.

Travel Report from APPSEM05

Johan Erikson
Department of Computer Science and Electronics
Mälardalen University
johan.erikson@mdh.se

APPSEM (<http://www.tcs.informatik.uni-muenchen.de/mhofmann/appsem2/>) is a thematic network funded by the IST program of the European Union. Its objective is to promote research into application-oriented semantics of programming languages. This years workshop on applied semantics, APPSEM'05, was held 12-15 September 2005 in Germany, and was located at the island of Frauenchiemsee, in the Lake Chiemsee. The geographical location of Lake Chiemsee is approximately right in the middle of Munich and Salzburg. The workshop, as well as its participants, was hosted by the sisters of the Benediktinerorden in their abbey.

Frauenchiemsee is a rather small island, you could easily walk around it in 15 minutes. But despite the size of the island, there was a lot of tourists coming to it, and I think there were 3 or 4 restaurants and a number of "Biergartens" on the island, as well as some souvenir stores. The main attraction is probably the above mentioned abbey though.

The reason for my trip was to present the paper titled "Two Formal Semantics for PLEX", which was authored together with my supervisor (B. Lisper). The paper was presented in a special session devoted to applications of semantics in industrial applications/problems.

As usual (?) there was a mix between interesting, and not so interesting, talks as well as some invited talks. Among the invited speakers were Chris Hankin (program analysis), and Joy Stoy (Bluespec) who talked about how the company had "hidden" semantic technology in their design tool in order to get it accepted by people not familiar (or sceptical) to semantics . . .

My overall impression is that it was a very well organized conference at a very pleasant location, even if took quite some time to get there; my flight departed from Stockholm at 10:45 and I arrived at the abbey somewhere around 18:30 . . . I met a lot of interesting people at the conference, both Phd-students and senior researchers, and the discussions during the meals, coffee breaks, etc. was about all kinds of different subjects such as lambda calculus, protocol specification, German beer, and comics (Tintin and Asterix :-)

Travel report from Net.ObjectDays 2005

David Svensson
Department of Computer Science, Lund University
david@cs.lth.se

The conference

Net.ObjectDays is a yearly international conference in Erfurt, Germany. This year it took place September 19–22. The main topics of the conference are software architecture and Internet technologies: Java, .NET, Web services, model-driven architecture, XML... I was there for attending the whole conference, and for presenting our paper *Composing Ad-hoc applications on ad-hoc networks using MUI*, at a workshop called Mobility Aware Computing.

Visiting this conference was very interesting and rewarding indeed. The following are some highlights from the talks:

- The main keynote was by Dave Thomas, who, among other things, is one of the persons behind the Eclipse IDE. He talked about the challenges of application development. His interest now was in so called Very High Level Languages, where skilled programmers write programs for very specific tasks, e.g. at the New York Stock Exchange. These programs live only for a few hours, but utilize thousands of processors at the same time.
- Andreas Raab from HP Research Labs demoed Croquet, a very cool 3D collaboration environment, with an integrated scripting programming environment in the 3D world. Mr Raab explained how they made heavy use of distributed computations. This meant that they could invite almost any number of spectators to a game, as long as these people do not interact, and just look (they perform their own computations).
- Steffen Meschkat from Google talked about Ajax, a technology for building Web applications, where more processing is done at the client side. He discussed experiences from building Google Maps, and demonstrated live over the Internet. The result was impressive, but it was striking that much seemed to be based on JavaScript, which has been around for quite some time.
- At the Mobility Aware Computing workshop, Gabor Paller from Nokia Research Center presented a paper which I found interesting. It was about a technique for increasing Java performance on resource-constrained devices. The idea was to introduce a new bytecode for explicit memory deallocation. This bytecode was to be inserted by a tool, after data-flow analysis of the program, with the purpose of getting less garbage collection.

The town

Erfurt is the capital of the German state of Thuringia. It has a nice city centre, with many fine buildings from medieval times. These were presented to us at a city tour one night, where we got to see traces from both Martin Luther and the Swedish king Gustav II Adolf. There is a calm atmosphere, in part thanks to the tram network, which means that there are few cars in the centre. I also experienced some cultural differences, compared to Sweden. E.g., at McDonald's, the staff came around to the tables, serving coffee after the meal. Very nice!

Pavel Krcal

December 6, 2005

I have attended FORMATS'05 conference, Uppsala (September 2005). This conference is focused on the formal verification of timed systems. The invited speakers, however, were chosen so that they represented an applied real time research. Lothar Thiele (ETH Zurich) presented arrival curves and their applications in hard real time scheduling. Karl-Erik Arzen (LTH Lund) talked about real time problems in control theory and presented several simulation tools. The most interesting papers were (among others)

- Average Reward Timed Games by Bo Adler, Luca de Alfaro, Marco Faella
- Quantifying Similarities Between Timed Systems by Thomas Henzinger, Rupak Majumdar, Vinayak Prabhu

The first one deals with an analysis of the average behaviour of systems with an uncontrollable environment. The other one proposes a measure on timed systems to express how similar they are using game theoretical concepts.

Report from ATIST 2 Summer School on

Component & Modelling, Testing & Verification, and Statical Analysis of Embedded Systems

Nässlingen, Sweden, September 29 - October 2, 2005

Motivation

This 4 days summer school is held at Nässlingen, a small and old archipelago homestead, located about 50 km north east of Stockholm. The summer school aims to provide a forum for young researchers in the fields of modelling, validation and performance analysis of embedded systems as well as industrial engineers with practical background in design and testing of embedded systems.

A number of foundational tutorials accompanied by a selection of exiting new emerging technologies were given by leading scientific experts in three domains: Modelling & Components, Testing & Verification and Compilers & Timing Analysis.

Highlights

The most interesting tutorial for me is in the modeling cluster. Ileana Ober gave a tutorial about UML/UNL2.0, which presents the major features of UML, with focus on system and components modelling of structure and behaviour. However, not much about UML 2.0 was introduced due to the time restriction.

Pierre Alain Muller and Reiko Heckel presented “Foundations of Model Transformations” and “Applications of model transformations”, where the basic concepts of graph transformation was introduced by mean of an example followed by an discussion of different applications.

Other presentations are also good but out of the scope of this report. Please see <http://www.artist-embedded.org/FP6/ARTIST2Events/SummerSchools/Artist05.html> for detailed information of presented tutorials.

Activities

As mentioned, Nässlingen is a small island combined old characters and modern fashion. Row-boat attracted many participators interests. Dinner on Gistholmen was full of happiness. Groups from Sweden, China, German, Italy, France and other countries sang typical songs. The Tai Ji show got many interesting feedbacks.

Experience Learnt:

Check map very carefully if you take bus. The table on the bus stop at Åsättra is not complicate but easily leads you to the opposite direction. I had to walk half hour and fortunately were driven to the port by a kind lady.

Travel Report from NWPT05

Johan Lindhult
Department of Computer Science and Electronics
Mälardalen University
johan.lindhult@mdh.se

The NWPT series of annual workshops is a forum bringing together programming theorists from the Nordic and Baltic countries (but also elsewhere). The scope of the workshop is to cover different aspects of program theory, and my impression is that this is a suitable "first workshop" for a Phd-student working in this area, since it is allowed to submit work that are to appear in formal publications elsewhere, as well as work in progress.

This year, the workshop was held in the second half of October (19-21), hosted by the University of Copenhagen. The *August Krogh* institute, where the workshop was held, is located in Universitetsparken, which is approximately 10 minutes by bus (or a 30 minutes walk) from central Copenhagen.

Traveling to Copenhagen was very convenient, the flight from Stockholm took one hour and the train from the airport to central Copenhagen took approximately 15 min. The only negative thing with the journey was my choice of hotel; I had managed to find a hotel that was not close to, but exactly adjacent to one of the railway stations. I had the first track right below my window!

My contribution to the workshop was a paper titled "Formal Semantics for PLEX", which was a summarized version of a paper presented in September at the APPSEM05 workshop. The paper was presented on the first day of the workshop which meant that I didn't have to spend some of my time (during the workshop) preparing for my own presentation.

The program was organized in a number of blocks, where each block was divided in parallel sessions. The invited talks were given at the beginning of the blocks, before the parallel sessions started. This was actually my first conference/workshop where the presentations was divided in parallel sessions. The advantage is that more presentations can be accepted, but at the same time it can be a problem if you want to attend two talks at the same time. Lucky enough, I didn't find myself in such conflicts during the workshop.

My overall impression is that the organizers really had made an effort in considering peoples traveling plans since the workshop started after lunch on the 19:th, and the final sessions (on the 21:th) ended before lunch.

Travel Report for IEEE NORCHIP 2005

Najeem Lawal
Mid Sweden University
najeem.lawal@miun.se

Introduction

The NORCHIP conference the main microelectronics event of the Nordic countries. Conference topics usually cover all areas of microelectronics (both digital and analogue) thus providing a large platform for collaboration among researchers in different fields but related to microelectronics. The conference provides an annual forum for presentations and discussions of advances in design and prototyping of VLSI circuits and systems and focuses on design concepts and results, verification, prototyping and testing of VLSI systems.

The Conference

This conference sponsored by the IEEE Circuits and Systems Society and the University of Oulu took place at Oulu, Finland on 21-22 November 2005. The focus of this year's conference was radio frequency (RF) technology. The keynote speech "Digital RF processors for Cellular Radios" was given Dirk Leipold, Texas Instruments, USA. I presented a paper at this conference. There were sixteen presentation sessions and two poster sessions.

The Presented Paper

My paper "Embedded FPGA Memory Requirements for Real-Time Video Processing Applications" was presented as a poster since it was not directly related to RF technology which is the subject of the conference. The paper is an analysis of the current and future requirements of video processing systems allocated on FPGA embedded memory resources and concludes that FPGAs should support multiple memory sizes to take full advantage of the architecture. The analysis was performed such that a set of video processing systems are allocated onto different existing and extrapolated FPGA architectures.

Conclusions

Although the conference is for Nordic countries there were researchers from all parts of the world. I met Arnaldo Azevedo from Brazil whose work is related to mine and we had excellent discussions on the challenges related to efficient use of FPGA embedded memories in video processing. I found the technical sessions on logic circuits and digital application to be very informative. Also I found discussions during the poster session very practical and personal since only researchers whose works are closely related and who are really interested in a poster come forward to ask questions. There is always enough time for a one-on-one discussion and opportunity to present their arguments. There is also enough room for people to explain why the suggestions would contribute to the work in the poster. I had the privilege of having intensive discussions with two people.

Travel Report from NORCHIP'05

Niklas Lepistö
Mid Sweden University, Sundsvall

Introduction

In November 21-22 I attended the NORCHIP conference with several of my colleagues from Mid Sweden University. NORCHIP is an annual microelectronics conference which is usually organized in the Nordic countries, it covers all areas of microelectronics from analog and RF to digital design. The NORCHIP 2005 conference was held at the Radisson SAS hotel in Oulu, Finland.

The trip

Since there were no direct flights between Sundsvall and Oulu we had to travel through Stockholm and Helsinki with a total of three flights, which resulted in a lot of time spent at the airports. After spending 8 hours travelling we finally ended up in Oulu, about as far from Sundsvall as the distance covered by the shortest of our three flights.

Oulu is the largest city in northern Finland and has a population of about 120000. The city is located at the Gulf of Bothnia and is approximately at the same latitude as the Swedish city of Skellefteå. This year happened to be the 400th anniversary of Oulu, not that I would have noticed it without someone telling me. I was slightly disappointed with the weather; there was no snow at all and it was far too warm for northern Finland.

The conference

The conference lasted for two days and had two parallel sessions, one for analog electronics and the other for digital electronics, there was also a poster session held each day. Totally about 70 papers were presented during the conference. The first day started with an opening speech by Timo Rahkonen from the University of Oulu followed by a keynote speech on Digital RF processors by Dirk Leipold from Texas Instruments. The keynote was one of the most interesting presentations on the conference and gave a relatively technical (for a keynote) description of Texas Instruments chips for software defined radio.

At the end of the first day I presented my paper, "High-Performance FPGA-Based Camera Architecture For Range-Imaging", it was my first "real" presentation and afterwards I felt that I probably should have used that extra time at the airport for rehearsing. On the second day my colleague Najeem Lawal had an interesting poster presentation on Embedded FPGA Memory Requirements for Real-Time video Processing Applications. Another presentation among the most interesting ones was on Semi Floating Gate A/D converters presented by René Jensen from Oslo University. To my surprise the analog electronics sessions which I attended proved to be more interesting than many of the digital sessions.

Report from the 3rd Swedish National Computer Networking Workshop 23-24 November 2005

Andreas Johnsson
The Department of Computer Science and Electronics
Mälardalen University, Sweden

November 30, 2005

1 Venue

The 3rd Swedish National Computer Networking Workshop (hereafter SNCNW) was held in Halmstad, which is located on the west coast of Sweden. The workshop took place at Halmstad Högskola.

2 Workshop

The aim of SNCNW is to bring researchers in Sweden within the area of computer communications together. The workshop gives opportunities to present current research within its early stages. Another important aim of the workshop is to discuss new wild ideas and to find new partners for collaboration.

My contribution to the workshop was to present a work on how active network measurements affect the performance of TCP. Using active network measurements one can obtain an estimate of the available bandwidth between two nodes in a network. Soft real-time systems that depend on the available bandwidth can use the estimate in order to adapt and adjust the send rate to the current conditions. For example, a tool that is streaming live TV to viewers over a network (e.g. the Internet) adjusts the send rate by changing the quality of the stream. A lower quality requires less available bandwidth.

Other interesting work presented at SNCNW was, for example, the following:

- a work on how to improve the estimates of the available bandwidth on an end-to-end path by adjusting parameters in the estimation algorithm. The method in focus of this work estimates the available bandwidth in real time.
- a work that discussed quality of service for ad-hoc multicast communication.
- a work that discussed scheduling analysis to support real-time services over standard switched Ethernet.

One social event was planned for the researchers attending SNCNW. It was a workshop dinner on the 23rd of November. Great food, wine and company!

3 Experiences

Oral presentation of research results is always an important exercise and experience, even though it may be a bit nervous. This is my 5th large presentation (in English) of research results. It seems that, and I surly hope that, I manage to give better and better presentations. The questions asked after the presentation also gives feedback on how well you managed to explain your research.

Another experience from the workshop was that it seems important to have a local Swedish workshop dealing with computer communications. SNCNW is a great place for new researchers to try their wings and to get feedback from a comparatively friendly audience.

I have spent a month on a research stay at the National University of Singapore in the group of P.S. Thiagarajan. I have mainly worked on the synthesis of time bounds for Timed Petri Net models there. Other research topics were scheduling with quality of service requirements and schedulability with the processor availability information.

The synthesis problem for Timed Petri Nets I have studied there was motivated by the design of the integrated circuits, where the timing constraints become a key issue. From the theoretical point of view, the hope

for a synthesis algorithm was based on a recent paper by Madhusudan, Thiagarajan, and Yang (P. Madhusudan, P.S. Thiagarajan and Shaofa Yang, The

MSO Theory of Connectedly Communicating Processes, FSTTCS'05). The authors identify a class of distributed systems for which the controller synthesis problem is computable in this paper (otherwise, the controller synthesis problem is not computable for many distributed systems). The goal was to show that a new notion of K-fairness gives us a property making timing constraints synthesis computable. However, it turned out that this notion is

not sufficient and we would need a stronger notion.

Other research directions I have met in Singapore are formal analysis of hybrid systems and scheduling. The motivation for the research in formal analysis of hybrid systems is that the current models enable for behaviours which are unrealistically detailed. Therefore, the goal is to limit these behaviours while preserving a reasonable modeling power. Results of this research have been recently published in several papers at HSCC conference (e.g., Manindra Agrawal, Frank Stephan, P.S. Thiagarajan and Shaofa Yang, Behavioural Approximations for Restricted Linear Differential Hybrid Automata, HSCC'06).

A novel method for scheduling investigated in Singapore is to transfer methods and results from the electrical engineering community, namely analysis of systems using arrival curves. The research group has defined a new class of discrete time automata - event count automata - which extends the notion of the arrival curves with state information. This approach is being experimentally evaluated for quality of service scheduling for multimedia streams. The seminal paper introducing event count automata is Samarjit Chakraborty, Thi Xuan Linh Phan, and P.S. Thiagarajan, Event Count Automata: A State-based Model for Stream Processing Systems, RTSS'05.

Industry Visit Report: Ericsson AB, Stockholm

Johan Lindhult
Department of Computer Science and Electronics
Mälardalen University
johan.lindhult@mdh.se

Introduction

During the period fall 2004 - 2005, I have spent approximately 1 day/week at Ericsson AB in Älsjö, Stockholm. The site in Älsjö is, among other things, responsible for the development and the maintenance of the software in the AXE exchange system. I don't think that Ericsson as a company need any further introduction.

The project that I am involved in, deals with adapting software written for sequential architectures to parallel hardware. This is carried out together with people from Ericsson, and I also have two of my (assistant) supervisors at the company.

The purpose of my visits

The main reason for the "trips" during the fall of 2004 to the summer of 2005 has been to document (by a formal semantics) the language PLEX, which is used to program the functionality in the AXE system. In this work, we have looked at both the current sequential implementation/architecture, as well as an experimental implementation/architecture. The work has been carried out together with my supervisors at Ericsson, and we have also reported on the developed semantics in a paper presented at the APPSEM'05 workshop [1].

The visits has continued this fall (2005), and the purpose is now to perform inspection of the current software in order to get an opinion on how well the existing code is suitable for parallel processing, i.e., trying to identify those parts of the software that are suitable candidates for concurrent processing. In order to determine this, i.e., to get an opinion on the suitability, we look at how the shared variables in the system are used, and if there are any potential problems/conflicts. This has already been discussed, in theory, in a master thesis project at the university [2], and the main purpose of our current activities is to get an opinion on the actual frequencies of the potential problems discussed in this master thesis. The result of this study is planned to be published in a Technical Report, and perhaps also in a forthcoming conference/workshop paper (as a case study).

References

- [1] J. Erikson and B. Lisper. Two Formal Semantics for PLEX. In *Proceedings of the 3rd APPSEM II Workshop, APPSEM'05*, Frauenchiemsee, Germany, 13-15 September 2005.
- [2] B. Lindell. Analysis of reentrancy and problems of data interference in the parallel execution of a multi processor AXE-APZ system. Master's thesis, Mälardalen University, 2003.

Report from Industry Visit in VCC at Göteborg

Jianlin Shi

PhD at Mechatronics, KTH

jianlin@md.kth.se

Motivation

The motivation of the industry visit in VCC (Volvo Car Corporation) is to investigate and study the current industrial problem and tendency regarding model based tool integration at complex mechatronics products development, and thus to identify the needs and requirement following by analysis, and new framework and work procedure development.

Interviews

I had couple of interviews with people working in different department at VCC, covering electrical functions, architecture design, infoentertainment and so on. This helped me to know the situation of model based development and information management at VCC. Near 10 participators provided lots information.

Workshop

The first workshop on 21st January was hold at VCC. Participators were from VCC, Systemite, CTH/IVF, and KTH.

The workshop was divided into two parts: state of art and research projects introduction. In the workshop, projects MBEED/EEDS and Model management motor control from Volvo, Integrated product development from CTH/IVF, Scania Case Study, Aida2 and truck development from KTH were introduced.

On the second workshop, the summary of the interview was presented.

More information could be found at <http://www.md.kth.se/RTC/modcomp>.

Graduate student	Activity	page
2004		
Anderas Johnsson	CiC'04 "International Conference on Communications in Computing" in Las Vegas, USA.	1
Johan Fredriksson	"26th International Conference on Software Engineering (ICSE), 23-28 May 2004, Edinburgh, Scotland".	3
Joakim Eriksson and Linus Svensson	ECRTS 2004 and WCET 2004.	4
Larisa Rizvanovic	"16th Euromicro Conference on Real-Time Systems (ECRTS 04) and RTMM - International Workshop on Real-Time for Multimedia, Catania, Sicily, Italy, June 29th - July 2nd, 2004".	6
Dan Henriksson	"2004 American Control Conference (ACC04) "	7
Martin Andersson	"The 10th IEEE RealTime and Embedded Technology and Applications Symposium (RTAS 2004)".	9
Mikael Åkerholm	"26th International Conference on Software Engineering (ICSE), 23-28 May 2004, Edinburgh, Scotland "	11
Johan Andersson	"26th International Conference on Software Engineering (ICSE 2004) May 22nd – 29th 2004, Edinburgh, Scotland, UK".	13
Håkan Zeffner and Martin Karlsson	"The Tenth International Symposium on High-Performance Computer Architecture (HPCA 2004)".	14
2003		
Cecilia Ekelin	"the 7th International Conference on Principles of Distributed Systems (OPODIS'03)"	15
Lars Albetsson	"The Fourth International Workshop on Software and Performance (WOSP 2004), California."	17
Björn Andersson	RTSS 2003, Cancun, Mexico	18
AnnMarie Ericsson	RTSS 2003, Cancun, Mexico	19
Sven Gestegård Robertz	"The 2003 ACM SIGPLAN Symposium on Languages, Compilers and Tools for Embedded Systems (LCTES'03)"	21
Radoslaw Szymanek	Design Automation Conference 2003	23
Anders Pettersson	RTCSA 2003 in Tainan, Taiwan	25
Jonas Neander	International Parallel and Distributed Processing Symposium, (IPDPS), 22-26 april 2003, Nice, France	26
2002		
Elisabeth Uhlemann	UniSA 2002, RTAS 2002, ISIT 2001	28
Anders Möller	The 17th International Parallel & Distributed Processing Symposium (IPDPS) in Nice 22 – 26 April 2003.	36
Dan Henriksson	RTAS02	38
Jonas Norberg	DSN02	41
Cecilia Ekelin	ICPP'02, 31th International Conference on Parallel Processing, August 18-21, 2002	43
Håkan Sundell	LCR'02: Sixth Workshop on Languages, Compilers and Run-time Systems for Scalable Computers.	45
Thiemo Voigt	Protocols for High-Speed Networks April 2002, Berlin	47
2001		
Andréas Johansson, Robert Lindström, Martin Hiller	ISSRE 2001	49
Thomas Nolte	ETFA 2001	51
Martin Karlsson	ISCA 2001	52
Vilgot Claesson	SRDS 2001	53
Alexandre David	ETAPS 2002	54
Tomas Lennvall	ETFA 2001	55
Bo Lincoln	University of Illinois	56
Ulf Assarsson	SIGGRAPP 2001	57
Örjan Askerdal	European Test Workshop, Saltsjöbaden, Stockholm May 29 -June 1, 2001.	58

Graduate student	Activity	page
Yi Zhang	SPAA 2001	59
Thiemo Voigt	USENIX 2001	61
Lars Albertsson	RTAS 2001	63
Asmus Pandikow	INCOSE 2001 in Melbourne, Australia.	64
Jan Carlson	ECRTS'01	66
Jakob Engblom	DARP HIRTS WS in York May 2001 (only available on paper)	
Flavius Gruian	ASP-DAC 2001	67
2000		
Per-Håkan Sundell	Opodis 2000	68
Björn Andersson	RTCSA 2000	71
Radu Dobrin	RTCSA 2000	72
Anton Cervin and Bo Lincoln	CDC 2000	74
Anders Pettersson	RTSS'2000	75
Tomas Lennvall	RTSS'2000	76
Anders Wall and Markus Lindgren	RTCSA '00.	78
Ola Redell	RTSS'2000	80
Ulf Assarsson	SIGGRAPH2000	82
Flavius Gruian	PACS 2000 and 9:th ASPLOS	84
Elena Fersman	SPIN '2000	86
Patrik Persson	TOOLS EUROPE 2000.	89
Lars Albertsson	RTAS'00	90
Cecilia Ekelin	RTAS'00	92
1999		
Monika Andersson Wiklund	RTMCS and RTSS 99.	
Martin Sanfridson	RTMCS and RTSS 99.	
Marcus Nilsson	Visit to Liafa Paris	94
Ulf Assarsson	SIGGRAPH 99	96
Johan Eker	RTCSA'99	98
Thomas Lundqvist	from RTCSA'99 and RTSS '99	99
Cecilia Ekelin	from CP'99 and RTC'99	105
Paul Pettersson	FM'99 , World Congress on Formal Methods, 20-24 September 1999.	108
Alexandre David	FM'99 , World Congress on Formal Methods, 20-24 September 1999.	110
Per Håkan Sundell	EUROMICRO'99 (on Real-Time Systems), June 9-11th, 1999.	113
Jakob Engblom	RTAS '99, Vancouver, June 2-4, 1999	114
Anton Cervin	EUROMICRO'99 (on Real-Time Systems), June 9-11th, 1999.	115
Andreas Ermedahl	EUROMICRO'99 (on Real-Time Systems)	116
Man Lin	24th IFAC/IFIP Workshop on Real Time Programming WRTP'99 and the Third International Workshop on Active and Real-Time Database Systems ARTDB-99	119
Patrik Persson	LCTES '99, ACM SIGPLAN 1999 Workshop on Languages, Compilers, and Tools for Embedded Systems	120
Patrik Persson	ETAPS '99 (European Joint Conferences on Theory and Practice of Software)	121

Andreas Johnsson
Mälardalens Högskola
Institutionen för Datavetenskap

ARTES++ reserapport 2004

Inledning

Jag har varit på en konferens i Las Vegas från den 19 juni till den 26 juni 2004, delvis finansierad av ARTES++ (10000 kronor har rekvirerats). Konferensen som jag reste till hette "International Conference on Communications in Computing" (CiC'04), som var en del av en internationell multikonferens i datavetenskap.

Jag presenterade två artiklar på under en session som hette "Special session on Network Simulation and Performance analysis". Mina artiklar presenterade forskningsresultat inom bandbreddsmätningens område. Bandbreddsmätningar anses vara viktiga vid prediktering av prestanda (tillgänglig bandbredd samt länkkapacitet) vid användandet av mjuka realtidssystem som ska fungera över t.ex. Internet. Exempel på mjuka realtidssystem som är intressanta från mitt perspektiv är "Voice over IP" och strömmande media.

Den ena artikeln ("On the Analysis of Packet-Train Probing Schemes") presenterades muntligt. Den var ganska teoretisk och handlade om interaktionen mellan mättrafik och övrig trafik på Internetlänkar. Den andra artikeln ("A Study of Dispersion-based Measurement Methods in IEEE 802.11 Ad-hoc Networks") presenterades på en poster. Den artikeln tittade på aktuella och än så länge olösta forskningsfrågor när mätning av tillgänglig bandbredd ska göras i trådlösa nätverk.

Konferensen

Som nämndes i inledningen så var CiC'04 i Las Vegas en av flera konferenser som gick parallellt. Ämnesområdena sträckte sig från databaserad analys av sjukvårdsdata till datakommunikation och datasäkerhet.

Kvaliteten på bidrag och presentationer var högst varierande. Tyvärr så var många föredrag dåligt genomförda och ur min synvinkel ointressanta. På vissa sessioner fattades även upp till hälften av berörda författare och presentatörer. På grund av den dåliga närvaron tvingades konferensorganisatorerna att stuva om i presentationsscheman vilket i sin tur ledde till att jag missade en del potentiellt intressanta föredrag. Anledningen till saknade presentatörer sades vara tull- och visumproblem.

I övrigt så fanns det få intressanta föredrag som berörde realtidssystem eller prediktering av prestanda. Jag gick istället framför allt på föredrag med anknytning till allmän datakommunikation eller datasäkerhet. Jag passade även på att bredda mig genom att lyssna till en del forskning i medicinsk datavetenskap.

Las Vegas

Staden Las Vegas var något utöver det vanliga. Jag bodde på hotell Monte Carlo, vilket även var platsen för konferensen. Hotellet syns på bilden nedan till vänster.

Mina intryck av Las Vegas (speciellt turiststråket "the Strip") kommer framförallt från storleken på hus, kasinon, shoppingstråk, bilar med mera. Dessutom är Las Vegas ett verkligt turistparadis speciellt för dem som tycker om att spela på kasinon, men även för dem som tycker om bad och nöjesfält. (På bilden nedan till höger ses en mycket typisk enarmad bandit.)



Jag passade även på att besöka Las Vegas centrum. Där stannade jag dock inte länge. Här fanns ju inga shoppingcentra och inte heller några fina casinon.

Värmen är också något som gav ett bestående minne. Det var torrt, varmt (107 grader Fahrenheit som varmast) och soligt under alla dagarna jag var där.

Jag åkte på utflykt ut i öknen och bergen utanför Las Vegas med "Pink Jeep Tours". Det var en guidad tur där man fick lära känna växt- och djurliv samt veta en del om geologi och kulturarv. Området som vi besökte hette "Red Rock Canyon", vilket är en frekvent använd bakgrund i många västernfilmer. Den här utflykten var en skön kontrast mot det turistexploaterade Las Vegas.

Reflektioner

Jag har fått en hel del positiva erfarenheter från min Las Vegas resa, även om själva konferensen inte var den bästa. Framför allt är det erfarenhet av att presentera mitt forskningsmaterial inför andra som gav störst utdelning. Presentationer är inte min starka sida varför det är viktigt att träna på just detta.

Det var även givande att träffa andra unga forskare i samma situation som mig - det vill säga personer som var ute på en av sina första stora konferensresor där de ska presentera sitt forskningsmaterial. Jag pratade framförallt med en instituttsforskare från Finland samt en kvinnlig doktorand från Grekland.

I övrigt skulle jag inte rekommendera en alltför erfaren person att åka på just denna årligt återkommande internationella multikonferens. För det första är det dyrt att ta sig till Las Vegas och för det andra så höll konferensen inte tillräckligt hög kvalitet. För personer med mindre erfarenhet (som jag själv) är det dock en bra förstagångskonferens.

Travel Report from ICSE 2004

Johan Fredriksson

Mälardalen University, Department of Computer Science and Engineering

johan.fredriksson@mdh.se

3rd June 2004

This year, the ancient Scottish city of Edinburgh hosted the **ICSE** conference from 23rd to 28th May. ICSE is one of the largest and most prestigious conferences within the area of software engineering. I and two colleagues presented a paper at the 7th international Symposium on Component-Based Software Engineering (CBSE) which was held in conjunction with the ICSE conference. ICSE is a very large conference with almost 1000 participants, more than 70 papers on the main conference, six adjunct and co-located events and almost 20 workshops and nine tutorials. During the conference there are also many industrial sessions and events.

It was very exciting to participate in the conference and even more exciting to have a paper accepted in one of the co-located events. CBSE7 was a two day event with 25 papers and about 70 participants. As usual the symposium was very discussion oriented, and many of the senior researchers within the community participated in the discussions. One of the hot discussions of this year was regarding component composition. The symposium featured two invited talks. The first speech was by Oscar Nierstrasz, University of Bern, who talked about continuing change and increasing complexity of modern software. The second talk was by Hans Jonkers, Philips Research in Eindhoven, who talked about component interfaces.

The invited keynote speakers of the conference were also overall quite good; one of them however, made a special impact on me as well as many others. This one, special keynote speaker, was Richard Stallman, the founder of the Free Software Foundation. Stallman is also widely known as the author of EMACS, and the GNU system. Stallman was talking about the negative impact of software patents for small businesses, and that the only ones that really gain from patents are the larger companies.

The most interesting part of the conference was, as usually, to meet and talk to fellow researchers. One of the discussions lead to a cooperation on a paper with a professor at an Australian university.

Edinburgh is a very charming town with many small pubs and restaurants. The building style is old-fashioned and somewhat picturesque. The food in scotland is quite british, and so is the beers. Edinburgh has a lot to offer in terms of historical buildings and monuments. The most obvious monuments are the castle and the scotts monument, both located in the very center of the city. Edinburgh is well worth a few days of extra stay. And I suggest visiting the castle of Edinburgh.





ECRTS 2004 and WCET 2004

Joakim Eriksson (Joakim.Eriksson@ltu.se)
Linus Svensson (Linus.Svensson@ltu.se)
Luleå University of Technology
Sweden

Introduction

The 16th Euromicro Conference on Real-Time Systems (ECRTS 04) and the associated 4th Intl Workshop on Worst-Case Execution Time (WCET) Analysis was held June 29 – July 2, 2004, in Catania, Sicily, Italy.

Since we were relatively new to the area of real-time systems and WCET analysis, this seemed to be a good opportunity to get an overview of current research.

We were also looking forward to travelling to a conference in Italy instead of USA since we would not suffer from jetlag once we were back in Sweden.

WCET Workshop

As we did not foresee any trouble travelling within Europe, we planned to arrive in Catania the day before the workshop. Unfortunately, the plane taking us to Milano collided with a fence just before takeoff in Stockholm. Not a big collision, but nevertheless it delayed us for three hours – enough for us to miss our connecting flight to Sicily. As a consequence we were delayed one day and did not arrive to the workshop until lunch time which meant that we missed two out of three sessions.

The third session was about WCET calculation methods. Among the presented papers, *Measurement-Based Worst-Case Execution Time Analysis using Automatic Test-Data Generation* by Kirner, Puschner and Wenzel was perhaps the most interesting. It addressed the problem of finding accurate timing models for processors. Their approach is to use automatic generation of test data to find instruction timing for code sequences.

ECRTS Conference

The conference covered a wide range of different real-time subjects, altogether 12 sessions during three days.

In a work in progress session, Nasr et. al. used Uppaal to express different scheduling policies within the Cotre project. This was of some interest to us since we had been working with Uppaal in an ARTES++ course.

One of the conference's sessions covered timing and execution-time analysis. A paper worth mentioning is David and Puaut's *Static Determination of Probabilistic Execution Times* where they work with probabilistic distributions of execution times, instead of conventional worst-case execution times.

Another interesting session covered the topic of energy-aware real-time computing. The three papers presented covered topics such as dynamic voltage scaling, slowdown factors, static and dynamic algorithms, and systems with both predictable and unpredictable workload.

Finally, we found one of the keynote speakers, professor Alan Burns, very interesting. Especially his introduction to Ada 05 with features like timing events, dynamic priorities and support for EDF dispatching.

Catania

Downtown Catania was rather charming, especially after eight o'clock in the evening when many back streets were closed down for car traffic, and the restaurants spread out onto the streets. The food was as expected very good (even though they seemed to have problem making a decent pizza). The weather in Catania was warm and sunny; this was appreciated by Joakim while Linus preferred the climate on Etna.

Conclusions

This was our first conference in the area and we believe that it gave us a good overview of not only current research, but also over different research groups.

A conference also provides the opportunity to meet new people and this conference was no exception. The relatively small number of participants (perhaps 150 persons) made the atmosphere relaxed and informal, something that encourages people to talk.

Worth mentioning was also that a large number of Swedish participants, including a few more ARTES/ARTES++ students besides the authors.

Finally, a few words on the subject of jetlag. It seems that jetlag is not limited to travels across time zones – travels across climate zones are just as bad. A northbound flight from the subtropical Catania to the subarctic Luleå can easily be compared to an eastbound flight from New York to Stockholm.

**Travel report from
16th Euromicro Conference on Real-Time Systems (ECRTS 04)
and
RTMM - International Workshop on Real-Time for Multimedia
Catania, Sicily, Italy,
June 29th - July 2nd, 2004**

**Larisa Rizvanovic
Mälardalen Högskola,
Department of computer science**

The sixteenth Euromicro Conference on Real-Time Systems (ECRTS 04) is a forum aimed at covering state-of-the-art research and development in real-time computing. The conference was held in Catania, Italy. In conjunction with conference I have also attended RTMM - International Workshop on Real-Time for Multimedia with special focus on Real-time Middleware for Consumer Electronics.

On this workshop I have presented my work which was carried out within the FABRIC project (FABRIC is the European IST project IST-2001-37167). The whole workshop was very interesting for me, thus it has a topic that is really close to my research area.

The workshop addressed the global interoperability aspects while concentrating on delivering standard wide real-time guarantees to provide high quality guaranteed video and audio streaming between devices operating under different middleware standards. Very interesting point of the workshop was a panel discussion. A topic of the panel was to address a number of initiatives, both industrial and academic, in order to provide a solution for communication among networked multimedia devices. I heard a critical view at these initiatives both from the application and research viewpoints. The objective was to identify new possible opportunities and areas in which research has to be reinforced.

The conference offered many interesting papers and presentation. The papers presented can be sort in five categories:

Foundations - theories and models of real-time computing and systems

Applications and Tools - embedded real-time systems; real-time control applications; real-time aspects in ubiquitous computing; distributed real-time information systems/databases; video/audio streaming with real-time constraints; in-home entertainment networks; frameworks and tools for development and analysis.

Software - software architectures and languages; operating systems; design, scheduling, timing and execution-time analysis; validation; monitoring.

Hardware architectures - real-time devices and (co)processors; power-aware RT-computing.

Distributed Systems and Networks: communication protocols; interfaces and compos ability; wireless and ad-hoc networking, real-time mobile computing.

Keynote session offered really useful information about programming in real-time systems. It was presented by Alan Burns (University of York, England).

Thus, my overall impression is that this was very good conference with so many interesting papers and works, which I have to look in for my future work.

Travel Report from ACC'04

Dan Henriksson

Lund Institute of Technology

July 30, 2004

1. Introduction

The 2004 American Control Conference (ACC04) took place June 30 to July 2 in Boston. ACC is one of the two largest annual conferences within the control community. The original purpose of the trip was to organize a workshop "Tools and Techniques for Control Loop Timing Analysis" demonstrating our work within the area of integrated control and real-time systems design. Unfortunately, however, it turned out that this was not the right community to present this kind of interdisciplinary research. The workshop was canceled in the last minute due to lack of registered participants.

The interest for control within the real-time community is large and growing. Sadly, the reverse situation is not that common. However, I also had a paper in an invited session treating performance control of computing systems (mainly web servers), which was the reason I still went to the conference.

2. The Boston Area

This was my first visit in Boston, and I really liked the city. Many parts of the city had an European flavor and the conference venue was conveniently located in the heart of the city.

On the days before the conference started we had time to pay visits to Harvard and MIT and to taste the Maine lobster in the harbor. We also were able to locate a sports bar that was going to show the upcoming semi-finals of the Euro 2004 soccer championship!

3. The Conference

The conference featured 1031 papers (corresponding to a 57 percent acceptance ratio) presented in 19 parallel sessions over the course of three days. This to compare with real-time conferences that usually run in one single session with an acceptance ratio around 30 percent. The large number of papers made it virtually impossible to cover all interesting presentations.

However, as mentioned in the introduction, only a very small fraction of the papers were related to real-time aspects of control systems, which is my area of

research. The sessions most closely related to my own area of research mainly treated various aspects of networked control and control of computing systems. No session treated real-time implementation aspects of control loops.

4. Interesting Presentations

Below I will briefly present some of the presentations that I found most interesting.

”Packet-Based Control”, D. Georgiev, and D. Tilbury

This paper presented an efficient use of the packet structure for networked control systems. By storing output and control signal samples and submitting sequences of these in single packets the network traffic and computation time in the controller node can be reduced. The resulting multirate system was analyzed and an H_2 -optimal controller was derived.

”Inverted Pendulum Stabilization through the Ethernet Network, Performance Analysis”, O.R. Natale, O. Sename, and C. Canudas-de-Wit

This paper treated control over the standard Ethernet MAC layer protocol, and evaluated the effects of the MAC policy and network load on control performance for three different control strategies. The compared controllers were; a pole placement controller, an LQ-controller and a H_∞ -controller. For the performance simulations the authors had used the TrueTime toolbox developed by our group in Lund.

”Challenges in Control Engineering of Computing Systems”, Tutorial session organized by Joe Hellerstein, IBM

This was the tutorial session in which I had my own contribution, work performed in collaboration with Tarek Abdelzaher at University of Virginia on web server delay control. The session featured a one-hour introduction by Joe Hellerstein followed by four 15-minute presentations. The session gave a good overview of current research (both industrial and academic) on the use of control-theoretical methods for performance control of complex and stochastic systems such as web servers.

Travel Report from RTAS 2004

Martin Andersson
Lund Institute of Technology
martin.andersson@control.lth.se

7 juni 2004

1 Introduction

The 10th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2004) took place in Toronto, Canada may 25 to 28. The conference was held at Le Royal Meridien, King Edward a rather stylish hotel in downtown Toronto. I went there together with another PhD student (Dan Henriksson) and my supervisor (Karl-Erik Årzén). The purpose of the trip was for me to get acquainted with conferences and to meet people.

2 The trip

The trip started not so well, the train to the airport was canceled due to maintenance of the track. This was however solved by Dan's girlfriend who agreed to drive us instead. As this was my first flight ever it was kind of exciting, but that ended rather quickly when I found out that flying meant a lot of waiting. We even had to wait for two hours on the plane after it had landed in Toronto because there was a thunderstorm.

3 Toronto

We stayed at Le Royal Meridien, King Edward in the middle of downtown Toronto. I found Toronto to be a decent city, even though I would prefer a little more green. We arrived a couple of days before the conference started so we had time to do some sightseeing. We visited Hockey Hall of Fame, the Niagara Falls and we were also able to get tickets to the fabulous musical Mamma Mia.

4 Conference

On Tuesday 25th, there were two workshops. One on Model-Driven Embedded Systems (MoDES '04) and one on the usage of the UML profile for Scheduling, Performance and Time (SIVOES '04). I had not signed up for those but heard afterwards that they were not very interesting. On Wednesday and Thursday there were two parallel tracks. On Friday there were

only one track. There were a lot of papers presented during the days, many theoretical but also a lot that were of a more practical nature. Most of them were not in my research area, but I found a few that I will read more carefully later.

5 Conclusions

I enjoyed the trip and found it a worthwhile experience. There were also some highlights that struck out from the rest of which I will share only two. The first is the Niagara Falls which are quite nice, the other is a cite from one of the presentations and is about deadline misses:

100% miss ratio is undesirable even using feedback technique.

Travel Report form 26th International Conference on Software Engineering (ICSE), 23-28 May 2004, Edinburgh, Scotland

Mikael Åkerholm
Mälardalen Real-Time Research Centre
Department of Computer Science and Engineering, Mälardalen University
mikael.akerholm@mdh.se

Abstract. ICSE is the premiere conference on software engineering; it is intended to be a showcase for the discipline. In addition to the main program, there were 19 workshops, 9 half day tutorials, and 5 co-located events. The main reason for my presence at ICSE was to participate with a paper at the co-located event 7th International Symposium of Component Based Software Engineering (CBSE7). The remaining part of this travel report therefore contain, brief summaries of CBSE7, ICSE, and the city of Edinburgh.

CBSE7

CBSE 1-6 has been organized as ICSE workshops, this year the event was organized as an own detached symposium with own proceedings published by Springer Verlag. CBSE received 82 submissions and accepted 12 as long papers, and 13 as short papers, the submission rate was beyond the expectations of the organising committee. It was a two day symposium (24-25 May), with two invited speakers Oscar Nierstrasz, and Hans Jonkers. The symposium was divided into four paper sessions; unfortunately there were two parallel sessions, so it was only possible to attend to two of the four sessions. However, the focus was on discussions so half the days were dedicated for discussions, and half the days for papers and invited speakers. The most interesting part from my viewpoint was not surprisingly session 3, components for real-time embedded systems, which were the session most close to our research and the session of our paper. I find the work presented by Paolo Gai, A Hierarchical Framework for Component-Based Real-Time Systems, most interesting since it is the first paper from their group about a project that relates to my research. Similar to our work they use larger software components, meaning that a software component can be viewed as an application with several concurrent threads. The long discussions tended to land up in discussions about basic definitions, which is important to agree upon, but at least according to me the paper presentations gave the impression of research from an established field, while the discussions did not belong to such a field. The first days discussions were mostly about component definitions and if connectors should be in or out. During the second day, a reasonable and according to me sound explanation was raised: "The abstraction called component will vary in what is abstracted, what is exposed, depending on desired properties", from a slide summarizing the discussions made by Kurt Wallnau titled "Matser of the Obvious".

ICSE

ICSE received 436 submissions and accepted 58; there were three invited keynote speakers, Richard Stallman, Karl Lieberherr, and Janet Thornton, opening one day each. Richard Stallman, founder of the GNU project, called the father of free software, gave a speech about software patents. Where his standpoint of course was that they should be forbidden, even if conference participants agreed or not, he gave big impressions and people were arguing about the topic for the rest of the conference. The session that placed most impressions on me, was a panel discussion with Dave Bustard, Mike Holcombe, and Ian Sommerville, concerning new

directions in software engineering research in UK. They were talking about the grand challenges of software engineering, the benefits of broadening the focus of software engineering etc. Something that became obvious to me during the discussions was that software has an undeserved bad reputation; the common understanding is that software causes all faults, and software is always late. However, the functionality we build with software is fantastic, all advanced functions we are using is mainly realized with software, e.g., consider all functionality in the latest mobile phone, or car. Try to implement that without software! A considerable reason for software being late were also given, most often the software projects are dealing with completely or partly new applications where some inventions is required. Compare that to more mature engineering disciplines as mechanics or construction, a mechanic engineer estimate the time the project will take based on the last times something similar was built, the first times a bridge was built by a construction engineer it was surely hard to estimate the time it would take and if it would be possible at all. Otherwise the paper sessions held overall good quality, with interesting session topics as testing, software architecture, analysis, and verification.

Edinburgh

The city of Edinburgh is the Capital of Scotland and has 750.000 inhabitants, the second largest in Scotland next to Glasgow. The city centre has a lot of old buildings, and there is a local pub in almost every block. We can recommend visiting a pub on a Saturday afternoon, watching a football game, a festive atmosphere and nice prices for ale. However, talking about food, the pubs seem to be popular among Scottish people, but we recommend one of the common Italian or Indian restaurants. Two things that must be done when in Edinburgh, number one admire the dramatic castle on a rock in the middle of the town, and visiting the royal mile whisky shop!

26th International Conference on Software Engineering (ICSE 2004)

May 22nd – 29th 2004, Edinburgh, Scotland, UK

Johan Andersson
Mälardalen Real-Time Research Centre
Department of Computer Science and Engineering
Mälardalen University, Västerås, Sweden
johan.x.andersson@mdh.se

Edinburgh

The city of Edinburgh was very beautiful. It has a lot of old impressive stone buildings such as churches, monuments and castles. The city is dominated by Edinburgh Castle, overlooking the city centre from the top of a very steep and rocky cliff, at least 50 meters high. Since Edinburgh attracts a lot of tourists, there are plenty of hotels, pubs and nightclubs. However, although the city has an intense night-life, walking around in the city felt very safe. Ordinary people in Edinburgh walk to a large extent, so there were always people around. The city has less crime than other larger cities in Europe.

Edinburgh is the capital of Scotland and has a population about 408.000 in the inner city. It is however not the largest city, Glasgow is significantly bigger with almost 700.000.

The trip

I left for Edinburgh early on the 22nd of May, together with Dag Nyström. The plane departed from Arlanda at 09:20, so I had to get up around 05:30 in the morning. Flew with BA to Heathrow, where we switched planes for a domestic flight to Edinburgh. My hotel was located about 1.5 km outside the city centre, a 15 minute walk from the conference centre. The hotel was very nice; It was fresh and I had a view over a large park from my room.

The Conference

Apart from the ICSE main conference, there were a lot of workshops and tutorials. I attended a tutorial about Software Architecture Reconstruction, given by Claudio Riva from Nokia Research Center, and also a workshop, the Second International Workshop on Dynamic Analysis (WODA 2004). They were both very interesting, as these areas are close to my research.

The main conference was quite large, 600-700 delegates and several parallel sessions throughout the three days. Richard Stallman, founder of the Free Software Foundation, opened the conference as keynote speaker. He gave a 1 hour talk on Software Patents. I don't believe that the talk can be considered objective, software (idea) patents is the essence of evil according to him. However, he was a very good speaker.

The technical sessions were often quite interesting, and not too long. Typically 3 papers were presented in each session, where each paper had 25+5 minutes. The most interesting sessions I attended were "Dynamic Analysis" and "Static Analysis".

Two social events had been arranged for the main conference: a whisky tasting event, which was very nice and informative, and a main reception, where we got the chance to see clowns playing bagpipes while dancing and try the infamous Haggis. It tastes and looks like "kryddad pölsa".

Travel Report from HPCA 2004

Håkan Zeffer and Martin Karlsson

Uppsala University, Department of Information Technology, Division of Computer Systems
zeffer@it.uu.se, martin.karlsson@it.uu.se

12th Mars 2004

The Tenth International Symposium on High-Performance Computer Architecture (HPCA 2004) was held February 14 to 18 in Madrid, Spain. HPCA is one of the best conferences in the field of computer architecture. In conjunction with the conference we also attended a tutorial and a workshop. The tutorial “Advanced Processor Architectures and Verification Challenges” was held by Sunil Kakkar from IBM Global Services. Verification of computer systems of today is getting more and more complex. Sunil showed us how IBM addressed these problems. The tutorial was interesting and gave us some new knowledge. The workshop on Computer Architecture Evaluation using Commercial Workloads (CAECW-7) looked very interesting but was in fact quite disappointing.

This years HPCA conference contained a lot of processor oriented papers which was one of the reasons why we wanted to attend. The research quality of the papers presented at the conference was of very high quality with a few exceptions. The good papers gave us lot of new and interesting knowledge whereas the poor papers (there were two of them) made us quite upset.

The invited keynote talks were overall very good. The conference also contained a panel discussing with members from both industry and academia discussing the research gap between industry and academia. The panel turned out to be quite entertaining since one of the panel members and one of the members of the audience started arguing in a less than cordial way.

As usual the most interesting place of the conference was in the hallway just outside the conference room. For example, we spent an hour interrogating a CTO from IBM about their upcoming server design. Surprisingly he was quite forthcoming about it, despite that the details of the design haven't been made official yet

We enjoyed our stay in Madrid very much. We visited both the Prado museum and the museum of modern art, which we both enjoyed. However, we did have problem with the Spanish eating habits given that we were preparing for the “Vasaloppet” cross country ski race. Overall we are very satisfied with the conference and the topics.

Travel Report from OPODIS'03

Cecilia Ekelin
Chalmers University of Technology

January 8, 2004

The trip

The trip went to Fort-de-France at Martinique which is an island in the French Caribbean. There I visited the 7th International Conference on Principles of Distributed Systems (OPODIS'03) which took place December 10-13. The conference was hosted at the Université Atilles-Guyane in their brand new facilities. The main purpose of the trip was to present my paper "A Lower-Bound Algorithm for Load Balancing in Real-Time Systems".

The conference

OPODIS is a pretty small conference - this year there were about 35 participants - which makes the tone very familiar and allows you to talk to everybody. As given by the name of the conference, the emphasis is on *principles* of distributed systems. Hence, the papers were rather theoretical and presented new models and algorithms/protocols rather than improvements/experiences of existing technology. (Not much on real-time aspects though.) Despite the rather low visibility of the conference I think the paper quality was similar to that of bigger conferences such as ICPP. (There were 19 accepted papers out of 61 submissions.)

The presentations

The conference featured three keynote speeches which all were very interesting. The first speech was by Neil Gershenfeld from The MIT Center for Bits and Atoms who talked about the problem of making really large distributed systems (like paintable computing) reliable. He pointed out that crashes in these kind of systems often is not due to a single point of failure but rather a lack of ability to understand/analyze/manage the complexity of the system. He also mentioned that the problem of reliability versus complexity was present even in the early days of computing and that papers on fault tolerance by e.g., von Neumann are still highly applicable. The second talk by Jo Ebergen from Sun Microsystem Laboratories also offered an historical outlook. The speech was

about asynchronous (clockless) circuits and why they are interesting. Apparently, in the 1940s there was a debate on whether a clock is necessary or not. One of the most pro-clock persons was Alan Turing which is why all circuits since then have been clocked. However, the clock consumes about 30% of the energy and limits the speed to that of the slowest component. The talk included a live demo of a clocked versus a clockless system and proposed a “homework assignment” of how to construct an asynchronous pipeline. The third talk was by Maarten van Steen from Vrije Universiteit Amsterdam who spoke about self-management in very large systems. The keyword here was simplicity since too complicated algorithms will not scale with the system size. He also presented some experimental results (on web replication and caching) from his research group which showed that you can get pretty impressive results even with very simple algorithms.

The program included four tutorials (although the one on radio networks was cancelled). The remaining ones were self-stabilization, distributed computing and information security, and non-blocking synchronization. Although the topics of the tutorials were interesting, the level of the contents was perhaps not right. The first tutorial was hard to follow all the way if you did not know anything in advance. The second tutorial mainly discussed basic cryptography (that I already knew) and could have been more focused on the distributed systems part. The third tutorial was both easy to follow and contained (for me) new stuff but could perhaps have been even more technical considering the audience.

As for the papers, most of them were too far from my topic to be useful or understandable. You probably have to be more into communication to fully appreciate this conference as a real-time researcher.

About Martinique

Martinique is your typical tropical place with 28 degrees in both air and sea all year around. This also implies that you cannot expect the same kind of efficiency and infrastructure that you are used to, which may be annoying on a conference trip. On the other hand, not many places offer white sand beaches and clear waters just 20 minutes from downtown.

The future

Next OPODIS is planned to be held in the French alps in December 2004.

Travel Report from WOSP 2004

Lars Albertsson
Swedish Institute of Computer Science
lalle@sics.se

10th February 2004

The Fourth International Workshop on Software and Performance (WOSP 2004) was held January 14 to 18 in Redwood City, California. The workshop, which was held in Oracle's premises just by the San Francisco Bay, seemed interesting when looking at the advance program, but it did not meet my expectations. The conference started with tutorials, and the first tutorial on software performance antipatterns by Connie Smith was good, whereas a tutorial on automatic benchmark generation indicated that research in the field had produced little of interest.

The research quality of the papers presented at the conference was a disappointment, and although some papers touched interesting areas, their research contribution were either minimal, or the researchers had made simplifying assumptions that made their results hard to use in practice. The invited industrial keynote talks, on the other hand, were great. The first talk was a presentation of automated performance tuning mechanisms in Oracle's next release of their database. The second keynote, from IBM, made a strong case for embracing model-driven development, i.e. automated code generation from object-oriented modelling tools such as UML, as the next logical step in raising the abstraction level for software development. The last talk described the structure of Google's search engine, and the performance issues they are facing. One interesting observation is that search engine operators have virtually unlimited thread-level parallelism, but energy costs are a substantial factor. Hence, today's computer architecture trends of performing speculative operations, which waste energy, in order to improve single thread performance are working against them.

Redwood City is, like the rest of the Bay Area, a monotonic Californian neighbourhood, which seems artificial by European standards. San Francisco, however, is a charming city, and well worth a few days of extra stay. I had visited the town before, so I joined some friends and drove out into the countryside, visiting Yosemite National Park and the scenic Highway 1, both of which can be recommended. If you visit Central California, my recommendation is to either experience the often magnificent nature in unpopulated areas or stick to the coast, and avoid inland urban areas, such as Fresno and Sacramento.

Artes travel report, RTSS'03, Cancun

Björn Andersson

Department of Computer Engineering

Chalmers University of Technology

SE-412 96 Göteborg, Sweden

ba@ce.chalmers.se

I went to Cancun in Mexico to present my paper “Synthetic utilization in online aperiodic scheduling” at the conference IEEE Real-time systems symposium (RTSS) and to spread my Ph.D. thesis to colleagues.

Scientific aspects This year RTSS had parallel sessions: one session dealing traditional real-time systems issues and the other dealt with sensor networks and hardware-software codesign. In both of these sessions, the two hottest research topics were: (i) wireless communication and (ii) techniques to improve energy-efficiency. My own area, multiprocessor scheduling, remains an active area with a session dedicated to it. One particularly interesting paper was: T. Baker, “Multiprocessor EDF and Deadline Monotonic Schedulability Analysis”. My biggest surprise was the low number of papers from Pisa/Pavia.

So what did I get out of this conference? I had some interesting discussions with colleagues and my poster got attention. I brought printed copies of my Ph.D. theses and put them on the table at the registration desk. All the ones that I put there were taken.

Non-scientific aspects Cancun is in Mexico but it feels like a part of the U.S. You can pay in U.S. dollars. There are McDonalds, WalMart, Gold's gym and Porsche shops. Department stores play Christmas songs in English (“Little drummer boy” is popular). Of those bartenders I talked to, nobody knew how to prepare the Mexican chocolate drink (it contains cinnamon). People in TV commercials don't look very hispanic either.

In Cancun, salespeople are verbally aggressive, so it is important to know the word “no”. Taxi-drivers ask if you want to go somewhere. Salespeople ask you to enter their store to have a look at their merchandise (if you hesitate their sales pitches intensify). Salespeople ask you to enter their restaurant or bar (in swedish: inkastare). Don't be surprised if a stranger contacts you on the street trying to sell a time sharing apartment. Mexicans call you “amigo” even if you are a complete stranger. These behaviors are understandable because it was low season in Cancun and the typical Mexican salary is 50 SEK/day.

My advice when visiting Cancun: use sun oil.

ARTES Travel Report

RTSS 2003, Cancun, Mexico

AnnMarie Ericsson
University of Skövde
ammi.ericsson@ida.his.se

Introduction

The RTSS conference held 3-5 December 2003 was located in a sunny but windy Cancun, Mexico. I was asked to present a work in progress paper at the conference poster session. This was a good opportunity for me to gain feedback and inspiration for my ongoing work about using timed automata for specifying event triggered systems.

Workshop

The day before the actual symposium started, a workshop on constraint aware embedded system was held. The workshop contained many interesting talks by e.g. Al Mok, who talked about limited network bandwidth, but there were also a few less prepared talks where it was hard to understand the contribution, or point of the work presented.

Unfortunately, some of the invited speakers had VISA trouble when travelling from USA, which resulted in that two of the workshop speaks were cancelled.

Daniel Mosse closed the work shop with an informal discussion about the possibility of arranging some kind of programming competition connected to the RTSS conference. Most people present seemed to think it was a good idea, and Mosse welcomed interested persons to give inputs on how such a competition could be arranged. I think that some kind of team development competition is a really good idea, perhaps with participants from different universities in the same team. Such a competition would be a fun and interesting opportunity to solve some practical development issues in combination with gaining experience of working together with students from other countries.

Symposium

This was the first time I participated in a conference, and my first impression was that there were *many* talks about scheduling. I think scheduling is kind of interesting, but I am more interested in real-time databases and higher level modelling.

Fortunately, deep in the jungle of scheduling talks, I actually found some talks within my area of interest. Some of the talks I enjoyed were “QoS Management in Replicated Real-Time databases” presented by Sang Son and “Timed I/O Automata: A Mathematical Framework for Modeling and Analyzing Real-Time Systems” presented by Frits Vaandrager. I also think that the industry session with talks about e.g. using real-time Java was interesting.

Work in progress session

The WIP session was divided in two parts, the papers were either presented in a five minutes talk, or as a poster. My paper “Operator Patterns for Analysis of Composite Events in Timed Automata” which I wrote together with Robert Nilsson and Sten F. Andler, was presented as a poster.

Despite the sunny weather and blue Caribbean Sea 50 meters away, the poster session was rather well visited. I got some good advice about what my next step in this work should be and met a lot of interesting people, so in my opinion this was a good poster session. However,

I was rather surprised by the number of questions from people who had never heard about neither active databases nor timed automata models.

Conclusion

This was the first time I participated in a conference, and even if it is hard to remember each specific talk, I learn a lot from the talks close to my area of interest. I met a lot of nice and interesting people and it was a good experience for me to participate in a conference and to listen to different kinds of talks from expert speakers. This experience will hopefully make it easier for me to prepare talks and posters for conferences in the future. I am also grateful for the feedback I gained during the posters session, since it will help me to continue my work in the future.

The 2003 ACM SIGPLAN Symposium on Languages, Compilers and Tools for Embedded Systems (LCTES'03)

A travel report

Sven Gestegård Robertz
Department of Computer Science, Lund University
email: sven@cs.lth.se

The conference

LCTES is, as the name suggests, a symposium with a quite broad scope of topics, including most aspects of embedded and realtime system software and development. This is illustrated by the titles of the sessions, which were, in order: compiler optimizations, efficient java systems, memory management, scheduling for embedded systems, modeling and analysis of embedded systems, software synthesis tools and methods, hardware/software partitioning and reconfigurability, partitioning and memory optimizations, efficiency of compressed code, and energy management.

The advantage of the broad scope is that attending the symposium gives a good view of what are the trends in the embedded systems community, possibly at the cost of in-depth technical discussion.

The technical program

As my main research interest is real-time Java in general and real-time automatic memory management in particular, it is gratifying that both are gaining more and more acceptance in the real-time and embedded systems community.

At the symposium, there were two presentations on Java in small embedded systems: *A Java Virtual Machine Architecture for Very Small Devices*, by Nik Shaylor, Doug Simon, Bill Bush (Sun Microsystems) and *Compiling Java for Low-end Embedded Systems* by Kim Burggaard (Systematic Software Engineering A/S), Flemming Gram Christensen, Jrgen Lindskov Knudsen (Mjolner Informatics A/S), Ulrik Pagh Schultz (University of Aarhus), which both relate to our real-time Java activities in Lund.

There were also two papers about real-time garbage collection: *Controlling Fragmentation and Space Consumption in the Metronome, a Real-Time Garbage Collector for Java* by David F. Bacon Perry Cheng V.T. Rajan (IBM T. J. Watson) and *Time-Triggered Garbage Collection - Robust and Adaptive Real-Time GC Scheduling for Embedded Systems* by Sven Gestegård Robertz and Roger Henriksson (Lund University)

For people who, for some reason cannot or will not use garbage collection, but choose the RTSJ (Real-Time Specification for Java) method of scoped memory (a region-based approach to memory management), the paper *Efficient Memory-Reference Checks for Real-Time Java* by Angelo Corsaro and Ron K. Cytron

(Washington University) might be interesting, as it shows how the potentially expensive run-time checks of the legality of reference assignments can be efficiently implemented.

For safety-critical systems written in a system with manually managed memory, the paper *Memory Safety Without Runtime Checks or Garbage Collection* by Dinakar Dhurjati, Sumant Kowshik, Vikram Adve and Chris Lattner (University of Illinois, Urbana-Champaign) might be worth examining. It presents a technique for ensuring that dangling pointers (which may still occur) can only cause local damage and not affect other parts of the system.

Another high-level programming technique that is getting interest also for embedded systems is aspect oriented programming as illustrated by the papers *Time Weaver: a Software-Through-Models Framework for Embedded Real-Time Systems* by Dionisio de Niz and Raj Rajkumar (Carnegie Mellon University) and *Transport Layer Abstraction in Event Channels for Embedded Systems* by Ravi Pratap and Ron K Cytron (Washington University).

Other topics which seem to still be moving fast are hardware/software co-design and energy-aware scheduling and code-generation. A common approach of most of the papers in this areas was that they exploit properties of (or modifications to) a particular architecture or processor.

**Travel Grant report
by
Radoslaw Szymanek
(June-2003)**

Design Automation Conference is the biggest and the most prestigious event in Electronic Design Automation Community. This year more than 5000 participants came to Anaheim and I was one of them. I came to Anaheim few days earlier so it was easier for me to adapt to a different time zone. The conference consisted of many parallel events. I myself spend all three days from the morning until late evening at the conference site. Conference attracts probably more people from industry than academia.

The conference was opened Tuesday morning by program and executive committee of DAC. It was shortly followed by very interesting keynote speech by Sir Robin Saxby, who is CEO of ARM. His speech was titled "100nm ... a giant leap for mankind?". Very interesting talk about possible future which will be heavily influenced by current developments in Electronic Design Automation industry. Tuesday morning I partially followed panel discussion about reshaping EDA industry for power. Later, I went to see one article presentation in session about Embedded Hardware Design Studies. Right after this session during lunch break I went for the first time to the exhibit floor. There were more than 200 companies presenting themselves and their work. Just a walk through the whole exhibition forum plus few short conversations ate away my two hours lunch break. After lunch break I went back to the presentation floor to the next embedded system session. This session was about Lower-Power Embedded System Design.

I left a bit earlier this time since next session will be my session and I wanted to do last minute preparation and relax a bit. At 16.30 I was introduced by Nikil Dutt, who was the chairman of my session. My talk was scheduled to take maximum 25 minutes followed by 5 minutes question time. I talked about constraints driven synthesis and partial assignment technique to simply partitioning and scheduling problem. My work touches on problems which are not easy to solve and even 25 minutes is not enough to give deep overview of my method. Hopefully people working with this type of problems were able to grasp some intuition behind my approach. After my presentation I have received one question from the chairman and four questions from the audience. The questions I have received indicated that some people did manage to get a good overview of my method and if necessary could deepen it by reading my article. In my session there was a presentation of the paper from Swiss Federal Institute of Technology by Kubilay Atas and et. This paper was

later given the best paper award. After my session I could relax, I went to a PhD forum where I could see what other students are doing.

Wednesday morning I have spent discussing with people from companies such as Celoxica, Magma, Cadence, Synopsis, Mentor Graphics. I have followed more than 5 different presentations of the recent developments in those companies. After lunch I have followed very interesting session about Novel Techniques in High Level Synthesis. After this session I decided to go to another panel discussion which had a following title "Nanometer Design: Place Your Bets". Each of the panelists had a very interesting view about the future developments and what he thinks will have highest impact on industry. I particularly liked the insights of John Cohn from IBM. All panelist have agreed that the biggest challenges ahead lies at technology level, when it comes to producing chips that more and more variability of all processes comes to the picture which make it more and more difficult to produce correct chip. After this panel I spend evening hours talking to few other companies like Intel, Accel Chip, and Synplicity. Very interesting long discussion I had with people from Accel Chip, who are starting their embedded system design flow in MATLAB, which raises the modeling level quite high.

Last day of the conference I spent in two panels and two sessions. First panel was about the importance of the libraries and modular design flow, where the second was about significance of formal verification methods and simulation in debugging and verification process of the electronic circuits. Both panels had a vivid and hot discussion with high degree of interaction with the audience. The main message of the first panel was that libraries help to decrease time to market. The important message of the second panel was that verification takes nowadays at least 50% of project time and gets longer and longer and there are immediate needs to short that. Formal verification can help in achieving faster verification, but will never replace simulation.

In the middle of the day there was a keynote speech by professor Alberto L. Sangiovanni-Vicentelli from university of California, Berkeley, CA. This speech compared the phases of the EDA industry to a Greek mythology where there was an age of gods, heros, and people. Great speech with amazing overview of the most significant developments in EDA and interesting insights to the future. One of most interesting statements from my point of view was that the process designing of chips has to go to higher levels of abstractions in order to cope with chip complexities.

I had a great time at the conference. I only wish there were not so many parallel sessions, panels which forced me to miss some other interesting discussions or presentations. I had a chance to meet many important people in our field, see for myself what is the state of the art in my field, and participate in discussion about current and future work in our field.

**Travel report by
Anders Pettersson
Department of Computer Science and Engineering
Mälardalens University, Västerås , Sweden
From The 9th International Conference on Real-Time and Embedded
Computing Systems and Applications (RTCSA)**

1 The Conference

The RTCSA 2003 took place at National Cheng Kung University in Tainan, Taiwan, February 18-20, 2003. The first day of the conference there were a panel debate about System on Chip (SoC) and Challenges to Next Generation Embedded Systems. During the conference there were three interesting keynote speeches that addressed the embedded computing and SoC area. Everyone of the speakers agreed on that this is an very interesting topic and will very soon be the approach for developing software and hardware in consumer electronics products. The most valuable input from the keynote speeches was how the industry were thinking of software/hardware development today and in the future.

The majority of the contributions to conference covered the real-time scheduling area. Other areas that were covered was networks and communication, tools and development, pervasive/ubiquitous computing, embedded systems/environments, systems and architecture, performance analysis, resource management and file systems and databases. However because of that the conference was organized with parallel sessions and there were interesting talks in both session it was difficult to cover the conference. Here is some examples of presented papers that I found interesting and that have relevance to my research:

On Soft Real-Time Guarantees on the Ethernet, Min-gyu Cho et al.

Software Platform for Embedded Software Development, Win-Bin See

Extracting Temporal Properties from Real-Time Systems by Automatic Trace Analysis, A. Terrasa et al.

On Wednesday, before lunch, I presented the paper Testing of Multi-Tasking Real-Time Systems with Critical Sections and my feelings was that my presentation were acceptable. This was my first talk at a conference, although I have been presenting a paper at a workshop (RTES01) at Real-Time Systems Symposium 2001.

2 Tainan, The City

Wednesday afternoon there were a organized excursion with a city tour, bird watching and a visit to a salt mountain. The city tour was very interesting we visited some famous castles. We were told that Taiwan have been occupied many times by many different empires for example the Japanese, the Chinese and the Dutch.

The city of Tainan was very crowded, and there were swarms of scooters everywhere I have never seen so many scooters in my whole life. Despite the hectic traffic in the city we didn't see any accidents and fortunately we manage to cross all streets without being injured ourself.

We also eat a lot of good food, but no one of us dared to try the thousand years egg.

International Parallel and Distributed Processing Symposium (IPDPS)

22-26 april 2003, Nice, France

Jonas Neander

Mälardalen Real-Time Research Centre
Department of Computer Science and Engineering
Mälardalen University, Västerås, Sweden
jonas.neander@mdh.se

Nice

I was travelling with Dr. Henrik Thane, Joel Husselius, Daniel Sundmark, Andreas Johnsson and Anders Möller to Nice. The city of Nice was very beautiful. Many houses were in old-fashioned style with high ceilings and large windows and they had a lot of detailed figures etc on the outside. There were nice parks with a lot of fountains. They seem to like fountains a lot because they were everywhere. It seems that it's ok to let the dog do a number two wherever they like. You had to look really carefully where you were going and it smelled bad sometimes (I'm not much of a dog lover). They French people park and drives cars like maniacs. The most impressing thing I ever seen is a man parking in a spot 2 millimetres larger than the car without hitting the other two cars that already were parked there. The beach was filled with round smooth stones. We didn't spend much time at the beach because it was a bit too cold in the water. The hotel we were staying at was nice and polite, they could even talk English. It was sometimes hard to shop because they answered you back in French when asking a question in English. Just 30-40 min away is Monaco, a lovely expensive little country at the French Riviera. The people living here are living in a dream. You could buy a apartment in a cave (400m²) for only 100.000.000 SEK. Every one another car was a Ferrari, Porsche or even fancier. The city is built on a mountainside so you were climbing high up over the sea very quickly. There were public elevators so you didn't have to walk upwards so much. Now you asking you're self if we were playing at the casino in Monte Carlo? The answer is: off cause we did. I have been playing at casinos in Las Vegas and now at the Monte Carlo so now I don't have to play at any more casinos.

The conference

This was the first conference that I attended to. The goal of the journey was to see and learn and to make connections with other researchers in the same research area. The first day there were ten different workshops. We registered and attended at several different interesting workshops. The following days I went to many different sessions. The conference topics were widely spread so it was a bit hard to choose what to hear. Sometimes you thought that a specific topic sounded interesting but when you heard the

presentation it wasn't. The speakers were as usual of different calibre. Some were outstanding and the presentation was a joy ride and sometimes when the speaker was heartless and torture us, you wanted to get out in the sun. The highlights of the conference for me were on Saturday's workshop. They had a whole workshop on wireless, mobile and ad hoc networks. At that workshop I found many new articles to read afterwards. It is nice to get the information you are searching for served for free. Dr. Henrik Thane from the department was giving a talk about Replay Debugging of Real-Time Systems Using Time Machines on the Saturday's workshop. His presentation was outstanding and I hope I could get half as good as he.

Conclusions

Overall the conference was good, I learned a lot and that was the goal of the trip. Next time, I want to attend to a conference that is a little bit more focused on my research area than this conference was.

Travel Report from University of South Australia, Adelaide, Fall 2002

[Elisabeth Uhlemann](#)

Introduction

In the fall 2002 I spent two months at the Institute for Telecommunications Research ([ITR](#)) at University of South Australia (UniSA) in Adelaide, Australia supported by travel grants mainly from [ARTES](#) but also from [Ericsson](#).

ITR is a research institute at UniSA in Adelaide, specializing in technology for digital wireless communications, including both fixed and mobile satellite and terrestrial radio services. ITR is located in the Signal Processing Research Institute building at The Mawson Lakes Campus. This campus is located at Mawson Lakes, 14 km north of the center of Adelaide. The 80 staff and postgraduate students in ITR engage in research programs designed to be of direct benefit to industry.

Purpose of Visit

The ITR has a recognized reputation for both theoretical research and practical implementation in the area of concatenated coding and iterative decoding a currently very hot topic. Iterative decoding is a sub-optimal decoding method with good accuracy and significantly lower complexity than the optimal method. Generally it is known that most block codes are good, provided that they are long enough. However, the complexity of optimal decoding is NP-hard and exponentially increasing with code length. Recently, a sub-optimal coding and decoding strategy has been discovered where, provided that the code is concatenated, the output of a sub-optimal decoder can be fed back again in order to be refined iteratively. This procedure, termed iterative decoding or turbo-decoding, has performance close to the optimal one with manageable complexity increase.

For real-time communication purposes iterative decoding and concatenated codes are very interesting topics. We want to benefit from the high quality that the long concatenated codes provide, but at the same time keep the decoding complexity, and hence the time to decode, at a minimum. This deadline dependent coding and decoding procedure is what I am currently looking at in my research.

Dr. Alex Grant is the leader of the Coding and Information Theory group at ITR and I was invited to work closely together with him and the members of his group during my visit. Dr. Grant is a recognized expert in iterative signal

processing with a particularly emphasis on analytical tools for performance evaluation. Currently, Dr. Grant has four students working on various aspects in iterative signal processing. In addition, my main supervisor Prof. Lars K. Rasmussen was visiting the ITR during most of 2002 and could, consequently, provide me with necessary supervision.

Results

The work resulted in two conference papers; one is accepted [1] and will be presented at the IEEE Wireless Communications and Networking Conference. The other is submitted and decisions are due in March. A poster presentation of the work in [1] will also be presented at the Australian Communications Theory Workshop in Melbourne [2]. Furthermore, I took a course in Multi-user detection given by Dr. Grant and Prof. Rasmussen. Finally, on the way back to Sweden I stopped in San Jose, California, USA to attend and present a paper at the Real-Time and Embedded Technology and Applications Symposium, RTAS 2002.

Graduate Studies in Australia

The Ph.D. program in Australia is typically only three years. No coursework is mandatory but is often encouraged by the supervisor. Since the ITR is a research institute they do research for both academia and industry, but provide no teaching of undergraduate students. This means that neither professors nor Ph.D. students have any mandatory teaching duties. If you want to become a Ph.D. student you have to apply for funding yourself, usually through government-funded scholarships. Upon doing this you should also state your research topic and suggest an appropriate supervisor. This means that lots of responsibility is put on the student from the very beginning.

Adelaide

Adelaide is the capital of South Australia hosting 1.2 million people originating from more than 100 different countries around the world. Many migrants arrived from Europe (especially Italy) after World War II and introduced the café culture that lends Adelaide its relaxed atmosphere. The city was named after Queen Adelaide, the wife of the British King William IV. Adelaide was unusual in that it was settled by free people - the city has no convict history. Adelaide has a reputation of being the festival capital of Australia and also the food and wine capital of Australia.

Superfluous details

Σor Australia versus Sweden [3]:

If you want to cross the street you better be fast. If you walk normally you almost make it half way across the street before the lights become red again.

No stores have the opening hours listed on their doors! It is very annoying. There is a little supermarket very close to where I live, but no one knows its opening hours.

The water tastes like a mix of chlorine and seaweed. Adelaide is located in the driest part of the driest continent, which makes it hard to access clean water. Most people in Adelaide buy bottled water or install purifying filters in their homes.

When at a restaurant you seldom order your food at the table. You notice this by the fact that nobody in the staff seems to care about you. You are then supposed to go to the counter and place your order. The weird thing is that you cannot order food and drinks at the same counter. You pay for food at one counter and then go over to the next and order drinks. This is regardless if you want water, coke or wine. It may even be the same guy that took your food order that makes his way over to the bar to take your drink order. This is especially annoying if you wish to pay for the entire dinner with credit card and are not sure upfront how much you will eat or drink.

The Australian milk does not contain 3% fat, but is 97% fat free! Why dont you write how much fat there is in the milk instead of writing how much fat there isnt in the milk?

All buss stops are request stops, which means you wave your hand to the bus with the appropriate number. This is troublesome because often three buses with different numbers arrive at the same time. How do you stop the last bus? My bus is always the last one so I never see the number until it has already passed usually by overtaking the other two others that have already stopped.

Buying candy is hard, especially so called lösgodis (loose weight candy?). In Sweden there is one price for all sorts. In Australia it isnt every sort has an individual price stated on the respective boxΣ You have to take one bag for each sort and since I usually buy 20 different sorts (obviously none of them with the same price), I gave up.

Conclusions

My visit was of great benefit to my research. Having to describe real-time communication problems to people with non-real-time backgrounds, but with excellent communication knowledge is very instructive and gives you new insight to your problem. In addition, it is always valuable and interesting to visit a different research institute than the one you are used to and see different solutions to similar problems.

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Travel Report from RTAS 2002

**Elisabeth Uhlemann
Halmstad University, Sweden**

January, 2003

The Conference

The Real-Time and Embedded Technology and Applications Symposium, RTAS 2002, was held at the Double Tree Hotel in San José, CA, USA, September 24-27, 2002.

The RTAS focuses on applications and from this year on also embedded technology. It is in my opinion, a fairly theoretical conference with mainly theoretical analysis of applications. Companies are contributing by giving talks and participating in panel discussions, as opposed to e.g. the International Conference of Communication (ICC) where there is usually a full company exhibition outside the seminar rooms.

The conference has one single track with a varying number of talks within each session. Each talk within a session limited to 30 minutes including questions. There were a total of 27 technical papers. A ten-page paper in the conference proceedings accompanies each technical paper presented. The papers were accepted based on a 5000-words-paper subject to a peer-review process of three reviewers. It should be stated upon submission if the paper were in fact a research paper or an experience paper. The latter was intended to encourage practical application oriented papers and general participation by companies.

My impressions

With a single track it is easy to get an overview of the presentations at the conference. However, as in all real-time conferences I have previously attended (ECRTS 1999, ECRTS 2000 and RTCSA 2000) there are a wide variety of subjects that all have real-time constraints. Typically, a few of them are too far from my own research area in order for me to fully grasp their contents. Therefore I find that in general a double track is usually good when it comes to real-time conferences. One still has all the papers in the proceedings to see how the real-time problem is tackled in the different areas, but can attend the sessions on areas that borders on your own. However, as always with real-time conferences everybody knows everybody since it is a fairly small society and this results in a nice relaxed workshop feeling, facilitating new contacts.

The main purpose of attending the conference was to present the paper Concatenated hybrid ARQ - a flexible scheme for wireless real-time communication and, as always, to get new ideas and a general understanding of

the ongoing research in the area.

There was only one session on communication, but it contained a paper I found most interesting: "RAP: a real-time communication architecture for large-scale wireless networks" by C. Lu, B.M. Blum, J. Stankovic, T. Abdelzaher, and T. He. For a nice description of the contents of this paper see Dan Henrikssons travel report from RTAS 2002. Apparently, the USA has a large ongoing government funded project on large-scale wireless sensor networks so we can expect to see more research in that area. The paper does not consider error control codes of any kind (which is the main contribution in my paper) with the motivation that the sensors should be kept as simple as possible. I think, however, that this would have to be included in a later version of the sensor networks.

Conclusions

The RTAS is a relevant conference of good quality. It is small enough to maintain a friendly workshop atmosphere, but still big enough to attract high quality researches. The way of mixing industry with academia by experience and research papers respectively was also very successful. My overall opinion was very positive.

Travel Report from ISIT 2001

**Elisabeth Uhlemann
Halmstad University, Sweden**

September, 2001

The Conference

The International Symposium on Information Theory, ISIT 2001, was held at the Omni Shoreham Hotel in Washington, D.C., USA, June 24-29, 2001.

The ISIT is the most recognized conference in the area of information theory. It is a very theoretical conference, so the only companies represented are book publishers.

Every morning starts with a one-hour plenary session intended for a broader audience. This is then followed by six parallel sessions, where typically two or three are within your own area. Each session includes four technical talks limited to 20 minutes. There are two sessions before lunch and two after, resulting in a total of 345 technical papers. Each talk is accompanied by a one-page abstract in the conference proceedings. However, the papers that appear in the proceedings have been selected by peer-review based on a six page extended abstract.

Even though this is a very big conference, it is still fairly easy to get an overview of new things happening within your own area. The conference is like a big newsletter with close to everybody participating, either by presenting a paper or just by attending the conference.

Usually if you find an interesting abstract in the proceedings you would attend the presentation, which then gives a little more information. If you find the presentation interesting you usually contact the presenter off line to ask for the original six-page manuscript they sent for peer-review.

My impressions

The purpose of attending the conference was to get new ideas and a general understanding of the ongoing research in this area. My own research project is a combination of information theory and real-time communication. Since I have participated in some real-time conferences before (ECRTS 1999, ECRTS 2000 and RTCSA 2000) it was very interesting to participate in a pure communication conference this time.

A very hot topic is iterative decoding, i.e., a sub optimal decoding method with good accuracy and significantly lower complexity. Generally it is known that most block codes are good, provided that they are long enough. However, the complexity of optimal decoding is NP-hard and exponentially increasing with code length. Recently, a sub-optimal coding and decoding strategy has been discovered, where the output of the sub-optimal decoder is feed back again in order to be refined iteratively. This procedure, termed iterative decoding or turbo-decoding, has performance close to optimal with manageable decoding complexity.

For real-time purposes turbo-decoding is a very interesting topic. We want to

benefit from the high quality that the long codes provide, but at the same time keep the decoding complexity, and hence the time to decode, at a minimum. Obviously, the convergence behaviour is of utmost importance, since a slow or no convergence reduces the performance, as does convergence to an incorrect solution, i.e. errors. Therefore, one paper in particular was very interesting to me:

Convergence and errors in turbo-decoding by Andrew Reid, University of Canterbury, Aaron Gulliver, University of Victoria and Desmond Taylor, University of Canterbury.

Here, the convergence for different turbo-codes was plotted as a function of the number of iterations, which is a measure equivalent to time.

This paper has been very useful indeed to me and is referenced several times in my licentiate thesis. Also, I have plotted the convergence versus the number of iterations for my particular decoder.

Twelve different sessions concerned iterative decoding and related topics so it is indeed a very hot topic.

Conclusions

The ISIT gives an excellent research overview, since basically everybody involved or interested in information theory attends the conference. There are also some recent work sessions and good social activities further improving the possibilities to get to know the different research groups. Another reason for the high participation is that within the IEEE Information Theory Society there is only one conference (ISIT) and one workshop (ITW). My overall opinion of the conference could not be better.

ARTES Travel Report:
17th International Parallel & Distributed Processing Symposium
April 2003, Nice, France

Anders Möller
Mälardalen University
Anders.Moller@mdh.se

Nice in Nice

The 17th International Parallel & Distributed Processing Symposium (IPDPS) took place in Nice 22 – 26 April 2003. Nice is located at the French Riviera, a fabulous place for a frozen Swedish Ph.D. student just thawing out after a long cold winter. I went there together with some friends, also Ph.D. students at Mälardalen University (see figure 1), to learn more about my research area and to gain insight into the world of research and researchers.



Figure 1: The “gang” at the French Riviera at nighttime

The Conference

The conference was located at Acropolis Convention Centre (see figure 2), in the centre of Nice. INRIA, CNRS and the University of Nice hosted the conference; INRIA is the French Institute for research & development in information, communication, science and technology, CNRS sponsors research in high performance computing and networking and connects over 80 research groups in France that operates in cooperation with the University of Nice.



Figure 2: Acropolis Convention Centre

The conference main topic was a bit vague; it was rather a scattered symposium gathering interesting subjects in the area of parallel and distributed processing, than focused to one specific area of research. However, it was very interesting and I found

some attention grabbing presentations and interesting articles that can turn out to be useful in my work in the HEAVE project.

The first day of the conference was devoted to different workshops, so the main conference started on the second day, i.e. April 23rd. Some of the workshops, e.g. the Workshop on Parallel and Distributed Real-Time Systems (WPDRTS), continued for a couple of days. The WPDRTS workshop, catching a lot of my attention during the first three days, contained a lot of invited researchers from academia as well as from industry. In my opinion, this workshop was the most interesting part of IPDPS'03.

The Presentations

As a novice in the area of researching, one of the most important reasons for me to take part in IPDPS'03 was to learn more about the procedures at a conference, e.g. how to give a good talk. Therefore I went to quiet some presentations, some of them interesting and attentions grabbing and some of them just the opposite.

There were some presentations, which I easily can relate to my own research, that were particularly interesting. There were some sessions during the workshop on parallel and distributed real-time systems (WPDRTS) that were very interesting, e.g. a session about real-time applications. This workshop also contained keynote speeches that were very interesting, e.g. industrial researchers talking about their experience when designing distributed real-time systems.

Beside the WPDRTS workshop, I went to some interesting presentations during the ordinary conference, e.g. the presentation made by Dr. Thane from MdH about Replay Debugging of Real-Time Systems Using Time Machines.

Conclusion

I feel that I have learned a lot from the IPDPS'03 conference, not so much from the details of the presented papers, but rather from the conference as a whole. It gave some insights to what issues are currently important in real-time research, and it provided some interesting ideas for my future work.

Travel Report from RTAS'02

Dan Henriksson

Lund Institute of Technology

October 25, 2002

1. Introduction

The 8th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS'02) took place September 24-27 at DoubleTree Hotel in San Jose, California. I went there together with my supervisor Karl-Erik Årzén, and the main purpose with the trip was to present our paper "Feedback Scheduling of Model Predictive Controllers", co-authored with Anton Cervin and Johan Åkesson.

2. The Bay Area

The conference was held in San Jose 45 miles south of San Francisco. San Jose lies in the heart of Silicon Valley and the recreation opportunities here were rather limited. The conference venue was located right between the highway and the international airport, so it was nice to have a rental car to escape with in the evenings.

On the evening of Saturday the 21st we arrived in San Francisco, where we spent the days before the conference. Sunday was spent sight-seeing in and around San Francisco. As usual it was quite misty and chilly weather in San Francisco, whereas it was considerably nicer down in San Jose.

On Monday we visited University of California at Berkeley, where we met with Professor Edward Lee and got an survey of the current status of the Ptolemy-project. We also got an introduction to Giotto, a time-triggered language for control programming.

3. The Conference

The focus of the RTAS conference was to bridge the gap between researchers and practitioners in the field of embedded real-time systems. A nice balance of the conference content between academia and industry was obtained with a mix of technical papers and experience papers.

The first day of the conference was devoted to a workshop on Embedded System Codesign (ESCODES), and the main conference started on Wednesday the 25th. The main conference ran in a single track with 30 minutes presentations

(27 accepted papers out of 88 submissions). This was a nice format which gave the opportunity to hear all the presentations included in the proceedings.

The conference featured a broad range of papers of which many were quite far from my area of research. Unfortunately, not many papers focused on embedded control applications. The major disappointment of the conference was the keynote speeches, but the conference also featured two interesting panel discussions, one on RT-LINUX and one on RT-JAVA. The panels featured leading experts and future directions in these two areas were discussed.

4. Interesting Presentations

Below I will briefly present some of the regular presentations that I found most interesting.

”RAP: A Real-Time Communication Architecture for Large-Scale Wireless Networks”, C. Lu, B.M. Blum, J. Stankovic, T. Abdelzaher, and T. He

A real-time communication architecture for large-scale sensor networks was presented. These networks are typically used to perform distributed micro-sensing and control of physical environments, e.g. in surveillance systems. The paper introduced a new packet scheduling policy called velocity monotonic scheduling accounting for both time and distance constraints. This policy was shown to be very suitable for wireless sensor networks and the end-to-end deadline miss ratios in the network were reduced.

”Achieving End-to-end Predictability in the TAO Real-Time CORBA ORB”, I. Pyrali, D.C. Schmidt, and R.K. Cytron

CORBA is a middleware intended to simplify the development of distributed applications. Next-generation distributed real-time and embedded applications will have complex quality-of-service requirements, e.g. concerning latency, jitter, and dependability. The paper presented some empirical results integrating Real-Time CORBA 1.0 in the CORBA specification to provide quality-of-service guarantees. The evaluated real-time CORBA ORB is called TAO.

”The Aperiodic Multiprocessor Utilization Bound for Liquid Tasks”, T. Abdelzaher, B. Andersson, J. Jonsson, V. Sharma, and M. Nguyen

The paper presented an multiprocessor extension to a previous utilization bound for aperiodic tasks. A special task model, called the liquid task model, is assumed. This model is representative for high-performance servers (e.g. network routers and web servers) with aperiodic workloads. The schedulability bound then enables admission controllers in these systems to determine if incoming tasks can meet their deadlines. No resources will then be spent on tasks that in the end will miss their deadline.

5. Conclusions

The conference was very interesting and gave a nice in-sight into hot topics in real-time embedded systems, both from an academic and industrial point-of-view. The next RTAS will be held in Toronto, Canada in June 2003.

Travel Report from DSN'02

Jonas Norberg

The Mechatronics lab at the Department of Machine Design

KTH

jonas@md.kth.se

Introduction

The DSN'02 conference was held in Washington DC June 23-26 at the Hyatt Regency Hotel in Bethesda, which is a suburb to Washington DC. I went with a fellow PhD, Ola Larses, who is an industrial PhD at Scania. This was my first major conference and the purpose with the trip was to present a "fast abstract" and to get inspiration from interesting presentations.

Washington

Washington in June is very hot. The temperature during daytime is between 35 to 40 centigrade. The conference was held in Bethesda, which is located a little bit outside of central Washington. It was hard to figure out what kind of area it was, was it a suburb, an industrial area or both? The scenery in the central parts of Bethesda was dominated by the big Chevy Chase Bank, the Hyatt Regency Hotel surrounded by some old small houses rented by lawyers, and a big high school, the Chevy Chase High. No doubt Chevy Chase was (or is) an important man in Bethesda. In the outskirts there were medium sized houses, which were in a good condition but no one seemed to live there. Bethesda is a strange place.

The Conference

The DSN conference is the most important dependability conference. It is attended by many of the famous persons within the field such as: Jean-Claude Laprie and Herman Kopetz. It is also a very big conference with three parallel sessions and two workshops per day. This makes it a little bit hard to follow and some times interesting sessions collide. The variety of the subjects is also quite large but the IT and e-Commerce sessions dominate. My feeling is that they want to be more attractive to the industry where the money is, which might be good though.

Presentations

The first day of the conference was on the Sunday before the actual conference started. It was filled with workshops.

On the second day (or the first day depending on how you see it) João Cunha held his presentation: On the use of disaster prediction for failure tolerance in feedback control systems. Attendance for the presentation was low and I think that this community isn't that interested in control systems. The idea described in the paper is that by using a fail bounded approach instead of a fail silent, the demands on redundancy can be lowered. By using a model of the system it is possible to predict whether the control system can tolerate a disturbance or not and therefore transient errors can be filtered out. Another interesting presentation was: Model checking safety properties of servo-loop control systems, held by M. Edwin Johnson from ITT. He

looked at hazards in tracking antenna systems and used control theory and a symbolic model checker to cope with the hazards.

There was a very interesting panel discussion on the subject dependability benchmarking. This discussion revealed the big gaps within the dependability community. Generally it can be said that it is hard to find what to measure. Reliability and availability might be too abstract and even impossible to measure. Maybe more concrete and implementation specific properties to measure have to be found. It was also debated whether fault-injection is a good benchmarking method or not. It was pointed out that in order to get relevant measures from fault injection a relevant fault model has to be used.

Conclusions

The conference was a good experience for me. I got new ideas and saw that there are gaps to fill in.

Travel Report from ICPP'02

Cecilia Ekelin
Chalmers University of Technology

September 10, 2002

The trip

The trip went to Vancouver (Canada) where I visited the 31th International Conference on Parallel Processing (ICPP'02) which took place August 18-21. The conference was hosted at the Renaissance Hotel located in central Vancouver just by the shore. The main purpose of the trip was to present my paper "A Lower-Bound Algorithm for Minimizing Network Communication in Real-Time Systems".

The conference

ICPP is THE conference for parallel processing and includes all aspects of this area. Hence, the conference is very broad and featured three parallel sessions plus a workshop each day. I think the variety of topics has both pros and cons. On one hand, there is the opportunity to learn something new that you would not have come across otherwise. On the other hand, if your area is periferal to the main-stream topics, it may be hard to make anything useful out of the presentations.

To the main conference, there were 67 accepted papers out of 188 submissions. The number of participants was approximately 150 which is a rather large decline from earlier years.

The presentations

The first day, which was actually before the main conference, there were a number of workshops but I did not attend any of those.

The conference featured three keynote speeches which I think were the major attraction of the conference. The first speech was by William Pulleyblank from IBM Research that talked about the problem of determining protein structures and protein folding. This is a very hard problem and it usually takes one year for a (post-doc) chemist do perform such a task through experimentation. Therefore, computer scientist and engineers have tried to come up with computational methods to address the problem. For IBM, this problem had motivated the development of the BlueGene computer. The second keynote speech was

by Ian Foster from Argonne National Labs that talked about grid computing. I think this was more like a paper presentation and not as visionary as the other talks. The third speech was by John Gustafson which talked about why single systems still were better (more used) than parallel systems. This was the most provocative talk and it pointed out some important issues for the community to work with, e.g., the difficulty of programming parallel computers.

As for the papers, I had not really expected to understand them or find them useful but there were actually some presentations that contained material interesting for my research. For instance, the same algorithm that I have been using for task assignment has also been used for loop parallelization. There were two sessions and a workshop on scheduling but the considered problems usually differed from real-time scheduling (e.g., only on-line and no periods or deadlines). However, after my presentation there were at least some people that thought my work seemed interesting which was fun. Otherwise, the standard of the presentations was quite varying. (Some speakers did not even show up.) There was also quite few persons (approx. 10) attending each session.

The program also included a panel discussion on whether parallel processing is dead or not. The background was that there appears to be harder to get research funding for parallel processing project nowadays and the number of conference participants has decreased significantly. That is, parallel processing does not seem to be “hot” anymore. It was argued that one reason for this is that parallel processing now is so common that it has lost its news (and research) value. Another reason brought forward is perhaps common for all “silver-bullet” techniques: the difficulty of applying the technique (parallel processing) to real applications. This includes both programming issues and the fact that many non-scientific applications do not parallelize easily.

About Vancouver

Vancouver is a popular conference city and it is easy to understand why (at least in the summer). The city is located by the sea and is surrounded by mountain tops. Close to downtown there is a large park (forest) that provides nice trails for walking. Just 20 minutes from downtown it is also possible to do alpine skiing (in the winter).

The future

The schedule for the location of ICPP follows a four year cycle: North-America, Europe, North-America, Asia. Next year (2003) it will be held in Taiwan, 2004 in Santa Barbara (California) and 2005 in Oslo.

LCR'02 Travel Report

Håkan Sundell
Department of Computing Science
Chalmers University of Technology

LCR'02: Sixth Workshop on Languages, Compilers and Run-time Systems for Scalable Computers

This workshop is held every second year and is mainly focused on the scalability of software solutions. In other words that means how well one can make programs run in as much parallel sense as possible. In the ideal case, doubling the number of processors should half the computation time. However this is not the case, so this workshop looks on methods to get higher scalability. This year it was taking part from 22-23 March 2002 and was held in Washington D.C., USA. Because of the organization, most of the participants were from the United States, especially around Maryland, although there were as well speakers from Germany, France, Spain and Japan. I was the only speaker from Scandinavia, the goal of my visit was to present the NOBLE software library, which has showed very good performance in scalability as well on real-time systems.

The acceptance procedure of the workshop is of the very fast kind. Short versions of the papers are submitted only one and a half month before the conference, and acceptance is reported only after two weeks. The proceedings including the full versions of the papers are made available several months after the workshop has occurred. The full papers of this workshop will be printed in the LNCS (Lecture Notes in Computing Science) series sometime this autumn. Because of the workshop characteristics of this conference, the audience might interrupt talks and discuss between themselves (sometimes not including the paper presenter who just keeps quiet!), although you have anyway to limit yourself to the scheduled time of 30 minutes. This can make life hard for especially new un-experienced students; some of them got interrupted for over 15 minutes, resulting in more or less corrupted talks. Keeping that experience in mind, I was quite nervous myself when having my talk. Although I had rehearsed several times before to keep the time, I now had to improvise when needed instead. The number of workshop participants was quite less than anticipated, even more surprising was that one of the head organizers never turned up at all as he had to visit some competing event. The number of people was about 40 the first day, lowering to 25 the next day, although the workshop always had interesting conversations going on. A good move from the organizers side was to end the conference with lunch, thus keeping the audience also through the very last talk.

The papers presented had overall high quality. They covered most topics, including new fields like power consumption in mobile computing. As on many other conferences, the Java language was used in most of the applications. One interesting paper was about extending the RMI for calling procedures in a distributed to also include groups, called GMI, in that way call the same procedure in parallel on several computers with just one call from the originator. What was particularly interesting for me was that this construction scaled well up to some point, after which the performance gain decreased significantly. This was probably caused by the overhead imposed by lock-based synchronization that was used. I talked to the author about instead using non-blocking synchronization, he admitted they had considered a bit although their experience with lock-free was that it was hard to implement correctly. This was good for me, as the goal for my visit was to make advertisement for my library containing several efficient implementations of lock-free and wait-free algorithms. My own talk was appreciated well, I got several interesting questions and people even suggested that I should incorporate the library into some internationally accepted standard library.

Washington D.C. is interesting from a tourists perspective if you haven't been there before. There are a lot of interesting things to see, including the White house and the Capitol. Otherwise it is a very boring city, there is a lot to see but only a little to do. Everywhere is federal buildings, each one greater than the other, but very few places to enjoy, almost no shops, no pubs, no restaurants. It seems obvious that people don't live in Washington City; they just work there. There are of course shops, but only in gallerias and only of the most exclusive kind (definitively not suitable for PhD-students). The only cheap thing that you can do is using the metro system; going to the airport, which is about 60 km away costs only about 14 Swedish crowns.

ARTES Travel Report: Protocols for High-Speed Networks April 2002, Berlin, Germany

Thiemo Voigt

May 5, 2002

I attended Protocols for High-Speed Networks in Berlin (<http://www.usenix.org/events/usenix01/>). This is a quite small but high-quality workshop with about 50-60 attendees. There were quite a number of well-known and respected people among the attendees. I had also attended the previous PfHSN which was had less participants.

The workshop started with a keynote speech, given by Bryan Lyles, the reasearch director of Sprint Labs, one of the largest carriers in the USA. The main theme of his talk was that soon there willbe network processors out that have the capability to perform sophisticated functions on packets at line speed (10 GBit/sec). Sophisticated functions include traffic shaping, policing, updating the protocol headers etc. Furthermore, these units are capable of handling huge numbers of flows. This would enable at least some simplified RSVP, i.e. some kind of guaranteed service for individual flows. The technology involved is not exotic and will scale to 40 Gbit/sec when fiber transmission at that speed is available (so-called OC-768).

I presented my paper “Handling Multiple Bottleneck in Web Servers Using Adaptive Inbound Controls” in the application-level mechanisms session. This session also contained a paper on a distributed cache pruning approach and a paper that stated that TCP is not efficient when the delay-bandwidth product of a network is high. The paper proposed one kernel-based and one application-level solution both of which try to make sure that the window the receiver announces is large enough to “fill the pipe”.

Several papers dealt with Quality of Service. The presented papers included a simplified guaranteed service, using admission control and scheduling to provide service guarantees as well as end-to-end DiffServ support. Interesting is that several papers built on Stoica’s concept of core-stateless networks, where the flow state is carried in the packet headers.

Besides the paper sessions, the workshop also included working sessions on the nowadays almost ubiquitous peer-to-peer computing, high-speed mobile and wireless networks. There were also two invited papers: One on high speed networks for carriers by a person from Siemens who presented their view on a future public network infrastructure capable of seamlessly supporting a variety of telecommunications, data services and applications. The other was a very interesting retrospective on high-speed

networking research. The slides of this talk and the keynote speech are worth looking at and are available on the workshop homepage.

Thiemo Voigt

Travel Report for ISSRE 2001

Andréas Johansson, Robert Lindström, Martin Hiller
{aja, rl, hillier}@ce.chalmers.se
Department of Computer Engineering
Chalmers University of Technology

We have attended the conference “International Symposium on Software Reliability Engineering” in Hong Kong, China. The conference is one of the largest in its area; including students the conference had roughly 200 participants. The main track of this year’s conference was Internet and e-commerce.

The conference had four (!) keynote speakers (one each day of the conference). The first keynote speaker was Terrence Heng from Motorola, who gave a talk called “Software Quality and Reliability” covering the importance of software quality and reliability and the positive experiences that Motorola has had with the capability maturity model (CMM). His talk was a good insight regarding what can be achieved regarding software quality and some suggestions and experiences from Motorola in implementing the CMM model. It should be pointed out here that Motorola has several facilities (especially in Asia) which operates at CMM level 5 (the highest). Overall, he gave the impression that Motorola had very positive experiences regarding CMM. He also had a number of suggested areas where the research community should focus their attention.

The second keynote speaker was Steve McConnel from Construx who gave his talk “10 Keys to Software Project Success” on what makes software projects go well. He gave 10 interesting rules of thumb/keys which one needs in order to be successful in software projects. Of course, these keys were not revolutionary ideas; rather the talk illustrated the fact that there is a huge gap between *best practice* and *common practice* in the software industry.

The remaining keynote speakers were Kalyana Rao (“Business Value of Quality”) from Satyam Computer Services Ltd., and Dalibor Vrsalovic (“Issues in Design & Operation of Modern e-Business Systems”) from Intel. Unfortunately, we did not attend these keynote talks, as we had to prepare our own presentations.

We had all been authors and/or co-authors of various fast abstracts, which we presented at special sessions. The talks went well; although these sessions were not that well attended from other conference attendees (mainly populated by other authors of fast abstracts). Some of the other fast abstracts gave “teaser trailers” to work-in-progress which will be interesting to follow as they grow into full contributions/papers.

We attended several sessions with interesting talks. One of the most interesting talks was given by Brendan Murphy from Microsoft, in a talk entitled “Development & Verification of Windows 2000 and Windows XP”. He talked about the measures taken by Microsoft to increase the reliability of its operating system Windows, when going from the older versions, like Windows 2000 to the new version, Windows XP. He especially focused on the importance of facilitating the use of and the certification of third party software, like hardware drivers.

More information about the conference (including some material from keynotes, papers, panels, etc.) can be found on the Internet (www.issre2001.org).

The papers of this conference were mainly geared toward engineering practice for software projects, primarily covering various testing approaches and statistical reliability prediction approaches. The application domain was to a very high degree Internet and mobile services (which, incidentally, also was the main topic area for this year's conference...:-). Sweden was represented by a paper from Professor Claes Wohlin et al. (now at Blekinge Tekniska Högskola, formerly at Lunds Tekniska Högskola) entitled "Defect Content Estimation for Two Reviewers".

Apart from taking in the technical/scientific information presented at the conference, we had the opportunity to experience the city of Hong Kong. Hong Kong is a very interesting city with a mix of traditional Chinese culture and modern western style making it one of the most exiting cities in the world. This is also extremely evident in the local cuisine, which is a mix of Chinese and many other cuisines, especially other Asian cuisines. But, as a warning, one should be prepared to be served dishes that are really hard to distinguish the origin of (or whether they are alive or not).

Overall, this trip was rewarding in many ways, both professionally, as we got to meet many active researchers in "our" community, as well as socially, as we got to learn more about Asia in general and Hong Kong in particular.

Thomas Nolte
Mälardalens University
thomas.nolte@mdh.se

9 November 2001

The eighth IEEE International Conference on Emerging Technologies and Factory Automation (ETFA'01) was held October 15 – 18 in Antibes – Juan les Pins, France. ETFA is the largest IEEE conference dedicated to Factory Automation. I went there, with the help from the ARTES mobility fund, to present a paper written by my supervisors Hans Hansson, Christer Norström and Sasikumar Punnekkat. The paper “A Simulation Bases Method for Estimating the Reliability of Distributed Real-Time Systems” is produced within the same topic as my research project and therefore it was no problem for me to hold the presentation.

The conference was very good with people from both academia and industry. Sad though, was that many US researchers did not show up on the conference since of the “fear of flying” effect. Good though, was that the conference program was printed with respect to this, so no sessions in the program was cancelled.

The first day was dedicated to be a “hands on” day with speakers from industry, and they gave nice presentations mainly about technical solutions/products with integrated GSM/GPRS modules for monitoring of vehicles. The following days contained 4 parallel sessions running several different “tracks”, for example Factory Communication (which I attended), Automated Manufacturing Systems and Real-Time and Embedded Technology to mention a few. One nice thing with this conference is its wide range of topics, which allows for conference participants to listen to talks on other research areas than just talks within their own field of research.

The sessions were held in quite small rooms, which allowed people to not use microphone. During the 3 conference days I saw many interesting talks, and some that I think can be useful for my research. I also exchanged contacts with some people that I will follow up.

The overall arrangements around the conference were very good. The included lunch buffet was appreciated since the large amount of small dishes served, consisting of many and strange types of food. The gala dinner was also very nice with really good food. The location for the conference was good, Juan Les Pins, with a great range of accommodations and restaurants.

Nolte

Travel report from ISCA 2001

By Martin Karlsson
Uppsala University
martink@it.uu.se

The 28th annual International Symposium on Computer Architecture (ISCA) was held Gothenburg. I attended the conference supported with a travel grant from ARTES mobility. ISCA is considered the most prestigious conference in the computer architecture field and the conference contained a wide variety of interesting papers. I found the overall quality of the papers very high. I especially enjoyed the keynote speech by Greg Papadopoulos, CTO of Sun Microsystems, where he presented his view on the future of storage. I also appreciated a paper on speculative execution as a method of prefetching presented by Craig Zilles from the University of Wisconsin. The paper closest to my own area of research was "Locality versus Criticality" by Srinivasan et al, which explores selective caching based on criticality i.e. a load is classified as critical if a cache miss will cause the processor to stall.

This time was the second time the conference was held in Sweden, which is quite impressive considering that no other country except the US has hosted the conference more than once. General chair for the conference was Per Stenström, coordinator for the ARTES PAMP initiative. In conjunction with the ISCA conference was the Workshop on Memory Performance Issues (WMPI). At the workshop I presented my work on selective cache allocation, which has been done with support from Ericsson UAB. My presentation generated a lot of interesting discussion and I received valuable feedback on my work. The proceedings of the workshop are currently being put together into a book and will be published by Springer-Verlag. I was staying at the conference hotel and my next-door neighbour was Maurice Wilkes one of the computer architecture pioneers and a legend in the field. Dr Wilkes among other things published the first paper on cache memories, which is my own area of specialization. My overall experience from visiting the conference and workshop was great and I wish to revisit the conference again in the future.

/Martin

ARTES travel report

Symposium on Reliable Distributed Systems (SRDS 2001)

*Vilgot Claesson
Department of Computer Engineering
Chalmers University, Sweden*

Location

The conference was held in New Orleans, which is called the “Big Easy” in US from its more relaxed lifestyle compared to the “Big Apple” I presume. There are of course many famous places in New Orleans, one of the most known is probably the French Quarters with its famous Bourbon Street. There you can find many people listening to music, foremost Jazz, eating nice and partying. It seemed to be a small mardi gras there every night.

Conference

The Symposium on Reliable Distributed Systems focus on distributed systems design and development, particularly with reliability, availability, safety, security, or real-time properties. The mostly include research papers but state that they accept experience reports as well. The 2001 edition of SRDS consisted of approximately 25 papers where a few were a bit shorter. There were a number of interesting papers presented, however there were few with any closer relation to my research. One example thought is “A Consensus Protocol Based on a Weak Failure Detector and a Sliding Round Window” by M. Hurfin et al. This paper also shows a trend or penetration of the work of Shandra and Toueg have had regarding failure detectors.

As usual, there are a number of very lousy presentations, but I must also admit that I witnessed the most well prepared presentation I ever watch. The timing was perfect and I even think the slides with all its animations switched automatically while the presenter talked extremely fast. Despite this, he managed to get through with his presentation and it was actually easy to understand...

Our research group had two papers accepted one was presented by Arshad Jhumka and one by me.

Report from Aalborg visit and ETAPS conference, spring 2002

by Alexandre David

Supported by a travel grant from ARTES, I spent four weeks in Aalborg University to work on UPPAAL. We implemented new data structures, we changed the pipeline of UPPAAL, and we prepared the future hierarchical engine. This work gave a performance boost to UPPAAL: 5x faster and 5x less memory compared to the official release.

During my visit I was asked to give a seminar on "Verification of UML Statecharts with Real-time Extensions" that was going to be presented at the FASE conference, part of the joint ETAPS 2002 conference.

Then I spent a week in Grenoble for the ETAPS conference where I presented my paper. From the other presentations and the invited speakers there was a clear trend towards abstraction in model-checking.

Updated: 04-May-2002 14:40

Location: http://www.artes.uu.se/mobility/reports/etaps02_david.shtml



ARTES travel report

Emerging Technologies and Factory Automation, ETFA, conference 2001

Tomas Lennvall

Department of Computer Engineering
Mälardalen University, Västerås

Location

The conference was held in Antibes- Juan les Pins, France, in October 15 – 18. Juan les Pins is situated on Côte D'Azur between Nice and Cannes, which is a very beautiful area, but quite expensive.

The Conference

ETFA is an IEEE (more specifically Industrial Electronics Society, IES) conference and was held for the 8th time.

ETFA is the largest IEEE event dedicated to factory automation and emerging technologies in factory automation, since 1992 it has been hosted by leading academic and research establishments around the world.

The aim of ETFA is to provide researchers with a platform to report on their recent developments in new and emerging technologies and the potential applications to factory automation.

Many of the papers that are submitted to ETFA are later published in the IEEE transactions on Industrial Electronics.

Before the actual conference started, on October 15, there were some very interesting keynote presentations about ways to track vehicles using GPS, GPRS and such. The application for this technology was very wide, from rescue services to the police finding out if you are speeding (not good:).

I attended the conference to present a paper: "*Improved Handling of Soft Aperiodic Tasks in Offline Scheduled Real-Time Systems using Total Bandwidth Server*", authored by Gerhard Fohler, Giorgio Buttazzo, and me. I presented the paper on the first day of the conference, during the first session after lunch.

The ETFA conference had 4 parallel sessions, and a lot of papers were presented since the presentation time was only 15 minutes. This setup was new for me, the conferences I usually attend has no parallel session and 25-minute presentations. The quality of the presentations was very varied, as usual, but in general they were good. For me the sessions about Ethernet communication was most interesting and come closest to my own research. I attended the few sessions that contained these presentations and also the sessions with some other form of communication topic. Most communication topics were about fieldbuses and similar technologies, since it's a factory automation conference. But the introduction of Ethernet into factories is starting to slowly build up some speed.

I also made some good contacts with people involved in the Ethernet communication topic.

As summary I think it was a very interesting conference, and it had very varied topics, which I think is good. This gives you the chance to meet people from totally different fields of research.

Travel Report from University of Illinois

During September 2001 I visited [University of Illinois at Urbana Champaign](#) (usually referred to as UIUC, or just U of I), and the [Coordinated Science Laboratory](#) (CSL). My host for the visit was professor [Kumar](#), who is a professor in control and communication. The visit was paritally funded by [ARTES](#) travel support.



CSL hosts professors in various fiels, such as communication, control, computer science, mechanics, etc., to support cooperation and inter-diciplinary research. This works to some extent (some groups have rather overlapping research).

Kumar's group works primarily with wireless network problems. Some students work on new wireless MAC protocols (to share the medium), others work on capacity theorems for wireless data. One of the more famous results from the group is that the capacity of wireless networks with N nodes scales as $1/\sqrt{N}$ bit-meters/second/user, regardless if optimal or random positions are used. Thus, the more users, the less capacity per user. The idea of a cost of **area** around the receiver for correct reception is central.

Many practical experiments are performed by the group to back-up the theory. They have some 30 Linux laptops with Cisco 802.11 wireless LAN cards spread out in the building, to run capacity and routing experiments. The 802.11 standard is nice to experiment with due to its simplicity (all users in the same "channel", virtually replaces the wired ethernet).

Using the same wireless cards, a new lab has been set up to experiment with complex wireless systems. About 20 radio-controlled cars have been bought, and they

intend to control these using WLAN with camera feedback. With this they can experiment with e.g traffic control. More important for this project, though, is the **software architecture**. How does one build a system which is robust and general, with lots of sensors, actuators, safety nets and objectives spread out and all communicating?

Over to **real-time issues**; there will of course be control problems using the wireless networks. Signals get delayed or lost. For this reason I gave an overview seminar on the topic of control using networks with focus on delays, which was well received. Also wireless networking involves a lot of **scheduling**, especially for routing.

Overall, the three week visit was very rewarding, finding new friends in the area of networked control.

[Bo Lincoln](#)

Last modified: 2001-11-15

Travel Report SIGGRAPH 2001

Ulf Assarsson

Department of Computer Engineering
Chalmers University of Technology
SE-412 96 Gothenburg, Sweden
uffe@ce.chalmers.se

Abstract

This is a short travel report of my trip to SIGGRAPH 2001 in Los Angeles, August 12-17, that was made possible by ARTES travel support.

1 General

SIGGRAPH (Special Interest Group Graphics, ACM) is held every year in USA in the summer. This year, the conference was situated in Los Angeles Convention Center, with between 20.000 and 30.000 visitors. SIGGRAPH is the largest conference in the world for computer graphics and the quality is regarded as exceptionally high. The quality of the accepted papers are generally extremely high. I went to the conference together with a couple of friends.

2 Conference

As always, the conference is divided into School, Papers, Panels, Sketches and Demonstrations. Every day there is parallel events from 8 am to 5 pm, so you have to carefully choose between the sweets. This year, hardware supported vertex shaders and pixel shaders and algorithms for those, were a hot topic. nVidia and ATI have both recently launched graphics hardware supporting programmable vertex- and pixel shaders. A new approximating mathematical model for light scattering in surfaces also received lots of attention, because it is able to produce very realistic images of for example milk and human skin, and still keep the complexity of the computations at reasonable levels. This model was used in the movie "Schrek", launched this year.

On the first two days, Sunday and Monday, the Eurographics Hardware Conference took place at SIGGRAPH headquarters - a hotel near by. One of my friends and I both had registered for that conference, which is much smaller than SIGGRAPH. In total, we were about 200 people. The focus is graphics hardware; algorithms in hardware, algorithms using the hardware, and future improvements.

3 Exhibition

In parallel with the conference, there is also a big exhibition. The exhibition usually takes place in the same building as the rest of the conference and is scheduled to take place the last three days of the conference. Usually there are exhibitors like Intel, Sun, nVidia, Industrial Light Magic, Pixar, Sony and several other famous companies in the graphics industry. This year, my biggest impression was from a small company presenting a flat screen 3D-TV, which fairly convincingly could generate true three dimensional images. For each pixel, it displayed eight images from different angles, in corresponding eight directions. An old technique typically used on

rulers or for toys. Intel demonstrated their Pentium 4, 2GHz processor. nVidia demonstrated their new Geforce3, and ATI launched the Radeon 8500 at the convention and held thorough presentations of the technical issues. ATI were invited to the Hardware Conference and held a very interesting talk with nice graphical demos where they also explained the algorithms and techniques behind what was shown.

4 Personal Reflections

Two receptions were held by the conference: the "Papers/Panels Reception" and the "Course Reception". The Course Reception was situated at Universal Studios, which of course was very nice. At the arrival, we had the chance to see the 3D-show "Terminator", which is a nice mix of real actors, 3D computer graphics and real smoke and drops of water. This certainly inspired the imagination.

One of the most important benefits of visiting SIGGRAPH is the chance to speak to interesting people. In particular I got the opportunity to speak to Henrik vann Jensen (Stanford) and a few days earlier I also bought his new book about photon mapping. Furthermore I had the pleasure to meet one of his students and discuss real-time simulation of smoke and fire. I also got to share the latest insights in ray tracing and real-time ray tracing. Real-time ray tracing is still too costly for anything but small scenes, and the main problem to solve for the future seems to be the memory bottleneck.

This year's trip to SIGGRAPH was very inspiring and gave birth to an idea that hopefully will result in a paper. The idea is about real-time shafts of light. The phenomenon can often be seen very clearly when sunlight shines down between clouds, and is caused by the fact that air scatters light. Simulating this effect can greatly increase the realism of outdoor scenes (but also indoor scenes in certain cases) and is therefore highly desirable for real-time rendering.

Artes Travel Report

European Test Workshop, Saltsjöbaden, Stockholm May 29 - June 1, 2001.

*Örjan Askerdal, Department of Computer Engineering, Chalmers
askerdal@ce.chalmers.se*

I attended this workshop (it feels almost wrong to call a meeting with 130 people for a workshop) to learn more about techniques and problems of testing hardware components. The first day I visit the tutorial “Test Challenges in Nanometer Technologies” by Sandip Kundu and Rajesh Galivanche at Intel Corporation. This workshop treated technology trends, defect mechanisms, circuit marginalities, current test trends and solution trends. The speakers were excellent and I really got to learn a lot of the things I hoped to learn from the workshop already during this tutorial. The second day the main workshop started with a keynote speech by R. Payne from Philips Semiconductors. He addressed the need for common platforms between different products to enhance testing. He also argued for the need of early silicon implementations to find specific faults early in the design process and stated that it is safer to remove hardware during design than to add new hardware. After that speech the main workshop started consisting of two parallel sessions, one containing papers from the academia and one containing industry reports. The fact that half of all presentations were made by people gave a nice mix of participants. This resulted in new ideas for the people from the academia during the industry presentations (this is the problem we want you to solve) and the right level of criticism during the presentations made by the academia. In many of the sessions it was allowed to ask questions during the presentation and 10 min was left in the end for both questions and discussions. That made it easier to put the presentation in a wider perspective in the area of testing and I think that most conferences would gain from such a schedule. To also make it possible for researchers to get feedback in an early phase of their projects a number of poster sessions were held during extended coffee breaks. Another event was the evening breakout session where 5 topics were presented by well known researchers and then everyone chose one topic and joined a brainstorm meeting around that topic. During the brainstorming wine was served and the results were summarized and presented at a specific common session the next day. The subjects of the normal sessions were: Testing of Analog and Digital Circuits (poster session), Defect-Oriented Testing, System-Level DFT (industrial practice), delay testing, Core-based Testing and P1500 (industrial practice), Scan Based Test & Testability (poster session), Case Studies, Full Scan (industrial practice), Analog and Mixed-Signal Testing, Transportation of Test Data (industrial practice), Test Generation and Testability Analysis (poster session), System-Level Testing, Hierarchical DFT (industrial practice), RTL Validation, DFT and TPG, Memory Testing (industrial practice), BIST and Power Consideration, BIST and Test Resource Partitioning, Mixed-Signal Testing (industrial practice), Logic BIST in Action (industrial practice). To summarize ETW, it is a nice workshop with a lot of well-known attendees from both the academia and industry, which gives a very nice atmosphere and interesting discussions. I learned a lot.

Symposium on Parallel Algorithms and Architectures (SPAA) 2001

Travel Report

Yi Zhang

Department of Computing Science
Chalmers University of Technology

Location

The Thirteenth Annual ACM Symposium on Parallel Algorithms and Architectures (SPAA '01) was held at Hersonissos, Crete Island, Greece, July 4-6, 2001. Crete is the largest Greek Island and is notable for its geographical location, climate and diverse natural beauty as well as its unique cultural and historical heritage. Flying to Crete is very easy, there are several charter flights that connect Sweden and Crete.

The Conference

SPAA is supported by the ACM Special Interest Groups on Algorithms and Computation Theory ([SIGACT](#)) and Computer Architecture ([SIGARCH](#)). This year SPAA was co-located with the 33rd Annual ACM Symposium on Theory of Computing (STOC) and the 28th International Colloquium on Automata, Languages and Programming (ICALP). The whole event lasted one week. SPAA 2001 covered all traditional research on parallel and distributed algorithms and architectures, plus new aspects including satellite networks, the web, quantum and DNA computing.

I attended the conference in order to present the regular paper titled: “A Simple, Fast and Scalable Non-Blocking Concurrent FIFO Queue for Shared Memory Multiprocessor Systems”, authored by Philippas Tsigas and me. Our paper was presented the second day of the conference during the morning session.

This year, SPAA had a single track with 34 papers and 14 revue papers presented during the three days of the conference.

For my own research, I found the following papers very interesting:

1. “Room Synchronizations” by G. Blelloch, P. Cheng, P. Gibbons
This paper proposes a new synchronization technology to allow parallel access to data structures. The technology considers the asynchronous system with bounded delay, which is more realistic model compared with the fully asynchronous system.
2. “Scheduling Best-Effort and Real-Time Pipelined Applications on Time-Shared Clusters”, Y. Zhang, A. Sivasubramaniam
This paper addresses scheduling the CPU resources of a cluster system. They consider scheduling both best-effort and real-time applications that have processes communication with each other on such a cluster parallel system.

3. “Pursuit and Evasion on a Ring: An Infinite Hierarchy for Parallel Real-Time System”, S. Bruda, S. Akl

Several complexity classes based on timed w-language are presented in this paper for parallel real-time systems.

The arrangements of the conference were very good. The only disappointment for me was that there was no keynote talk for SPAA.

ARTES Travel Report:
Usenix Annual Technical Conference
June 2001, Boston, MA, USA

Thiemo Voigt

August 1, 2001

I attended Usenix01 (<http://www.usenix.org/events/usenix01/>) in Boston. This was the first time I attended Usenix. My first impressions were that this conference is different from all other conferences I have been to before. Usenix is huge, there were more than 1400 attendees. Also the crowd was very much different, lots of people with long hair and beard, also among the numerous more senior attendees. A large part of the attendees seemed to be system administrators. But there were also interesting and well-known researchers.

Usenix has several tracks:

- The general track, where system research is presented, with researchers as the primary audience. The presented research was of great variety including storage, OS, scheduling, security and networking sessions.
- The freenix track, where free software is presented. This track contained a lot of Linux talks, but for example also a talk given by the inventors of the X system.
- An invited talk track, with very good and well-known speakers. For example, Radia Perlman gave a talk on protocol design while I attended the sessions in the next room. If I had not known Radia was talking I would have guessed a comedy show was going on in the other room.
- And a “Guru is in” track, also with well-known people such as Vern Paxson, one of the gurus in the networking world.

The keynote speech was given by the Director of the IBM Linux Technology Center. Daniel Frye explained IBM’s interest in Linux and why IBM will make a lot of money with the Linux technology. They do not care that they do not develop the OS but they can sell the HW beneath as well as applications and services.

The general session reflected the increasing interest in storage issues. There were two sessions on storage (6 out of 24 papers). The Usenix Association organizes also a new conference on File and Storage Technologies which confirms

this increased interest. There was also a great deal of interest in security issues, which is not surprising given the audience.

The WIP session spanned all the fields cited above. But as for the regular session, the Web is still and will be the dominating example application for a huge part of the developed schemes.

One of the most interesting sessions (besides the Web Server Session where I presented) was the scheduling session. It included a non-blocking synchronization scheme developed at the University of Dresden and implemented in the L4 microkernel that combined lock-free and wait-free synchronization. The next paper presented an improvement of a Linux event-dispatch mechanism. A paper that dealt with a similar problem was presented in the Freenix track. The author had developed a generic and scalable event notification facility called *Kqueue* which e.g. greatly increases the scalability of an event-driven web server. *Kqueue* is implemented FreeBSD but will surely make its way into other OSes. The last paper presented an $O(1)$ proportional share scheduler that was slightly less accurate than WFQ but with less overhead.

In summary, Usenix is different, but it is very interesting. We have seen that good Usenix papers get cited a lot and it is a good place for publicity and spreading your research. In my opinion it is an interesting forum for the ARTES people that also implement their ideas.

Travel Report from RTAS 2001

Lars Albertsson
Swedish Institute of Computer Science
lalle@sics.se

27th July 2001

The seventh IEEE Real-Time Technology and Applications Symposium (RTAS 2001) was held May 30 to June 1 in Taipei, Taiwan. I had received a travel grant from the ARTES mobility to visit this conference, which is one of the main annual events in real-time research. The main reason for my attending the conference was to hold a presentation in the work in progress session.

The quality of the conference was similar to last year; some papers were of high quality and interesting, but most were bland, or not within my field of interest. I appreciated a few presentation on soft real-time systems, for example a paper by Miyoshi and Rajkumar, who presented *resource control lists*, a method for assigning resource reservations to processes. This is a continuation on their good work in resource kernels, and the design was implemented in Linux/RK. I also found a theoretical paper by Tarek Abdelzaher to be interesting. He generalised Liu's and Layland's fundamental theories on scheduling and utilisation bounds to include aperiodic tasks. This paper may very well be frequently cited in future real-time publications.

Overall, I find that RTAS does not focus on theoretical an scheduling research, instead focusing on soft real-time and quality of service support in general-purpose environments. I therefore serves as a much needed complement to more theoretically oriented real-time forums.

The arrangements around the conference were good, although the keynote speakers were not that interesting. I appreciated that an internet connection was provided this year. The conference program also included a guided tour to a museum. Apart from that, Taipei is not very interesting to tourists, and almost completely lacks cultural and historical attractions.

INCOSE 2001 / ARTES Travel Report

Asmus Pandikow
Real-Time Systems Laboratory
Linköpings Universitet
581 83 Linköping, Sweden
asmpa@ida.liu.se
25 July 2001

Abstract. This paper reports the author's attendance of the INCOSE 2001 symposium held 1 - 5 July 2001 in Melbourne, Australia..

BACKGROUND

INCOSE¹ is an international organization that strives to "foster the definition, understanding, and practice of World Class Systems Engineering in industry, academia, and government". The annual INCOSE symposia are the biggest conferences for systems engineering in the world. The number of members attending INCOSE symposia usually ranges between 800 and 900, this year's symposium attracted only around 650 people, probably due to the location of this year's symposium in Australia. INCOSE's members are mainly from the aircraft, space and defense industry, mainly from the United States. Furthermore, there meet also members from different government's departments of defense and also people from academia interested in systems engineering.

AP-233² is a current ISO standardization effort to create an international systems engineering standard enabling data exchanges between systems engineering tools. AP-233 is based on results from the SEDRES-2³ project, in which the author is involved.

The author is working on the integration of object-oriented engineering methods with traditional structured methods. He was invited to present his paper "Support for Object-Orientation in AP-233" at the 11th annual international symposium of INCOSE, which was held 1 - 5 July 2001 in Melbourne, Australia.

¹ INCOSE: "International Council on Systems Engineering", see [INCOSE Website 2001]

² AP-233: "Application Protocol 233", a part of the ISO 10303 standard, see [SEDRES Website 2001]

³ SEDRES-2: "Systems Engineering Design Representation Exchange Standard 2", IST project 11953, see [SEDRES Website 2001]

CONFERENCE

Organization. The INCOSE symposia start with board meetings and working group meetings on the weekend. On Monday, full and half-day tutorials are given, followed by presentations of technical papers and panels from Tuesday through Thursday. During the conference, meetings of the different working groups take place and a permanent exhibition presents different sponsors as well as other companies related to INCOSE.

This year's over 150 technical papers and 14 panels were organized in up to eight parallel tracks. Furthermore, the different working groups had scheduled their meetings in parallel to the paper presentations and panels.

Tutorial. The author chose to attend the full-day tutorial "The Systems Engineering Environment" by Leonard Karas and Lori Pajerek. The tutorial did not quite meet the author's expectations. It mainly focused on presenting a method for engineering at system level, focussing on quality improvements in early phases of system development, mainly by simplifying the concepts of early phases (such as in requirements engineering) and a more intense customer involvement. The presented method lacks automated tool support and hence also does not provide the advantages of formalized methods. The tutorial did not elaborate the environment of systems engineering in general. It was not abstract, such that one could have extracted many new ideas from it for other systems engineering environments than the one presented.

Working Groups. The author attended the working group meetings of the "Model Based System Development" working group. Here, the major efforts were spent on formulating requirements for a systems engineering profile for the UML⁴.

The interest of the systems engineering community in object-oriented methodologies is

⁴ UML: Unified Modeling Language, see [UML v1.3 2000]

growing, and the UML systems engineering profile would enable the use of this widely established notation (at least in software engineering) for engineering at system level.

Technical Papers and Panels. The author attended selected technical paper presentations and panels, mainly tackling object-oriented aspects of systems engineering, but he prioritized the parallel working group meetings.

The papers and panels have shown that object-orientation has been recognized by the systems engineering community, but is not yet used very much. Furthermore, discussions with paper authors and panelists have shown, that there is great interest but still a lot of misunderstanding when it comes to concepts and goals of object-orientation. Some delegates even see object-orientation threatening their good experiences with traditional structured methods and are strictly against the introduction of the “software-only tailored” object-oriented concepts to systems engineering.

The conference program of the INCOSE 2001 symposium as well as all paper abstracts can be found at [INCOSE Website 2001]. The author can provide detailed reviews of the following papers and panels on request:

- 6.2.2 “Shoot the Modelers & Begin Design – Focusing Analysis on Design Using a System Model”
- 6.2.4 “Investigating Risks in Systems Engineering Tool Data Exchange”
- 6.3.1 “Pilot Application of the OOSEM Using Rational Rose Real Time to the Navy Common Command and Decision”
- 6.3.2 “A Frame-Based Approach to Requirements Engineering”
- 6.3.3 “Emergence: Open Your Eyes to New Vistas”
- 6.3.4 “Threads, Reference Cases and System Models: Adapting OOA to Complex System Specification”
- Panel “Model Driven System Design: Update from the Trenches”
- Panel “Enhancing UML for Systems Engineering”
- 5.7.2 “The Data Standard AP-233: An Invigorator for Global Systems Engineering”
- 5.7.3 “Impact of Shared Data Environment – Enterprise Integration (SDE-EI) on Systems Engineering”
- 5.7.4 “Support for Object-Orientation in AP-233” (the author’s paper)

TRAVEL AND VENUE

The flight from and to Australia was strenuous. The net time on-plane was about 24 hours each way (Stockholm – Bangkok – Sydney – Melbourne and back), which definitively is too long for a 7-day-stay in Australia.

The Carlton Crest Hotel was a convenient and nice place to stay, especially because the symposium was hosted in the same hotel.

Unfortunately, due to long meetings and discussions, the author was not able to visit many other places in Melbourne, except for some evening dinners and a short walk through the city of Melbourne.

REFERENCES

- [INCOSE Website 2001]: INCOSE: Website of the International Council on Systems Engineering, INCOSE, at <http://www.incose.org>, updated 2001
- [SEDRES Website 2001]: SEDRES Project: Website at <http://www.sedres.com>, updated 2001
- [UML v1.3 2000]: OMG: “The Unified Modeling Language Specification v1.3”, at the OMG website at <http://www.omg.org>, 2000

Travel Report from ECRTS'01

Jan Carlson
Mälardalen University, Sweden

June 27, 2001

Location

The 13th Euromicro Conference on Real-Time Systems was held in Delft, The Netherlands, June 13–15, 2001. The town of Delft is located between Rotterdam and Den Haag, and feels very much like a typical Dutch town, at least to a foreigner. One quickly learns not to refer to locations as “close to the canal”, since there are at least ten of them within the city centre. Despite the modest size, Delft has a large technical university, which was where the conference was held.

The Conference

My main motivation for attending the conference was to present a paper at the work-in-progress session. Also, I expected to broaden my knowledge of real-time related issues, and since this was my first conference, to just watch and learn what a conference is like.

In general, I found the sessions interesting and well presented. The most interesting presentation, and in my opinion the most substantial contribution to the real-time field, was given by Enrico Bini in the second scheduling session. It was titled *A Hyperbolic Bound for the Rate Monotonic Algorithm* and presented a new way of verifying the feasibility of task sets under the rate monotonic algorithm. The new method has the same complexity as the well know Liu-Layland method, but less pessimistic.

The two sessions that I originally thought I would find most interesting were Design and Formal Systems. Both of these turned out to be somewhat of a disappointment, partly because of the quality of the presentations and partly because the addressed issues was not within my main field of interest. Still, I quite liked the description of MAST, a model for representing temporal elements of real-time applications. Another interesting presentation, titled *Test Generation for Time Critical Systems: Tool and Case Study*, described how a formal specification of a system can be used to automatically generate good test cases.

As a conclusion, I feel that I learned a lot from the conference, not so much from the details of the presented papers, but rather from the conference as a whole. It gave some insights to what issues are currently the important ones in real-time research, and it also provided some interesting ideas and many valuable contacts for my future work.

Travel Report from ASP-DAC 2001

<http://www.aspdac.com/>

February 20, 2001

Flavius Gruian
Lund Institute of Technology
<Flavius.Gruian@cs.lth.se>

The Asia-South Pacific Design Automation Conference (ASP-DAC) is the far east brother of the big Design Automation Conference (DAC). This year's ASP-DAC was hosted by Yokohama, Japan, between January 30 - February 2. My purpose of being there was centered on presenting a paper (*LEneS: Task Scheduling for Low-Energy Using Variable Supply Voltage Processors* by myself and Kris Kuchcinski) and meeting many of the great names in design automation.

The conference started with five parallel full day tutorials. I had a hard time deciding which to attend since *Software Development Methods for Embedded Systems* was only one of the several interesting tracks. Finally I chose *SpecC: Specification Language and Design Methodology* tutorial inspired by D.D. Gajski. SpecC was born at UCI, but its development has just recently been moved to eastern Asia, and Japan especially. TOSHIBA is working on a SpecC based modeling and synthesis tool which will be freely available for non-commercial use.

The actual conference span over three days, each containing 4-5 parallel tracks. The first day also contained the University LSI Contest which contained a multitude of working systems, fully designed by students. Throughout the conference I mainly followed the low-power and low-energy oriented tracks, so my impression was formed only based on these. And I have to confess, I expected a bit more from such a big conference. Most of the papers & presentations I was interested in contained dated methods and results or of mediocre quality. Yet, some (the embedded tutorials) delivered the high standard I was expecting. Only to mention here: *New Directions in Compiler Technology for Embedded Systems* by N. Dutt (UCI) and *Power Optimization and Management in Embedded Systems* by M. Pedram (Univ. of Southern California).

Apart from the formal frame of the conference, I came in contact with many researchers, from US mainly. It seems like the universities from US and Japan are quite interested in getting people for post-docs or graduate studies. I also found a korean research group involved in ARTES, which works in the exact same area as myself. Hopefully I will pay them a visit in Seoul soon.

Finally, the conference venue, Pacifico Yokohama Conference Center and the surroundings were absolutely marvelous. And the traditional japanese courtesy was at times almost embarrassing for me, as a westerner. I also managed to take a few days off and visit all the ex-capitals of Japan.

OPODIS 2000 Travel report

Hkan Sundell
Department of Computing Science
Chalmers University of Technology

OPODIS 2000

OPODIS stands for On Principles on DIstributed Systems and is a international conference held yearly since 4 years back in time. This year it was taking part from December 20 to December 22 in year 2000 and was held in Paris, France. Most of the participants were from France but there were also quite a big contribution from the rest of Europe as well as North and South-America.

The official language was English although one talk actually was held in French with English slides. The presentations were altogether very good and the conference hall was very well-suited for the purpose with built-in video-projector and high quality audio system. The hall floor also were leaning downwards which meant that you could actually see the slides and the presenter from anywhere in the hall, which is different from some other conferences where you only can see the back and neck of the person in front of you. The conference hall were actually rented from a big commercial center, a huge science center in the north region of the central parts of Paris. This center is mainly thought of being a portal to young people and the public in technical and natural sciences, it is called citÈ des sciences & de l'industrie.

As a paper presenter, as myself, you got a quite good freedom to layout the talk in a way to really present the papers in a more educating way, as each presenter got plenty of time. The papers

were divided in two sections, full papers with 45 minutes presentations and short papers with 30 minutes. In overall there were 14 papers presented and 2 invited talks. Although the conference was not focused on real-time systems, many papers touched this aspect in any way, like looking at bounding delays and etcteras which actually is part of real-time systems. Many presented self-stabilizing algorithms which also are applicable to distributed real-time systems, where fault-tolerance are considered. In my own area of mechanisms for avoiding the blocking problem connected with mutual exclusion there actually was one paper that looked on how to achieve mutual exclusion in a distributed system called "Self-stabilizing group mutual exclusion for asynchronous rings". Some papers also looked on aspects like QoS (Quality of Service) and multicasting. In overall I think the majority of the papers should be interesting to the real-time community, if not because they are considering real-time systems aspects but then perhaps more because they could be adopted to a real-time system environment.

In overall the conference was very well organized, and a lot of nice social events as well. The major was of course the evening with a high-class dinner up in the very Eiffel-tower, and the nice champagne testing event was also something to remember. Paris is a quite interesting city and has a lot of things worth to see, besides from Mona Lisa there a lot of other really nice things as well. Even you don't know a single word of french (as myself) you can manage quite well with english and gestures. As Paris is a big city with a lot of criminal problems you have though to be somewhat careful about yourself and your behaviour, we very actually advised not to be out on the subway (called Metro) after 10 pm.

The next conference in the OPODIS series will be held in Mexico.



Travel Report RTCSA'2000

Björn Andersson
Department of Computer Engineering
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
ba@ce.chalmers.se

Abstract

This document describes my visit at the conference RTCSA'2000 in South Korea. Facts about the conference is available at <http://casaturn.kaist.ac.kr/~rtcsa/>, so I focus on my impressions.

1 Motivation

I went to RTCSA'2000 to present my paper: "Fixed-priority preemptive multiprocessor scheduling: to partition or not to partition".

2 Impressions

Trends Based on papers from this conference and other conferences I have observed an increase in interest in the following areas: (i) energy-efficient scheduling, (ii) wireless real-time communication (iii) scheduling on processors based on future architectural ideas, e.g multi-threaded processors.

One of the invited speakers worked at Samsung. He stressed two trends: (i) the need to make software upgrades with minimal user involvement and (ii) many embedded systems of the future will be connected to the Internet.

Invited Talks Al Mok gave an interesting talk about scheduling anomalies for non-preemptive scheduling on a uniprocessor. That talk dealt with problems that are similar to problems that I study.

Papers For my research I found the following papers interesting.

- "Real-time Multiple Video Player Systems", *Chris C.H. Ngan, Kam-Yiu Lam* The paper describes feedback control scheduling, with the following unique features: (i) it uses fixed-priority rather than dynamic priority, (ii) a task that misses its deadline receives a higher priority directly even if its deadline and period is not changed, (iii) the scheme handles dependent tasks by raising priority to both the task that missed its deadline and its preceding tasks, and (iv) a preceding task has higher priority than the task that it precedes.

- "Space efficient wait-free buffer sharing in multiprocessor real-time systems based on timing information", *Håkan Sundell, Philippos Tsigas* The paper enables more innovative scheduling techniques.
- "Efficient Pure-buffer Algorithms for Real-time Systems", *James H. Anderson, Philip Holman* The paper enables more innovative scheduling techniques.
- "A Comparative Study of the Realization of Rate-Based Computing Services in General Purpose Operating Systems", *Kevin Jeffay, Gerardo Lamastra* The paper suggests that different rate-based scheduling policies should be used to schedule different layers in the operating system.

People Many researchers in the Artes network attended the conference. At the banquet, one Japanese researcher at my table suggested that the conference should be held in Sweden in the future.

There are some people who are studying a similar problem that I study, and I hoped to meet them. They are coauthors to other papers presented at RTCSA'2000. Unfortunately they did not attend the conference.

Human aspects South Korea in December is as cold as Sweden in December. The Korean food often consists of seafood. I had a problem to eat that, but I found the Japanese food to be easier to eat.

I found the employees at the hotel to be service minded. For example: hotel reservation via fax, something that usually screws up, did work this time.

Some Koreans, for example researchers and flight personnel, know English. However in general, Koreans do not know English.

RTCSA 2000 Travel report

Radu Dobrin
Department of Computer Engineering
Mälardalens University, Västerås, Sweden

2001-01-10

1. Location

The RTCSA conference was held at Cheju KAL Hotel, Cheju Island, Korea, between December 12 and December 14 2000. The conference was held in conjunction with the Swedish – Korean Real-Time workshop held on December 10 and December 11, 2000. Unfortunately, I was not able to attend the workshop.

2. RTCSA

My expectations for the conference were hard to define since this was my first attendance at a Real-Time conference, but as a general conclusion, the experience was very good. I gave a talk on the last day of the conference about a paper I wrote together with my supervisor, Gerhard Fohler, and the feedback was helpful. I meet a lot of people from all over the world who are working in the field of Real-Time Systems and the conversations with them was really useful. As a negative remark, I think the organization of the conference could have been better. Some of the talks were hard to attend since the conference was held in parallel sessions.

One of the most popular topics discussed at the conference was scheduling, which is also my field since I am involved in a project in the area of flexible and predictable timing constraints. There were a lot of interesting presentations but, unfortunately, some of them were hard to follow because of language difficulties some of the speakers had. J. Ng et al. wrote an interesting paper about designing a multi server for a distributed MPEG video system with streaming support and QoS control which is of our interest since we are developing a similar multimedia application in a project that involves the master students at the Department of Computer Engineering at MDH. C. Ngan presented an interesting paper about Real-Time video player systems. A presentation related to my own field was given by James Anderson about Pfair scheduling in which he presents an algorithm for scheduling intra-sporadic tasks. The paper is interesting for me because in my future work I will consider the derivation of fixed priorities, periods and offsets for tasks with complex constraints (instance separation, jitter).

As an overall evaluation, I think it was useful to attend the conference and I am looking forward to attend (and contribute to)

the next one that will be held in Japan in December 2001.

Updated: 29-Jan-2001 14:16

Location: http://www.artes.uu.se/mobility/reports/rtdsa00_radu.shtml



Travel report from CDC 2000

Anton Cervin and Bo Lincoln from the Department of Automatic Control at Lund Institute of Technology participated in the [39th IEEE Conference on Decision and Control \(CDC'00\)](#) in Sydney, Australia, December 12-15, 2000.

CDC is the world's leading annual automatic control conference with several hundred delegates. The lectures were given in thirteen parallel sessions, and there were also plenary lectures and special evening sessions. The conference has a strong theoretical control content, but some sessions this year were of interest to the ARTES community.

Anton presented the paper "Feedback Scheduling of Control Tasks" ([pdf](#)) in an invited session on Integrated Control and Scheduling, organized by Karl-Erik Årzén and Lui Sha.

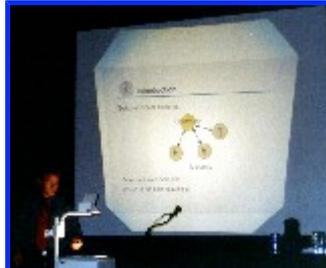
Bo presented the paper "Efficient Pruning of Search Trees in LQR Control of Switched Linear Systems" ([pdf](#)) in an invited session on Optimal Control of Hybrid Systems.



The venue



Anton lectures



Bo lectures

Highlights

Hybrid and switched systems

Controllers controlling real-world process using a shared resources, such as a CPU or a network, can be regarded as hybrid control systems. This is due to the real world being continuous in time and the CPU or the network (sampled or scheduled) being discrete in time. In several sessions on this topic, stability of such systems were investigated and optimal controller algorithms were presented. The problems stated are very hard, so the contributions to the field presented at the conference were mostly problem formulations and simplifications so that solutions could be found. Many approaches presented have connections to behavioral programming.

Feedback scheduling

Two invited sessions at the conference treated the topic of integrated control and scheduling, and in particular feedback scheduling: "Challenges in the Application of Control to Computer Systems" organized by Molly Shor and David Steere, and "Integrated Control and CPU Scheduling" organized by Karl-Erik Årzén and Lui Sha. The papers describe how control can be used in adaptive scheduling and resource management and including applications such as video streaming, internet servers, and hybrid controllers.

Control in communication systems and networks

There were quite a number of sessions regarding communications networks. Here, the topic was not control over a network, but rather control of the network itself. Control of network flows with quality-of-service constraints such as low delay is a very difficult problem, and this was treated to some extent.

[Anton Cervin](#)

Last modified: 2001-01-22

Travel report by
Anders Pettersson
Department of Computer Engineering
Mälardalens University, Västerås , Sweden
Visiting 21st Real-Time System Symposium (RTSS00) and Real-Time Linux Workshop (RTLW).

1 Where and Why

The 21st Real Time System Symposium 2000 was held 28-30 November 2000 at Hilton Hotel Orlando, Florida. Parallel with RTSS00 the Real Time Linux Workshop was held 27-28 November 2000. I arrived at Orlando International airport on Saturday 25 November. So I had the opportunity to spend the Sunday to explore the nature of Florida. We visited the Homosassa Springs wildlife park and looked on manatees, and other birds and animals in Florida.

RTSS00 was my first international conference, and therefore I had no expectations of what the conference could give. The purpose for attending the conference was to learn and see how it works at a conference. But I got more than that. I got an overview of state-of-the-art in the real-time research community today.

2 The symposium

In RTLW the main topic was how to use Real-Time Linux in industry applications. I got the impression that the industry will use RT-Linux more in the future than today due to the reason that it is a free software. Since it is shipped with the source code the system designers can have control over the whole system not only the in-house developed code. There was many interesting presentation. Thomas Bihari talked about using RT-Linux in safety critical applications, Phil Wilshire talked about testing and evaluation of RT-Linux, and Lars Albertsson talked about simulation-based temporal debugging of Linux.

Topics of the RTSS00 conference was in the range from real-time system design, including analysis, verification, and scheduling theory to real-time communication, distributed real-time systems, and applications of real-time system. Tuesday afternoon there was a joint session between RTSS00 and RTLW with a talk by Richard Stallman. He talked about free software foundation. Next there was a panel discussion about development of RTOSes and the use of Linux in the RTOS and embedded market. Wednesday's talk were of no interest for me, but there was some talks about worst-case execution time analysis and Scheduling that considered the impact of cache and pipelines. I probably going to read more about these topics since this seems to be a new approach to get more optimistic methods.

3 Impressions

Since this was my first conference I had nothing to compare to, but in my opinion the talks in RTSS00 was of high standard (with a few exceptions), the talks in RTLW had more varying quality. The only thing that was not so good was that those who presents their papers had so much trouble with their laptops and the projector. The Symposium ended on Thursday and my plane departed on Saturday so I had a whole day to spend in downtown Disney. The grand finale of the trip was to see the launch of the Endeavour space shuttle.

RTSS Travel report
Tomas Lennvall
Department of Computer Engineering
Mälardalens University, Västerås, Sweden
2000-12-19

1 Location

The RTSS 2000 was held at the Hilton Hotel Orlando, Florida, from November 28 to 30 this year. The symposium was held in conjunction with the RT-Linux workshop that was held from November 27 to 28. I went to the symposium with two other Ph.D. students from my department, and my supervisor. I also liked the location they choose for the conference since it was a lot hotter in Orlando the home in Sweden:-), and i had never visited USA so i was curious of how it was over there.

2 RT-Linux Workshop

My expectations for the workshop was the same as for a symposium but with shorter presentations. And the area of RT-Linux interested me so i thought that it would be very interesting to attend the workshop. But i was a bit disappointed, the quality of the presentations was not good, people had trouble keeping the time and seemed generally unprepared for the presentation. There were a few good one though, one interesting topic was the simulation of temporal debugging for RT-Linux, and another interesting topic was shared memory between user and kernel space. Since I'm not a RT-Linux expert it was difficult for me to follow some of the presentations that dove really deep into the internals of RT-Linux.

In the afternoon of day two, as a joint session for both the workshop and the symposium, there was an interesting speech about free software by Richard Stallman.

3 RTSS

I had heard that RTSS is supposed to be the biggest and most renown of the real-time conferences, so my expectations was quite high. And since this is my second conference, i also visited EUROMICRO conference on real-time systems in Stockholm this summer, i now how a conference works. Generally the quality of the presentations in the symposium was better than the presentations in the RT-Linux workshop, and more in my area of knowledge, but the conference didn't really live up to my expectations.

RTSS covers most of the topics in the real-time area but my impression is that scheduling is the most common topic, which is quite good for me since

we do a lot of scheduling in my research group. There were interesting presentations about scheduling to minimize the energy consumption of the system, for both embedded systems and PDAs. Another interesting presentation was about scheduling and considering cache and pipelines, and also a presentation about scheduling of dynamic method invocations in distributed systems. These presentations has lead to me searching for more papers in these topics, and they are in a way related to my own project.

Travel Report from RTCSA 2000 in Cheju Island, South Korea

Anders Wall and Markus Lindgren
Mälardalen Real-Time research Centre
Department of Computer Engineering
Mälardalen University, VÄSTERÅS
{[awl](mailto:awl@mdh.se), [mle](mailto:mle@mdh.se)}@mdh.se

Introduction

We went to Korea and RTCSA 2000 in order to present three papers. Sweden was well represented with 10 papers out of 70, including six papers from MRTC in Västerås. The conference was located at Cheju island and lasted for three days. Before the start of RTCSA there was a Sweden-Korean workshop at the same location, lasting for two days

Cheju Island

Cheju is the biggest island in Korea with approx. 500 000 inhabitants. It is located south from the mainland in the Yellow Sea. Cheju is most famous for being a resort where Korean honeymooners spend their vacation. It was a very interesting place to visit as the culture and the food was rather different from what we are used to. Even though tourism is one of the island main sources of income, it is almost not exploited at all.

Our slightly different appearance, compared to Koreans, seemed to amuse most of the local inhabitants, since many of them started smiling and giggling as soon they spotted us. Quite amusingly, it was equally easy to make ourselves understood when speaking Swedish. (Perhaps they all take Swedish classes?)

Sweden-Korean workshop

The purpose of the workshop was for Sweden and Korean researchers to get together and find areas for possible collaborations, but also to simply get to know the "other" sides work.

The workshop lasted over one and a half-day, with about equal number of presentations from each country. (The half day that's "missing" was spent on a short sight seeing tour of Cheju Island.)

Each presentation was allotted 30 minutes (including time for questions). The Korean researchers had a quite strong focus on reducing power consumption in embedded systems; an issue which today is very important and probably will be so for quite some time. They attack this problem by both software and hardware tricks. In my opinion the hardware approach is the best.

Talks

One talk was on a special device for measuring the power consumption. The device was able to measure the power consumption between two different (processor, RAM, etc.) states with only two or three sample points (others require many more).

Sheanyun Lee had performed an investigation of how "eor" instructions with different input data consume differing amounts of power. In essence the hamming distance between consecutive instructions decides the power consumption. (Rather low-level work and it seems quite hard to make significant changes to power consumption by optimizing the instruction layout from a compiler, which seemed to be the goal of this work.) Andreas Ermedahl who is currently a visiting researcher at Seoul National University was co-author of the paper.

One talk was on modifying frequency and voltage to the processor while still being able to make some predictions on real-time performance. (Basically the same result as was previously published in RTSS'98.) In

my opinion this seems to be a better approach towards reducing power consumption. Quite surprisingly they did not seem to be supported by industry (at least not Sheayun's work).

From the Swedish side execution time analysis dominated (Jakob, Ebbe, och Jan G). Hans reported on our effort on moving towards reliability estimates rather than timing guarantees. There was also one talk from Lund on their efforts on making Java suitable for embedded systems.

Conclusion/Result

Besides a greater insight into each others work, I don't think this workshop will have any immediate effects. (Perhaps Hans has some more input on this topic?)

RTCSA 2000

The conference can be concluded as “yet another conference on real-time systems”, thus the community still has its focus on guaranteeing temporal behavior, i.e. scheduling. Nevertheless, some indications on a shift of focus could be perceived, if not in the proceedings so in the keynote speech given by Al Mok from University of Texas, Austin. He hinted at that we have to investigate how to design- and maintain systems. In my opinion, he touched on a very important issue although he ended up falling into the “scheduling-pit” again. His main point was that we must schedule systems such as they are *robust* to changes in execution times and frequency. Such changes can, for instance, arise from changes to a more effective hardware. Another example is when new functionality is to be added and we need to release some utilization from the system for that by decreasing the frequency of some of the tasks that already exist in the system. Moreover, the same conclusion regarding trends could be drawn from some of the informal discussions we had offline.

The trend that has been going on for a while now, namely soft real-time systems, was continued. A lot of people are targeting consumer applications such as multimedia, and personal communication.

Travel Report from RTSS 2000

Ola Redell

Damek, Inst. för Maskinkonstruktion, KTH
ola@md.kth.se

Dec 11, 2000

In November this year I visited the Real Time Systems Symposium ([RTSS'2000](#)) in Orlando, USA. RTSS is one of the best known conferences in the area of real time systems and the papers presented are usually of high quality. The conference was preceded by a workshop on real-time Linux which I did not attend.

A paper by Saksena and Wang, "Scalable Real-Time System Design using Preemption Threshold" was specifically interesting as it relates to the problem of scheduling analysis together with object oriented design methods, e.g. ROOM and OCTOPUS. Generally such methods are based on the concept of active objects that respond to incoming signals using an internal non-preemptable scheduler. The paper presents a method for designing systems with such active objects.

Another interesting paper was the one by Palopoli et al. ("Real-time control system analysis: an integrated approach") who had implemented a tool that allows evaluation of control quality resulting from scheduling. Work that take an overall view of control system design and the following real-time implementation is rare but important as most of the embedded real-time applications are control systems.

A third interesting paper in a different field was the one by Lipari, Carpenter and Baruah ("A framework for achieving inter-application isolation in multi programmed, hard real-time environments"). It addresses how to isolate different applications from each other by using scheduling techniques. The basic idea is that two applications executing on two separate dedicated processors, should be possible to implement on one single processor with preserved behavior for each application. This can be specifically interesting for safety critical systems in which e.g. a possible failure of one application should not affect the success of another potentially more critical application.

The keynote speaker - Richard Stallman - gave a very interesting and entertaining talk on the GNU project (that he initiated) and free software in general (free as in free speech, not free beer!). He described how he had come to work full time on free software and how the GNU project, whose goal was a free operating

system, became a part of the Linux OS. He urged us to start calling Linux "GNU/Linux" instead. Richard Stallman is obviously one of those rare idealists and I think his talk worked as an eye-opener for many of us.

In all, the presented papers held a high standard and most of the american part of the real-time community was represented. The week came to a perfect end when we got to see the launch of the Endeavour space shuttle at Cape Canaveral.

Date: Mon, 18 Dec 2000
From: Ola Redell ola@md.kth.se

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SIGGRAPH2000

The SIGGRAPH2000 (Special Interest Group Graphics, ACM) conference was organized in New Orleans, 23 - 25 of July this year. SIGGRAPH is the worlds biggest computer graphics conference and exhibition with about 30.000 visitors each year. Next year (2001) it will be hold in Los Angeles again, 12-17 August. I went to the conference together with Tomas Möller (Ph.D. in computer graphics) and Jonas Lext (Ph.D. Student) from Chalmers.

Conference

As usual the conference was divided into School, Papers, Panels, Sketches and Demonstrations. Every day there was parallel events from 8 am to 5 pm, so you had to carefully choose between the sweets. This year subdivision surfaces were a hot topic, and several new papers were presented in this field. The next new issue was the abandoning of triangle rendering, in favor of point rendering. The idea is that a triangle has to cover at least 6 pixels in order to be cheaper to render than the individual points. The trend is that the triangles get smaller and smaller every year. The hardware vendors seemed to be very interested and we will probably see more of this technique within the next two years.

Henrik wann Jensen (Stanford) got some real attention this year with his Cephon mapping technique, which is a promising method to capture some difficult effects like caustics (caused by refraction and lens effects on rays).

Exhibition

Every year there is a 3D graphics exhibition going on in parallel with the conference the last 3 days. All major software and hardware vendors are present. This year nVidia and Intel ruled the exhibition. Intel presented their Itanium64 processor. Sony showed their GS-cube with impressing real time performance. It consists of 16 parallel Playstation2. They showed some real time rendering of a scene from Ants with 128 fighting ants, on a movie screen in a small cinema they had built up inside the convention center.

Personal Reflections

New Orleans is a wonderful city. Everyday is a celebration, and if you like to party, New Orleans is probably the best place to be in the USA. We stayed in the French Quarters at the Bourbon Street, with street playing jazz musicians all night just outside the window. The temperature is about 30 degrees Celsius, which could be tiring in the long run, but inside the convention center it was

cold (almost too cold).

The C̈ray tracing round table was held this year too, and was one of the most fruitful things I went to. We got some feedback on one of your latest papers (BART A Benchmark for Animated Ray Tracing). Last year we discussed whether or not real-time ray tracing is realistic in a near future. This year two German scientists demonstrated their real-time ray tracer, with the capability to ray-trace a static scene consisting of about 100.000 polygons, with a frame rate of 10-20 frames per second. No reflection rays of coarse, but including nice shadows, so the demo was quite impressive. A Ph.D. student had been optimizing the code for PentiumIII with its parallel floating point processing unit (SSE), for a year to get the code as fast as possible.

I also got to know Piero Foscari quite well, responsible for the real-time ray tracing mailing list, and we had some serious discussions how to design the best ray tracers, and what to expect in the future.

Currently Im working on ray tracing of fractal mountains and at one of the receptions I had the pleasure of getting a small chat with Ken Musgrave, a guru of fractal environments, and some of his students.

Since Tomas Möller currently is studying at the computer graphics department of Berkeley, we just had to make a visit for a couple of days, which was very inspiring. Due to an incredible luck I also got the chance to spend one day at the computer graphics department at University of North Carolina, Chapel Hill, which has been selected the best and largest in the world. It was very interesting to meet the people and see how they worked, whom I so far only had read about.

I learned a lot during the trip and it was very inspiring. We got several new ideas for research projects, with focus on real-time ray tracing.

Ulf Assarsson,
Ph.D. Student, Department of Computer Engineering, Chalmers
Södra vägen 91
412 63 Gothenburg, Sweden
+46 (0)31-833817

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Travel Report from ASLPOS IX and PACS'00

<http://foothill.lcs.mit.edu/asplos2k/>
<http://dynamo.ecn.purdue.edu/~pacs00/>

November 21, 2000

Flavius Gruian
Lund Institute of Technology
<Flavius.Gruian@cs.lth.se>

The 9th conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS IX) took place in Cambridge, Massachusetts, from November 13 to 15. Two full-day workshops were held one day before the conference, namely the 2nd Workshop on Intelligent Memory Systems and the Workshop on Power Aware Computing Systems (PACS'00). The purpose of my visit was, at first, to present a paper (*System-Level Design Methods for Low-Energy Architectures Containing Variable Voltage Processors*) at the latter. Second, an event such as ASPLOS is a good place to get the latest news in microarchitectural decisions, and not only.

The trip started with a pleasant surprise in the first day, when I realized that there were many participants interested in my work (Currently we are planning a longer term collaboration with one of the research groups I came in contact there). The following day begun to unwind in a hectic but fruitful pace with presentations involving MEMS (micro-electromechanical memory systems, which seem to be the next big step in the storage technology), FLASH, and network design. One presentation from Berkeley, on networked sensors (*System Architecture Directions for Networked Sensors*, by J.Hill & al.) was particularly interesting. The speaker sent working sensors into the audience, while showing on-screen how the network reconfigured itself as sensor were moving around or switched on/off.

The high-point of the next day was the session on Wild-and-Crazy Ideas, where most were centered on the low fabrication cost microelectronics will exhibit in the near future. More precisely, instead of Design-Test-Build paradigm, we'll see a shift towards a Build-Measure-Design approach. Pretty much as in FPGAs today, but at a higher level of reconfigurability. Although off the RT community interests, there was another "visionary" presentation from Berkeley's J.Kubiatowicz, *OceanStore: An Architecture for Global-Scale Persistent Storage* (Take a look at <http://oceanstore.cs.berkeley.edu>).

Finally, the last day revolved around speeding-up computations using application characteristic behavior. Intel and HP presented a joint paper on IA-64 (*OS and Compiler Considerations in the Design of the IA-64 Architecture*), which supports both data and control speculation, but leaves the compiler and the OS to decide when and how these should be pursued. Another interesting concept, connected to speculative execution, came from the North Carolina State University and says "two redundant programs combined run faster than either can alone." In principle, using a two-way microprocessor chip, two instances of the same program run simultaneously with a slight delay - one gathering profile information and skipping some code, the other patching up if things go wrong.

As a conclusion, there were presented a whole bunch of architectural features, very much application and data specific, that can lead to performance improvements. Some of these features are just improvements of older approaches, (e.g. using a LRU algorithm for cache-line power down) others were entirely new concepts. The impact of these on the RT-community is the need for more complex time estimators, because of their highly dynamic behavior.

One of the eye-striking facts at the conference was the large number of participants from industry (Sun, Intel, Transmeta, Compaq, HP-labs). Many of the papers presented work carried out during internships at IBM, Intel, etc. (Internship is something missing from the Swedish industry, unfortunately.) Furthermore, not only were two dinners sponsored by HP and Compaq, but there was quite a lot of active recruiting going on all the time.

All in all, it was a nice experience....And now I can also say "I've been to Harvard."

ARTES-STUD-26
ARTES graduate student report on the
workshop participation:
SPIN'2000 - the 7th International Spin
Workshop on Model Checking of Software

Elena Fersman
elenaf@DoCS.UU.SE
Uppsala University
Department of Computer Systems
Box 325, 751 05 Uppsala Sweden
Fax: +46 18 55 02 25

September 18, 2000

SPIN'2000 workshop, August/September 2000

SPIN'2000 workshop took place in Stanford University, California, USA. Atmosphere of the workshop was very friendly and it was firstly because of very good organization which was done mainly by Klaus Havelund (QSS/Recom at NASA Research Center, USA). It was a three days workshop where new tools and theoretical work have been presented.

Presentation given by me about the work done by prof. Bengt Jonsson (Uppsala University) and me considered a case study on abstraction of contents of communication channels in Promela. There we described abstraction technique applied to the Five Packet Handshake Protocol which is used in TCP for transmission of messages.

Another work on abstraction was presented by Wayne Liu (University of Waterloo) - Interaction abstraction for Compositional Finite State Systems.

Gerard J. Holzman (Lucent Technologies) was presenting work "Logic Verification of ANSI-C Code with Spin". There was described a tool, AX (Automaton eXtractor), that can be used in combination with Spin to verify logical properties of distributed software systems implemented in ANSI-standard C. AX can extract verification models from C code at a user defined level of abstraction. Target applications: telephone switching software, distributed operating systems code, protocol implementations, client-server applications.

Very interesting presentation was given by Theo C. Ruys (University of Twente) "Low-fat recipes for Spin" where he described several techniques to optimize both the modeling and verification activities when using Spin.

- Random number generation problem
- Array of bits - Bitvector
- Atomicity
- Invariance
- a lot of other recipes which make less state space of models

Those recipes are very useful for modeling and could be implemented in Spin.

Among the tool presentations one of the interesting tutorials was by Jerry J. Harrow (Compaq computer Corporation) - Runtime Checking of Multithreaded Applications with Visual Treads. Here was shown a runtime debugging and analysis tool for multithreaded applications called Visual Threads and described automatic runtime checking for multithreaded applications incorporated in Visual Threads.

Proceedings of the workshop are published in Lecture Notes in Computer Science, vol. 1885.

TOOLS Europe 2000

by Patrik Persson
Computer Science Department
Lund University

I visited the 33rd international conference on Technology of Object-Oriented Languages and Systems, TOOLS Europe 2000, in Mont Saint Michel, France, June 2000. Beside TOOLS Europe, sister conferences TOOLS USA, TOOLS Pacific, and TOOLS Eastern Europe are given annually. Hence this is a major conference in the field of object-oriented software engineering. There is also a fair industrial presence.

Object-oriented programming (OOP) has traditionally been restricted to desktop (and larger) computers, with graphical user interfaces as the "killer application". However, as the capacity and complexity of embedded system increase, several people (including myself) are working on OOP for embedded systems.

I was very happy to see that this community shows a growing interest in embedded and real-time software, emphasized by recent Java-related techniques such as Jini. Beside a session devoted to the subject (where I presented the paper "An Interactive Environment for Real-Time Software Development"), there were tutorials on, e.g., "Design Patterns for Objects in Limited Memory".

The papers presented were on the practical, industry related side; there are other conference with stronger academic, theoretical OOP material. I assume this focus stems from the industrial direction of the conference as a whole.

A good conference requires good opportunities to meet, mingle, and discuss with interesting people. An important component in this is the social programme. The french kitchen did well and offered nice lunches, great dinners, and good wine; there were plenty of opportunities to mingle. The setting, the stunning small village on the hill/island of Mt. St. Michel, added to the enjoyment.

-- Patrik

Date: Mon, 10 Jul 2000 10:43:23 +0200
From: Patrik Persson
Organization: Computer Science department, Lund University

Travel Report from RTAS 2000

Lars Albertsson
Swedish Institute of Computer Science
lalle@sics.se

Jul 3, 2000

The sixth IEEE Real-Time Technology and Applications Symposium (RTAS 2000) was held May 31 to June 2 in Washington DC, USA. I had received a travel grant from the ARTES mobility to visit this conference, which is one of the main annual events in real-time research. My purpose for visiting the conference was twofold: to (hopefully) attend presentations of good research papers and to get an overview of the real-time research field.

The papers presented were of decent, but not great quality. However, a few papers on soft real-time systems contained interesting work. I assume there were also a few good theoretical papers, whose quality I cannot assess as I am not proficient in the field.

Tarek Abdelzaher presented a paper with the title "An Automated Profiling Subsystem for QoS-Aware Services". It proposed an automated mechanism for determining application reservations based on estimation theory and profiling of running systems. The paper included an implementation and benchmark of a web server with a mixed workload. The proposal seems like a realistic approach for managing reservations in servers with soft real-time requirements.

Yoon, Bestavros and Matta had written a paper with the title "SomeCast: A Paradigm for Real-Time Adaptive Reliable multicast". The paper introduced a receiver-driven paradigm for reliable multicast. They also addressed temporal quality guarantees of multicast communication by adapting the amount of redundancy depending on the distance between deadlines. Their design seems like a good idea, although it is only useful under very specific circumstances in its current form.

The conference contained a mix of papers from the whole field of real-time research. There was also a panel discussing a subject common to all research areas: the gap between the needs of industry and research topics¹. Thus, the conference gave a good overview of the research field as well as the industrial needs.

The conference was held in an old American luxury hotel, and the accommodation, food and associated events were great. However, the lack of internet connection at the conference site

was quite disturbing. Overall, I enjoyed the stay in Washington, in particular the excellent collection of museums.

Footnotes:

¹ The panel actually mentioned ARTES as an example of a national effort to strengthen research in the field.

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On 3 Jul 2000, 12:08.

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Travel Report from RTAS'00

Cecilia Ekelin
Chalmers University of Technology

June 7, 2000

The trip

The trip went to Washington D.C. (USA) where I visited the 6th IEEE Real-Time Technology and Applications Symposium (RTAS'00) which took place May 30 to June 2. The purpose of the trip was to “watch and learn” and finally see the celebrities of the real-time community.

The conference

Being true to its name, RTAS emphasize on applications rather than theory. This makes it a very broad conference since there is an unlimited number of (soft) real-time problems. There were 26 accepted papers out of 84 submitted. In addition, 8 Work-in-Progress papers were presented. The number of registered participants was 96 of which the most part came from the US or (East) Asia.

The presentations

The first day, which was actually before the main conference, there were three tutorials: “Web Caching and Multimedia Streaming on the Internet”, “Quality of Service in IP Networks” and “Voice over IP”. None of the topics seemed that interesting to me so I skipped this day.

The conference started with a keynote speech by Janos Sztipanovits entitled “Software for Embedded Systems: Opportunities and Challenges”. (Unfortunately, I missed this talk due to illness.)

As for the papers, most of them addressed practical aspects of (soft) real-time systems. This included evaluation of existing tools and methods (NT, CORBA, ATM) concerning their real-time capabilities, as well as approaches on how to solve specific real-time problems (web caching, expert system response time, distributed file system). There were only a few papers that I could related to my own research (scheduling, embedded systems).

The program included a panel discussion on “Building a University and Industry Partnership in the Research and Development of Real-Time Embedded Systems” which to me sounded like they wanted something like ARTES in the US. Apparently, not that much cooperation is performed mainly due to lack of funding and diverse project objectives. The Swedish national initiative was mentioned as a role-model.

In conclusion, the conference provided a good opportunity to get a wider view of the real-time domain.

The organization

The conference was hosted at the OMNI Shoreham Hotel located in central Washington D.C. The hotel was quite luxurious (many presidents have partied there) but seemed to be frequent conference host (there were other ongoing conferences). Overall I think the organization was good but I would have appreciated Internet access and a list of the participants.

About Washington D.C.

Downtown Washington D.C. is rather small and consists of a green area (The Mall) surrounded by impressive old style buildings. A number of attractions (The White House, Washington Monument, Capitol Hill) are located here within just a few miles. A lot of time can be spent visiting the Smithsonian Museums or just wandering around “The Mall”.

The future

Next time RTAS will be held in Taipei, Taiwan May 30 to June 1, 2001.

Report for Visit to LIAFA Paris

Marcus Nilsson

February 16, 2000

Purpose of the Visit

I visited the laboratory LIAFA and Ahmed Bouajjani for four weeks during January 2000. The purpose of the visit was to pursue our common research, techniques for automatically verifying the dynamic behaviour of systems with unbounded data structures or with an arbitrary topology. Our aim is to provide a uniform environment for verifying large systems consisting of variables over infinite domains, e.g., clocks, queues and integers. My thesis work aims to accomplish this using regular languages from formal language theory. Ahmed and I have been coauthoring a paper in CAV'99[ABJN99] about verification of systems with an arbitrary number of processes, using regular languages. A generalization of this framework is to appear in TACAS'2000[JN00].

During the visit, we planned to write a joint contribution for CAV'2000 and also to set new directions for future research.

Outcome

During the visit I met and discussed with several of the members of LIAFA both about our current results and about our new ideas. Many of them are from a more theoretical community and think differently. Thus, the discussions gave new insights into our problems and also new directions for further research.

In the first two weeks we worked on the planned contribution to CAV'2000, titled *Regular Model Checking*, and we submitted the paper on the 15'th of January. This paper discusses different approaches to compute the effect of an unbounded number of execution steps of a program, using regular sets. For example, if a program has a loop adding one to a counter, the effect of an unbounded number of execution steps would include adding an arbitrary amount to the counter. During these weeks, we also found some new ideas and research directions to extend these techniques, which we plan to pursue during this year.

I held a seminar at LIAFA at the beginning of the last two weeks about our current research. This started some discussions, especially among people from a group working on automata and regular languages. It was very good to get feedback from these people, since there has been a lot of research into automata and regular languages in the past that should be useful to our work.

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SIGGRAPH'99

The SIGGRAPH'99 (Special Interest Group Graphics under ACM) conference was organized in Los Angeles 7-13 of August this year. SIGGRAPH is the world's biggest computer graphics conference and exhibition with about 30.000 visitors each year. Next year (2000) it will be given in New Orleans 23-28 July. I went to the conference together with a Ph.D. (Tomas Möller) and a Ph.D. Student (Jonas Lext) from Chalmers both with computer graphics as their subject.

Conference

The conference was divided into School, Papers, Panels, Sketches and Demonstrations. School meant class lessons in different computer graphics topics. Each day there were a range of courses given simultaneously from 8.00 to 17.00 together with a range of papers and a range of panels, sketches and demonstrations. There were a lot more to participate at than you possibly could manage. This meant that we had to choose carefully between the sweets. We had the pleasure of seeing and listening to almost all the computer graphics gurus. Tomas Möller pointed them out for us and presented us to some of them.

Exhibition

During the last three days (of the totally six days) there was an computer graphics exhibition simultaneously with the conference, with exhibitors from the whole graphics industry showing the latest in technology ñ like graphics cards, CPUs, 3D-software and even ray tracing hardware. This years focus was motion capture systems. Female beautiful models wore special motion capture suits and danced before an audience simultaneously looking at a big TV-screen showing some cartoon or other character moving exactly as the model in real time. There was also a major focus on movie software and special effects. The technology behind for instance Star Wars and Ants was extensively demonstrated and even explained and discussed at the conference with papers and panel discussions.

Personal Reflections

It was surprisingly cold in Los Angeles this late summer week. Down to 16 degrees Celsius the first days. The last days the weather got better and temperature was eventually up to what I expect is normal (fairly hot compared to Sweden). We had been warned that inside the Convention Center it should be cold. So it was. You cannot use only shorts and a T-shirt. I usually wore jeans and a shirt. Do not wear any kind of suit since people will

take you for some kind of business man and thus not take you seriously. They will expect that you know nothing interesting about computer graphics. You could say that dress code is very casual.

One of the most fruitful things we went to was the 'ray tracing round table' organized by Eric Haines (member of the editorial board for Journal of Graphics Tools and a ray tracing veteran). We had the pleasure of having a small chat with him. Practically every one interested in ray tracing was there, talking about the future, bottle-necks and whether or not real time ray tracing is realistic in a near future. We got very valuable information and thoughts from this discussion. Especially since real time ray tracing now is our subject of research.

I learned a lot during the week and we got several new ideas for research projects. After we had heard the presentation of a paper about caustic-phenomenon (a refraction phenomenon for light) we spent the evening throwing coins into a pool and watching the light patterns at the bottom and discussing how to simulate this in a computer. We also got some new ideas for fractal mountain generation (inspired by the surroundings of Los Angeles and a paper of the subject), real time rendering of nature (trees, grass etc) and real time ray tracing. Real time ray tracing is what we decided to focus on and now we are writing a paper about it, with some more to come.

Submitted: Thu Dec 2 10:33 1999

By: Ulf Assarsson, ulf.assarsson@se.abb.com

At: Department of Computer Engineering, Chalmers

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Location: http://www.artes.uu.se/mobility/reports/SIGGRAPH99_ulf.shtml



Report from RTCSA'99 in Hong Kong

by Johan Eker

There were a number of very interesting papers and presentations. Iain Bate from University of York gave a talk on "A framework for scheduling in safety-critical embedded control systems". He emphasized the importance of finding good methods for translating between control theory concept and scheduling attributes. Another great paper was Luca Abeni's "Adaptive Bandwidth Reservation for Multimedia Computing". He is a PhD student of Buttazzo at Scla Superiore in Pisa and his work is closely related to the ARTES project on "Integrated Control and Scheduling". It was also interesting to listen to the presentation of the "Utilization Bound Revisited" by Chen, Mok and Kuo from University of Texas, Austin.

The three invited speakers were Wolfgang Halang, K. Ramamritham and K-G Shin. Wolfgang Halang stated that both the past and the present of real-time control systems belong to the IEC-1131 standard. The simpler, the better. He did not believe that formal method would ever result in in any useful verification of embedded systems. He gave some great quotes during his talk that are worth remembering. He said that "Complexity is a bureaucratic tool for dictatorship" and "Evolution goes from the primitive via the complex to the simple."

Ramamritham's talk was in the use of off-the-shelf components in real-time systems. His conclusion was that it was possible to use NT in a real-time if your were careful and did not overload the CPU. The Wednesday speaker was K.G. Shin who presented his small real-time kernel Emerald. The talk was mostly about implementation details of the ready queue sorting, semaphores, etc.

The overall impression of the conference was fairly good. There were many interesting talks and especially the big Swedish troop did a good job in presenting its material. For me and Anton down at the control department in Lund, it is always good to meet with the other real-time people in Sweden. This does not happen as often as one could expect since we are a bit off both technically and geographically.

Submitted: Thu, 20 Jan 2000 14:39
By: Johan Eker <johane@control.lth.se>
At: Lunds tekniska högskola



Picture of Hong Kong Island viewed from southern tip of Kowloon.

Travel Report RTCSA'99

Hong Kong, China, December 13-15, 1999

by Thomas Lundqvist

In December 1999 I visited the [sixth international conference on Real-Time Computing Systems and Applications \(RTCSA'99\)](#) where I presented the paper: [A Method to Improve the Estimated Worst-Case Performance of Data Caching.](#)

General Comments

The conference took place in the New World Renaissance Hotel situated on the southernmost point of [Kowloon](#) with splendid views of the Hong Kong Island. Hong Kong is an exciting place for a conference; exotic, but still very western-friendly. For example, all street signs are required to be in English as well as Chinese. The conference was very well organized. However, the hotel and conference utilities did not meet all expectations. The meeting rooms were not well suited for presentations (too low ceiling) and the hotel had quite expensive facilities (expensive bar and restaurants, breakfast was 200 SEK). Still, the conference provided good opportunities for contact among participants and exchange of ideas.

Some basic facts about the conference:

Participants:	91. Many from Korea (13), US (12), Sweden (18), Taiwan, and Japan.
Papers:	95 submitted. Accepted 48 regular and 25 short papers.
Presentations:	Two parallel sessions except during the Best Student Paper presentations.
Invited talks:	Three invited talks by: <ul style="list-style-type: none"> 1. Prof. Wolfgang Halang 2. Prof. Krithi Ramamritham 3. Prof. Kang G. Shin

Since RTCSA is an Asian conference, most participants are from Asia. This year however, all were surprised by the large delegation from Sweden. The reason for this invasion, I suspect, is good advertisement from the program committee (Hans Hansson), but also the great number of real-time researchers present in Sweden (maybe due to the [Artes](#) research program).

The paper presentations took place in two simultaneous sessions. You then have a choice of running back and forth between the sessions to catch all interesting presentations (sometimes they collide) or be lazy and skip complete sessions. I asked the program co-chair, Joseph Ng, about this. He told me that his main objective was not only high quality but also try to include as many contributions as



Some local organizers and Joseph Ng. The students came from different universities in Hong Kong. (There are seven!)

possible. Well, many presentations leads to many participants and makes the conference an excellent place to pick up new ideas and discuss things, so maybe it is a clever idea.

Invited talks

The invited talks were all interesting but also a little disappointing. There were no great visions or predictions of the future. All of the speakers presented material taken from their own research or research area.

1. **Wolfgang A. Halang** presented *Software Dependability Considered as the Main Problem of Contemporary Real Time Computing*. This talk was about safety-critical (highly-dependable) systems. He argued that the real problem in real-time systems is not about scheduling. The greatest problem is how to write correct software.

To verify a program against its specification we can use testing or formal methods. However, formal methods only work on small programs and is not user friendly. To verify the specification we must involve a human cognitive process. Here the only solution is to avoid complexity. Simple design are the best ones.

The more safety-critical, the more simple design we need. If a failure can result in a catastrophe, the only verification method that works is social consensus. A design must be simple enough for everyone to understand its correctness.

2. **Krithi Ramamritham** presented *Can Real-Time Systems be built from Off-the-shelf Components?* This talk was an in-depth study of using Windows NT for a soft real-time application (he actually meant "off-the-shelf, non real-time components" in the title).

The answer is that "it is possible to use off-the shelf components (NT)" for soft real time. But only if you have deadlines not shorter than 10-100 ms and keep the utilization below 50%.

3. **Kang G. Shin** presented *EMERALDS: A Small-Memory Real-Time Microkernel*. This was a presentation of a real-time microkernel designed for small-memory embedded applications (15-25 MHz cpus with 32-128 kbytes memory). All basic OS services of task scheduling, synchronization, communication, and system call mechanism, had been redesigned.

I think Prof. Halangs talk was the most interesting one. When regarding the WCET area, it actually implies that for highly safety-critical systems, WCET analysis is probably a too complex technique to be used. It is hard to prove to people that the WCET tool used is correct. This also means that the safety of a system should not depend on a task being able to meet its deadline.



Wolfgang Halang



Krithi Ramamritham



Kang Shin

Paper Presentations

RTCSA is a very wide conference. The sessions include all kinds of topics but the main focus is still scheduling. There were 3 sessions on scheduling, one on resource management, and one on real-time requirements. Other session topics were databases, communications, multimedia & architecture, fault tolerance and two sessions on formal methods.

My topic, WCET (Worst Case Execution Time), was found in three different sessions: architecture, software & systems, and OS & Specifications.

Being very wide, the conference was an excellent place to get more general knowledge of different areas. In scheduling, for example, I found no title containing the word "Quality of Service". Rather, the contributions were sometimes quite theoretical like in *Utilization Bound Re-visited* by **Chen, Mok, and Kuo**, or more practical,



The audience is listening! Johan Eker, Anton Cervin and Petru Eles are paying attention.

putting things together, like in *A Framework for Scheduling in Safety-critical Embedded Control Systems* by **Bate and Burns**. I also found new areas combining scheduling and energy use: *Voltage-Clock Scaling for Low Energy Consumption in Real-time Embedded Systems* by **Lee and Krishna**.

Finally, there was a Best Student Paper sessions where **Johan Eker and Anton Cervin** did a nice presentation of *A Matlab Toolbox for Real-time and Control System Co-Design*. Overall, I think that the most understandable presentations were often made by people from Sweden (maybe I understand their dialect better).



Iain Bate



Jakob Engblom

WCET research

There were three presentations concerning the WCET area (Worst Case Execution Time). The first one was **Jakob Engblom and Andreas Ermedahl** who presented *Pipeline Timing Analysis Using a Trace-Driven Simulator*. The next one was my presentation about data caching. The last one was **Stefan M. Petters and Georg Färber** who presented *Making Worst Case Execution Time Analysis for Hard Real-Time Tasks on State of the Art Processors Feasible*.

- The first paper, by [Engblom](#) and [Ermedahl](#), is a detailed description on how to extract timing information about sequences of basic blocks from a trace-driven simulator (timing model). The interface to the simulator only gives information about:
 - the execution time for a sequence of instructions, and
 - the point in time when a certain instruction enters the pipeline.

They treat single-issue CPUs with contention between instruction and data fetch. The timing information obtained is used in their framework for WCET analysis based on constraints solving.

- The last paper, by [Petters](#) and [Färber](#), describes a new and interesting approach. Instead of trying to model complex processors, they measure the WCET. This is done by modifying the program to make it simple enough to permit test-runs of all feasible paths in the program. To assure a safe estimate, they add fixed penalties to the measured times. They demonstrate their approach on a Pentium II system.

I think this approach is very attractive, you eliminate the problem of modeling a complex processor. However, the authors do not really show how to obtain safe penalties to add to the measured times in order to obtain safe values.

We can never trust a complex model of a processor to be correct. This makes a simulation-based approach unsafe even if it produces safe estimates with regard to the simulation model. The same reasoning applies to the penalties we need to add when measuring. They are also based on some model of the processor. But an interesting question is: will a measuring approach produce safer values than a model-based approach? Maybe...

Besides the WCET presentations I also met some new people (for me) working in the WCET area.

1. Iain Bate from [York, England](#), has (almost) left his scheduling research and begun work on WCET analysis. He works with aviation systems where the programs are written in Ada. He has just started looking at the problems and had some ideas on a path based approach. I described our approach here at Chalmers.
2. [Isabelle Puaut](#) from IRISIA, France, has recently completed a WCET analysis tool that has been used to do worst-case timing analysis of the RTEMS real-time operating system. They have also made some new work on branch prediction (included in the upcoming issue of RTS, May 2000).

To conclude, I think WCET research is still growing. New people and projects appear all the time. We also see more attempts to make WCET analysis really practically feasible.

Future

The next RTCSA (2000) will take place in Korea. I recommend it as an excellent conference to meet people and to get influenced by some Asian atmosphere.

Pictures

If you want to see more pictures from Hong Kong, take a look in my [Photo Album](#).

Thomas Lundqvist, thomasl@ce.chalmers.se, modified: [2000-01-03](#). [Disclaimer!](#)

Travel Report RTSS'99 (and RTMCS workshop)

Phoenix, USA, 30 Nov - 3 Dec, 1999

by Thomas Lundqvist

In December 1999 I visited the [20th IEEE Real-Time Systems Symposium \(RTSS'99\)](#) where I presented the paper: [Timing Anomalies in Dynamically Scheduled Microprocessors](#). Also, before the RTSS conference, the first international workshop on Real-Time Mission-Critical Systems (RTMCS) was held.

General Comments

The conference was located in the outskirts of Phoenix, in the Radisson Resort & Spa in Scottsdale. The conference facilities were quite good, but for an European like me, I always find the American breakfasts a little odd (coffee and muffins) and without a car you were quite stuck at the resort place all the time.

Some basic facts about the conference:

Participants:	222.
Papers:	140 submitted and 27 accepted regular papers (20%). 26 accepted work-in-progress papers.
Keynote speakers:	There were three keynote speakers: <ol style="list-style-type: none"> 1. David Tennenhouse, Intel 2. Jim Kurose, Univ. of Mass. at Amherst. 3. C. L. Liu, National Tsing Hua University

Workshop on Mission-Critical Systems

The title for this workshop should have included "large" systems, because that was the topic of most papers. The workshop was sponsored mainly by a US military company and many of the papers were about large tactical military systems. A keynote speech by **Marc Pitarys** from the US air force research laboratory explained their situation. They are evolving from an industrial age when they built in-house, custom-made, systems, to an information age where software is the problem and where the hardware used is COTS-systems.

I found many presentations in this workshop to be quite fuzzy. They were too abstract for me.

Invited talks on RTSS

There were three invited talks:

- **David Tennenhouse**, Director of Research, Intel, talked about *It's Time to Get Physical*. He had a vision of what to do with all the computing power we can expect in the near future and wanted the computer systems to get more "physical". By this, he meant that computer systems should sample the physical environment more directly, avoiding analogue technique and going digital as early as possible. Also, all systems should be connected in a sensor net, tapping the physical world.
- **Jim Kurose**, Professor and Chair, Univ. of Massachusetts at Amherst, talked about *Scalable Network Support for Multimedia, Real-Time Communication*. He gave a interesting view of the future Internet, where Quality of Service demands could be handled at the border and not at each individual back-bone router.
- **C. L. Liu**, President, National Tsing Hua University, talked about *From Time Sharing to Real Time - Sharing of a Really Good Time in the Last 40 years*. This was about his life and experience of the development in the computer and real-time area. This was a real speech without any slides...

Paper presentations

Besides my own presentation, there was only one more presentation in the WCET (Worst Case Execution Time) area:

- **Kim, Ha, and Min** presented: *Analysis of the Impacts of Overestimation Sources on the Accuracy of Worst Case Timing Analysis*. Their results show that cache and pipeline analysis across basic blocks are important for the accuracy of WCET analysis. Also, pipeline analysis is important when the cache miss penalty is small. For large cache miss penalties, instruction cache analysis is more important.

I think their results really show that all factors are important if we want to get tight estimates. We need instruction and data cache analysis and pipeline analysis. All analysis should be performed across basic blocks. We also need to eliminate infeasible paths.

Among the other presentations, I found this one interesting:

- [H. Thane and H. Hansson](#) presented: *Towards Systematic Testing of DRT Systems*. They enumerate all possible execution scenarios of tasks when using priority driven preemptive scheduling in order to make an exhaustive testing possible.

I believe that system testing is largely forgotten in research. I discussed this with Henrik Thane who thought that in my field, WCET, there should be a lot of opportunities to combine testing/measurement with formal WCET methods. I must agree. A paper presented in [RTCSA'99 by Stefan M. Petters and Georg Färber](#) deals somewhat with this problem.

Future

The next RTSS (2000) will take place in Orlando, Florida.

Pictures

If you want to see some pictures from Phoenix, take a look in my [Photo Album](#).

Thomas Lundqvist, thomasl@ce.chalmers.se, modified: [2000-01-05](#). [Disclaimer!](#)

Travel Report from the 5th International Conference on Principles and Practice of Constraint Programming (CP'99) and the International Workshop on Real-Time Constraints (RTC'99)

Cecilia Ekelin
Department of Computer Engineering
Chalmers University of Technology
S-412 96 Göteborg
cekelin@ce.chalmers.se

November 5, 1999

About the trip

The purpose of the trip was to attend the 5th International Conference on Principles and Practice of Constraint Programming (CP'99) and the International Workshop on Real-Time Constraints (RTC'99) which was a post-conference workshop. The events took place in Alexandria, Virginia, USA on Oct. 12-15 and Oct. 16 respectively. The major interest was the workshop where I was to present the work-in-progress paper "Real-Time System Constraints Where do They Come From and Where do They Go?". It might seem odd for a real-time student to visit a constraint programming conference but since I intend to use constraint programming as a modeling tool for real-time scheduling, it could be a valuable experience. This was also the first time I participated in an international conference.

CP'99

About the conference

CP is the only conference dedicated to constraint programming, even though the area also appears in conferences on Artificial Intelligence and Logic Programming. Most CP research is conducted in Europe which was reflected in the submissions as well as in the participants list. There were 97 submissions (30

accepted) of which about 70 were from Europe. The number of participants was around 100 which was about 50 persons less than last year when the conference was held in Europe.

About the papers

The topics of the papers could be divided into two areas which are *Constraint Satisfaction Problems* (CSP) and *Constraint Programming*. Papers on Constraint Satisfaction Problems addressed the theoretical aspects of the studied problems, e.g., complexity theory, consistency techniques and search algorithms. The Constraint Programming papers discussed how specific problems are modeled and solved using tools that implement CSP techniques. There were some papers that later might be interesting for my research, e.g., “Excluding Symmetries in Constraint-Based Search” by Backofen and Will.

About the organization/arrangements

The conference was hosted at the same hotel where most of the participants were staying which was pretty convenient. Without having much to compare with, the conference felt well organized and was performed smoothly without any mishaps. The conference included a social event which was a visit to the Smithsonian Museums in Washington D.C. I visited the National Air and Space Museum which is the most visited museum in the world. There was also a conference banquet which was held on a replica of a 19-century riverboat on the Potomac river.

RTC’99

About the workshop

This was the first time the workshop was held and due to a very tight submission schedule not that many papers were received (about 10). This was one of four parallel workshops and the attendance was fairly low (about 7 people). This could be due to the short notice but also that the workshop was not organized by someone known within the constraint programming community. This made it difficult to know what the workshop actually would be about.

About the papers

There were one work-in-progress paper (mine) and four regular papers presented. There was also an invited talk. All the regular papers and the invited talk discussed formal specification and verification of real-time systems and were not particularly interesting for my work. I had hoped that the workshop would be more about how to identify constraints on real-time systems and how to ensure that they are satisfied. Furthermore, I had expected the papers to somehow

relate to the topics covered by the main conference. My paper was the only one that mentioned constraint programming.

About Alexandria

Alexandria can be considered as a suburb to Washington D.C. even though it actually is a town of its own. It is an old town that has quite a number of 18-century buildings. Among the attractions are the homes of Robert E. Lee and George Washington. Despite the feeling of a small town, downtown Washington D.C. is only fifteen minutes away.

The Formal Methods World Congress (FM '99)

By Paul Pettersson.

The Formal Methods World Congress ([FM'99](#)) was organized in Toulouse the 20th to 24th of September this year. With its 520 visitors, 31 technical symposia sessions, 12 user group meetings, 12 industrial tutorials, and formal methods tool exhibitions it must certainly be considered one of the main event in the formal methods community in the year of 1999.

The invited speakers at FM99 were Gilles Kahn, C.A.R Hoare, Cliff B. Jones, Amir Pnueli (two invited talks), John Rushby, Joseph Sifakis, Michael A. Jackson, and Gerhard Holzmann. I found many of their talks very interesting as the speakers often gave their personal view of the current status of formal methods (and formal method tools), both in academia and their use in industry. Some invited speakers also identified future directions and goals of the use of formal methods. A general recurring statement in several talks (including Amir Punueli's and John Rushby's) was that the industry seems to be more attracted to automated formal techniques, such as model-checking, than to the currently available deductive methods, such as theorem proving. It was argued that engineers in general prefer model-checking tools because they support a way of working that the engineers already are used to, whereas theorem provers often requires domain specific expert knowledge that the engineers are lacking.

One of the main events at FM'99 was the well organized exhibition, where as many as 32 exhibitors showed their products (mostly formal method tools, methods and computer science books). I (together with [Alexandre David](#), Uppsala University)

took part in the exhibition to launch a new version of [the verification tool UPPAAL](#). It turned out that the exhibition was exactly the right place for doing that.



Our exhibition, and the new UPPAAL version, received a lot of attention and we were often busy giving demos. The tool

developers at the exhibition were also invited to model and analyze a given problem in a competition. We also did so, but the jury did not rank our contribution among the three winners.

Of course, a number of interesting papers/talks were presented at FM'99. Here I very briefly review some of them:

- Error Detection with Directed Symbolic Model Checking, by F. Reffel and S. Edelkamp, in LNCS number 1708, pages 195 to 211: It is described in the paper how a heuristic directed search of the state-space (instead of standard depth-first or breadth-first) is used to reduce the space and time consumption of a verification algorithm. An experiment is presented where the technique is shown to work very well when applied to models with seeded errors.
- Deduction is Forever, by Amir Pnueli: In this talk Amir Pnueli discussed how the deductive methods will eventually take their rightful place as a verification technique for circuits. He also gave a list of (necessary) conditions on the ultimate verification tool. It must be: specific to an application area; all verification conditions should be automatically resolvable (i.e. no need for interactive proving); invalid verifications must yield usable and focused counter-examples; the need for cleverness should be factored into familiarity with the verified design.
- Applying Model Checking in Java Verification, by K. Havelund and J. Ulrik Skakkebæk, LNCS number 1680, pages 140 to 155: In this case study paper the authors describe how their recently developed Java to Promella translator, called Java Pathfinder (JPF), has been applied to verify a Chinese Chess game server application written in Java. The translation implemented in JPF is described as well as the sub set of JAVA translated by the tool.

To conclude this travel report, I wish to state that FM'99 was a very enriching experience for me. It gave me many ideas for future research.

Submitted: Wed, 03 Nov 1999 14:19
By: Paul Pettersson
At: BRICS, Aalborg University

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FM'99 in Short

Alexandre DAVID

September 27, 1999

FM'99 was definitive a unique event: never before have so many formal method papers been submitted (259), accepted (92) and presented. FM'99 had the following events: technical symposiums, an exhibition, user group meetings and workshops, industrial tutorials. The workshops had their own publications, which makes the number of papers presented even larger.

Concerning the exhibition, it was a very good opportunity to present the new version of UPPAAL. Many visitors seemed to be interested and Paul and I made many demos. No less than 50 pamphlets have been distributed. It was a good opportunity to look at the other tools and compare them. Industrial tools are mature to spread formal methods and academic tools are competitive against them.

A general impression from the different presentations (symposium and workshops) was that formal methods converge. The different tools are not used competitively but rather in conjunction. Much effort has been spent to hide the technical aspects of the tools and methods to spread the tools in industry. Verification pushed from the source code itself (C or Java), or abstraction by experts from a higher level were presented.

The thread of FM'99 was the following points from Tony Hoare:

Maturity: use of a formal method is no longer an adventure, it is becoming routine.

Convergence: the choice of a formal method or tool is no longer controversial: they are chosen in relation to their purpose and they are increasingly used in effective combination.

Cumulative progress: promise of yet, further benefit is obtained by accumulation of tools, libraries, theories, and case studies based on the work of scientists from many schools which were earlier considered as competitors.”

Following are remarks on some interesting presentations.

Error Detection with Directed Symbolic Model Checking

The goal is to explore as little state space as possible to find errors, with contrast to safety checking where the whole state space must be generated. An heuristic is presented to direct the search and to find errors faster.

This distinction between proofs and error detection was underlined in several presentations.

A GSM-MAP Protocol Experiment Using Passive Testing

This is about conformance testing: does a protocol implement some specification? The idea is to observe traces and test if they are accepted by the specifications.

Unfortunately, the coverage aspect was missing.

Model-Checking for Managers¹

This is about using the SPIN model checker in industry. A remarkable point is to use patterns for the requirements to hide LTL formulas: patterns in plain English are configurable and mapped to LTL formulas without any prior knowledge of LTL.

¹SPIN workshop

Xspin/Project-Integrated Validation Management for Xspin²

This is an integrated environment for the model checker SPIN. Distinction between debugging (weak abstraction, partial check: bit state hashing) and verification (strong abstraction, exhaustive) was stressed. The tool offers a Project Revision Control System similar to CVS with a repository which forces version integrity by reverification when changing a model.

PVS workshop - Amir Pnueli

This is in short deductive verification versus model checking. The message is deductive verification technology for hardware design is mature, and cumulative effort on verification is reusable making it worth the price.

Deduction is Forever - Amir Pnueli

This is the continuation of his previous talk. The fact that only deduction is symbolic is stressed and exploration is limited by the finite state systems. However there is a duality between exploration and deduction which makes it interesting.

The conclusion is the necessary conditions for the ultimate tool:

- to focus on the application area
- all verification conditions should be algorithmic resolvable (no interactive theorem proving)
- invalid verification conditions must yield usable and focused counter examples
- need for ingenuity and cleverness, experts: the central issues in a model, system engineers: rule out bad counter examples

Mechanized Formal Methods: Where Next? - John Rushby

The reason for poor usage of formal methods is: “Bill Gates does not use our stuff”³. The reason is that correctness is often not a goal: a program must be just good enough. Coding is not a problem, the real problem is: requirements and design. Formal methods have their place at the requirement analysis and design exploration.

Mechanized formal method is the **only** important thing. It should calculate answer to a practical question. Combining theories yields to undecidable theories or to specialized theories where it is really fast to compute an answer: it is there that we should take advantage of combining methods.

The problem of PVS is that it is oriented to verification, not debugging and people are not prepared to this in contrast to model checking where people are prepared to reduce a problem to fit into a model checker because *it looks like design*. The proposal is to focus on construction of abstractions and invariants. The goal is to calculate an abstraction and to generate an invariant by modifying a model checker which would return a formula to feed the theorem prover.

The conclusion is: one needs powerful and well focused tools which really address the problems.

Extracting Verification Models from Source Code⁴

This was done in an industrial project while building a telephone switcher at Bells. The product is named “PathStar”. The C source follows a @ notation like labels. Automata are extracted from the core of the switcher and fed to SPIN. A database of properties is maintained with the results, the fixes, the traces... The check is nearly interactive: done on special hardware (parallel machine dedicated to SPIN), parallel verification of properties, optimization of models

²SPIN workshop

³John Rushby's words

⁴SPIN workshop

per properties, bitstate hashing for incremental verification. The equivalent processing power is a 8GHz PII and it will be upgraded.

The system to manage the verifications is called “Trailblazer” and it separates the user’s side (web browser with updated database pages) from the database itself (“FeaVer”).

Applying Model Checking in Java Verification⁵

Use the java PathFinder to have a Java-to-Promela translation. Application to a game server is presented. Conclusion is: program verification is worth attention.

IF: An Intermediate Representation and Validation Environment

IF is a structured program level intermediate format. The point is: translations $IF \langle - \rangle Kronos, SDL \rightarrow IF, IF \langle - \rangle SPIN$ and a static analyser from *IF* to improve the program. As we can see we have now $SDL \rightarrow IF \rightarrow Kronos$ or $SPIN$, which is *SDL* (design) to verification tools!

Last Words

We have to hide the formalism and formal methods should be fun to use like programming languages.

⁵SPIN workshop

11th Euromicro Conference on Real-Time Systems (ECRTS)

Per Håkan Sundell

Department of Computing Science, Chalmers University of Technology
SE -412 96 Göteborg, Sweden
e-mail: phs@cs.chalmers.se

Travel report

The main purpose of my trip to York in England, June 9th to June 11th 1999, was to visit the 11th Euromicro Conference on Real-Time Systems. I have never been to an international scientific conference in real-time systems before, and as this conference is one of the leading in the field, I chosed to visit it this year. The trip was also combined with a visit to the RTOS software vendor company Northern Real-Time Group (NRTG).

The quality of the papers were very good, and also the presentations had a very high quality. Since my research area is mainly about wait-free and lock-free techniques and their applicability in automotive systems, there weren't any paper that directly addressed me. The paper that got closest to my area was Shadowing-based Crash Recovery Schemes for Real-Time Database Systems (LihChyun Shu, Huey-Min Sun, Tei-Wei Kuo) that used some kind of a wait-free transaction technique. The very nice invited talk about "Automotive Electronics" held by Hermann Kopetz, also addressed the need for high-performing synchronization methods in distributed systems.

The organization at the conference center was although not that high standard, I was actually very surprised and disappointed at some of the strange arrangements. The actual conference hall was far too small and narrow as I experienced it. It was very hard to see anything but the backs of the other listeners, so you could not follow the slides, only just listen to the speaker and look at the paper. It got even stranger when we very supposed to eat lunch and other meals standing up without any table, so you had to behave like an animal. Even the dinner at the reception was arranged without tables at first until we complained.

The visit to NRTG was done together with some people from the WARPing project and also some WCET analysts from Uppsala. We had a meeting with Ken Tindell and was allowed to get a copy of their old version of their RTOS called TPK. Not quite a real success as we really wanted to get their new SSX5 version, but at least it is a good starter.

Submitted: Mon Aug 16 13:03 1999

By: Per Håkan Sundell

At: Department of Computing Science, Chalmers University of Technology

Report from RTAS '99, Vancouver, June 2-4, 1999 (The 5th IEEE Real-Time Technologies and Applications Symposium)

Jakob Engblom, ARTES PhD Student, Uppsala University & IAR Systems AB

General Impressions

The people attending RTAS are mostly North Americans (US and Canada) (most of the European real-time researchers tend to attend the Euromicro Workshop on Real-Time Systems that takes place at approximately the same time). About half the participants were from industry, and many of the US participants were working with defense-related projects. It is obvious that the Department of Defense (DoD) is an important financier for US real-time research. I estimate the number of participants to be about seventy.

The conference venue was the Sheraton Wall Center hotel, which was a very good hotel (if a bit pricey, but apparently Canadian hotels tend to be expensive). The city of Vancouver is very nice: snow-covered mountains in the backdrop, but still warm enough to support a long stretch of beautiful beach by the Vancouver bay. Downtown is pedestrian-friendly (almost like a European city) and there are plenty of good restaurants¹.

Technical Presentations

The standard of the accepted papers was quite good, and the program was well-varied, with sessions on everything from scheduling theory through databases and worst-case execution time analysis. There was a large number of interesting case studies presented. In general, US real-time research tends to deal with larger systems than European research: there were more material on COTS hardware, distributed multiprocessor systems, middleware, etc., and less on scheduling theory and verification of hard real-time systems than Euromicro. I will not try to point out any “outstanding” papers, since it what constitutes outstanding depends on your research interests.

The conference contained a very interesting tutorial on real-time Java, one on real-time communications, and one on real-time CORBA.

Obvious trends were that Windows NT was being considered for (soft) real-time applications, and the tendency for real-time systems to become large, distributed, and based on databases. Command and control systems are very important to the US military.

The real-time Java people seem to have narrowed down their target applications to applications where a GUI is used together with some soft real-time applications. The main competitor is considered to be Windows CE².

I presented a paper on the properties of actual real-time programs, and the implication for the construction of worst-case execution tools. Mikael Sjödin (Uppsala) presented a paper on real-time call admission for ATM networks.

Recommendations

RTAS is a good conference, both as a target for paper submissions and as a conference to go to to learn about recent advances in the real-time field. The large number of case studies provides inspiration and information, and many interesting discussions can be held during the coffee breaks and lunches.

¹ A very good restaurant, mandatory for all engineers because of the name is the “C restaurant”, serving C-food and the C-front ☺. 2-1600 Howe Street. Phone 681-1164. Also try the “Lilith Feasthouse” that serves original first-nations (Canadian Indians) food. For chocolate lovers, “Death by Chocolate” is a sure hit.

² The defining factor of the competition is the leveraging of a well-known API for user interfaces and other desktop services, in combination with some real-time properties and programming APIs. Typically, real-time in this context means “several concurrent tasks, scheduling precision on the order of milliseconds”.

11th Euromicro Conference on Real-Time Systems (ECRTS)

Anton Cervin

Anton Cervin visited the 11th Euromicro Conference on Real-Time Systems (ECRTS) in York, England, UK, June 9-11, 1999. This year, the conference had a special emphasis on Real-Time and Control, and Anton presented the paper "Improved Scheduling of Control Tasks" in that session. An interesting paper in the same session was "The Case for Feedback Control Real-Time Scheduling", presented by John Stankovic. In that paper, an earliest-deadline-first scheduler containing a PID controller is presented. Using feedback in a consistent way, it is possible to cope with complex, dynamic real-time systems. Overall, at the conference there was a strong trend towards more flexible real-time systems, including papers in the sessions "QoS and Multimedia" and "Overload Scheduling". The notion of bandwidth-preserving servers was present in several papers co-authored by either Giorgio Buttazzo or Jane Liu.

Anton

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By: Anton Cervin

At: Department of Automatic Control, Lund Institute of Technology,
Sweden

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Location: http://www.artes.uu.se/mobility/reports/euromicro9906_anton.shtml



Travel Report from EUROMICRO'99

Andreas Ermedahl

Department of Computer Systems, Uppsala University
Box 325, SE-751 05 Uppsala, Sweden
email: `andreas.ermedahl@docs.uu.se`

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About the Trip

The purpose of the trip where to visit the 11:th Euromicro Workshop on Real-Time Systems, held in York, June 9–11, 1999. The Euromicro workshops on Real-Time (RT) Systems are among of the leading conferences within the RT research area with a lot of interesting papers and a chance to meet prominent researchers.

York is, except being the city the conference where held at, one really beautiful and historically well-preserved English city. The visit let us also to get in contact with some of the researchers from the well-known York RT Systems group as well as the RT Operating System vendor company Northern Real-Time Group (NRTG).

About The Conference

There where 88 papers submitted and 34 papers accepted for publication (not counting the work-in-progress papers) this year. I really felt that the quality of the papers had increased since the previous year when the conference where held in Berlin.

Interesting Papers

Since my work is focusing on Worst Case Execution Time (WCET) analysis, I was mostly interested in articles on this topic. Unfortunately there where only one WCET article presented in the conference [4]. The paper where more on Statechart modeling then on WCET analysis. Though its was an interesting paper but didn't added anything particular to the WCET research. The conference did though give opportunity to get in contact with researchers within different WCET groups, see below.

A somewhat WCET related paper is the article by Puschner and Burns [6] where they evaluated how well different sorting algorithms behaves if they are stopped before the sorting where completed. Interesting paper but made using measurements instead of static analysis.

There where a lot of scheduling papers or scheduling related papers presented (in my view far to many). Papers worth mentioning is the work by Bates and Burns [1] on how to assign attributes to tasks (which will later on be used in the schedulability analysis), the work by Aldarmi and Burns and some papers by Butazzo and his coauthors.

A very nice introduction to real-time computer technology in the field of automotive electronics where given by the invited talker Herman Kopetz [5]. According to him the automotive industry is moving towards putting more and more computers and wires in their cars. Both the reasons for this X-by-wire tendency as well as the new forecoming problems of this development is discussed in more detail in his article. The article is a good complementary reading material which can be given for students taking a RT course.

The Conference Place

The conference where held in one of the older university building really close to city center (and to my hotel). This meant that the surrounding where very nice but when a multitude of people where gathered in the same conference room it was quite hard to see the overhead screen and the humidity became very high. The guys in charge also insisted to serve the lunch without any chairs or tables (as in Euromicro'98 in Berlin). I think this is made so that the conference participants should be forced to talk to each other, but is really just stupid because you can not really talk to someone when you are standing with one plate in one hand, a glass in the other hand and your mouth full of food. For the Euromicro conference in Stockholm, KTH, I really hope that the organization committee decide to use tables and chairs.

The Participants

Almost the complete European Real-Time community where present. Well-known names like Burns, Wellings, Buttazzo, Stankovic and Puschner where all there. There where though less Americans there compared to eg. RTSS. Worth mentioning is that the Swedes where the largest group of researchers (maybe due to financial support from ARTES). The number of Swedish participants clearly exceeded the people from Great Britain. I wonder how many Swedes there will be at KTH the next year?

During break between sessions and lunches I had the opportunity to talk to some people within the WCET research area:

- *Peter Puschner* had performed a lot of WCET related research in the past and still have a lot of interesting ideas. He is now, together with Alan Burns, the supervisor of a special issue WCET for the Journal of RT Systems which we have submitted an article to [3]. Will probably not perform any deeper WCET analysis in the nearest future.
- *Ian Bate* is starting a project in York which will perform WCET analysis on Ada. Jakob and I gave him one of our technical reports and had really nice discussions on problems of timing lower-level hardware issues.
- *G. Bernat* is starting a project in York which will try to perform WCET analysis on Java byte code. Compared to Bate will Bernat more focusing on the timing of higher language level constructs. Both Bate and Bernat (which where not working in the same project at all) where looking forward to have more research exchange with our WCET group in Uppsala.
- *Edwin Erpenbach* had done some work with Peter Altenbernd. It seems like the most work within the WCET area in the Paderborn group will be made by Friedhelm Stappert. Except the cooperation we already have with Peter Altenbernd, Friedhelm will be visiting us for 10 days in August (during the ARTES week) to see if we can do some work together.

About the Meeting with NRTG

A meeting where arranged with people from Northern Real-Time Group (NRTG). Their current OS version SXX5 is one of the smallest and fastest predictable RT OS today, with overheads of just 800 bytes of ROM and 90 bytes of RAM for a typical system of ten tasks. The OS has true support for real-time behavior and aimed towards embedded systems RT market. SXX5 is used in the new Volvo S80 [2].

The reason for the meeting where to discuss NRTG:s plans of integrating WCET analysis in their developing workbench. The vice-president at the company, prof. Ken Tindell is well-known in the RT business and has been working at DoCS. Ken first showed us the WCET prototype they have made and after that I gave an one-hour presentation (including discussions). Compared to our ideas for doing WCET analysis they have no control of the compiler and therefore have to do the timing analysis directly on the assembler code. We convinced them to use a Implicit

Path Enumeration Technique (IPET)-based (see eg. [3]) instead of a Tree-based technique for portability reasons.

We were also able to get an older version of their RT OS. This will be used in the Wait-Free project for integrating some of wait- and lock-free features in the OS.

About York

York is a city which tries to keep its historic atmosphere intact. This means that many old buildings are restored (especially the city center), there is an almost complete city-wall, a lot of churches and, of course, many, many tourists.

The city was first built by Romans, conquered, rebuilt and renamed (York comes from Jorvik) by Vikings (they have a nice Viking museum which I visited on my last day in York). I really liked walking around in the town seeing the mixture of old buildings and the modern tourist crap sold in shops. They also had a number of really nice pubs where a lot of English Ale and Stout were served. I can really recommend a trip to the town for anyone who is planning to visit Great Britain as a tourist.

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Trip Report: WRTP'99 & ARTDB-99

Man Lin

Department of Computer and Information Science,
Linköping University,
S-581 83 Linköping, Sweden
linma@ida.liu.se

First of all, I would like to thank ARTES for supporting my trip to the joint 24th IFAC/IFIP Workshop on Real Time Programming WRTP'99 and the Third International Workshop on Active and Real-Time Database Systems ARTDB-99 which took place in Schloss Dagstuhl, Germany, May 30th - June 2nd, 1999.

The joint workshop focused on requirement engineering, software engineering, real-time and active database, embedded systems, communication and clock synchronization, formal methods, operating systems, timing analysis and scheduling theory. Two keynote speeches were given in the workshop. One was "Distributed Object-Oriented Active Real-Time Databases: We want it all, do we need them (at) all?" given by professor Alejandro P. Buchmann and the other was "Real-Time Software Architecture - Fundamental Concepts and their Consequences" by professor Janusz Zalewski. A panel discussion on "ARTDB - where are we and where are we going (or not going) to?" was also conducted.

The workshop provided an opportunity to present new results, discuss future development. Some interesting results are: Combining timing constraints with object-oriented design; Using active rules for distributing control systems; Constructing predictable rule set; Case studies on developing flight control system and hard real-time robotic applications; Formal verification for a subset of SDL and functional blocks; Specification language and tools for developing real-time control systems; Methods to achieve clock synchronization accuracy; Using COP techniques to derive tighter WCET for cooperating, cyclic processes; Using Timed-Automata to analyze response time for distributed real-time systems; Achieving better CPU usage by dynamic CPU scheduling with imprecise knowledge of computation-time. More detailed information about the joint workshop can be found in the following URL: <http://www.fernuni-hagen.de/IT/wrtp99>.

I am also glad to report that researchers from Sweden took very active roles in the joint workshop. Three papers from Sweden were presented in the workshop. University of Skövde is one of the organizers and sponsors of the joint workshop.

LCTES '99, ACM SIGPLAN 1999 Workshop on Languages, Compilers, and Tools for Embedded Systems

Patrik Persson visited FCRC '99 (Federated Computing Research Conference) in Atlanta, GA, April 30 - May 6, 1999. FCRC '99 comprised several conferences, including PLDI '99 (Programming Language Design and Implementation) and LCTES '99 (ACM SIGPLAN 1999 Workshop on Languages, Compilers, and Tools for Embedded Systems), where Patrik presented the article "Live Memory Analysis for Garbage Collection in Embedded Systems". Although the PLDI conference is not restricted to embedded systems, many of the presented papers address related topics, such as generation of compact code and code compression. This applies to embedded systems with ROM constraints, and/or in the case of Java byte code, limited communication bandwidth. LCTES, on the other hand, was specifically targeted at embedded systems. The issue of generation of compact code was even more emphasized, complemented by more established topics such as pipeline prediction and optimizations particular to embedded systems. Other topics included real-time garbage collection, re-engineering methodology for real-time systems, and measurements of static properties of real-time programs. Links: <http://www.cs.indiana.edu/~liu/lctes99/> (LCTES) <http://www.cs.rutgers.edu/pldi99/> (PLDI)

-- Patrik

Submitted: Mon, 10 May 1999

By: [Patrik Persson](mailto:Patrik.Persson@cs.lth.se), Patrik.Persson@cs.lth.se

At: Lund University, Computer Science Dept.

ETAPS '99 (European Joint Conferences on Theory and Practice of Software)

Patrik Persson visited ETAPS '99 (European Joint Conferences on Theory and Practice of Software) in Amsterdam, March 19-26, 1999. ETAPS '99 comprised several conferences, including CC '99 (Compiler Construction) and WAGA '99 (Second Workshop on Attribute Grammars and their Applications), where Patrik presented the article "Interactive Execution Time Predictions using Reference Attributed Grammars".

An interesting observation is that many of the techniques that are investigated in program optimization correspond directly to WCET prediction techniques. Both conferences addressed compilation issues related to WCET prediction in various forms, such as code optimization using integer-linear programming (ILP), optimization of cache utilization in the presence of recursive data structures, and modular specifications of program analyses using attribute grammars. Although not specifically targeted at the real-time community, the CC conference serves well as an introduction to compilation and program analysis in general.

-- Patrik

Submitted: 27 Apr 1999 10:14:24

By: [Patrik Persson](#), Patrik.Persson@cs.lth.se

At: Lund University, Computer Science Dept.
