

# César Sánchez

Research Scientist, IMDEA-Software

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## Education

- 2007 **PhD** in Computer Science, STANFORD UNIVERSITY. Adviser prof. Zohar Manna. Defended November 2006, graduated May 2007.
- 2001 **Master of Science** degree in Computer Science, STANFORD UNIVERSITY. Specializations: Software Theory and Theoretical Computer Science. Avg. GPA: 4.120.
- 1998 **“Ingeniero de Telecomunicación”** (BS+MSEE, six years degree), TECHNICAL UNIVERSITY OF MADRID (UPM) (Spain), *with Honors*. Specialization: telematics.

## Dissertation

“Deadlock Avoidance for Distributed Real-time and Embedded Systems.”  
Adviser: Zohar Manna. Coadviser: Henny B. Sipma.  
This thesis presents a novel method for deadlock avoidance in distributed real-time and embedded systems, using the combination of static analysis and run-time protocols. Program analysis allows the extraction of the call dependencies between remote components. Run-time protocols then ensure that the interleavings of executions cannot reach to deadlocks, while maximizing concurrency. This solution out-performs existing techniques to deal with deadlocks in distributed systems.

## Research Experience

- Jan 2008– present* **Research Scientist** (tenure-track), Madrid Institute for Advanced Studies in Software Development Technologies (IMDEA-Software) and UPM.
- May 2007– Dec 2007* **Postdoctoral Scholar**, University of California at Santa Cruz, working with Prof. Luca de Alfaro. Focusing on real-time testing for embedded systems. The key idea is the exploration of the combination static analysis, run-time verification and control theory to achieve timing coverage of real-time embedded software.
- 2001–May 2007* **Research Assistant**, Computer Science Department, Stanford University, in prof. Zohar Manna’s research group. Focusing on formal methods for specification, analysis and verification of concurrent and reactive systems. Developed novel techniques for deadlock avoidance in distributed systems with applications to embedded real-time systems. Developed the theory of finite-state event correlation for publish-subscribe architectures, with implementations integrated in the state of the art middlewares. Collaborated in the project LOLA for the run-time verification of hardware and software synchronous systems. Based on my research on event correlation, I led the writing of a successful—and highly ranked—NSF research proposal.
- 2004–2007* Under grant “Foundations of Event Correlation”, in the NSF program Foundations of Computing Processes and Artifacts.
- 2001–2004* Under grant “Automating the Development and Analysis of Embedded Systems”, in the DARPA program Constraint-Based Embedded System (PCES).
- Summer 2005* Research Intern, Intel Research, Hillsboro, OR. As part of the PlanetLab group, developed new algorithms for large-scale distributed event-based systems, with implementations in Java and C++.
- 1998–1999* Research Assistant, School of Computer Science (UPM). Implemented new transactional models using design-patterns for distributed systems, in Ada.

## Publications

- César Sánchez, Matteo Slanina, Henny B. Sipma and Zohar Manna: *The Reaction Algebra: A Formal Language for Event Correlation*. In Pillars of Computer Science: Essays Dedicated to Boris (Boaz) Trakhtenbrot on the Occasion of His 85th Birthday (Trakhtenbrot/Festschrift), vol. 4800 of Lecture Notes in Computer Science (LNCS), pp 596–619, Springer-Verlag, 2008.
- César Sánchez, Henny B. Sipma and Zohar Manna: *Generating Efficient Distributed Deadlock Avoidance Controllers*. In Procs. of the 15th Int'l Workshop on Parallel and Distributed Real-Time Systems (WPDRTS'07), collocated with IPDPS'07, IEEE Computer Society Press, 2007.
- César Sánchez, Henny B. Sipma and Zohar Manna: *A Family of Distributed Deadlock Avoidance Protocols and their Reachable State Spaces*. In Procs. of the 10th Int'l Conf. on Fundamental Approaches to Software Engineering (FASE'07), vol. 4422 of LNCS, pp 155–169, Springer-Verlag, 2007.
- César Sánchez, Henny B. Sipma, Christopher D. Gill and Zohar Manna *Distributed Priority Inheritance for Real-Time and Embedded Systems* In Procs. of the 10th Int'l Conf. On Principles Of Distributed Systems (OPODIS'06), vol. 4305 of LNCS, pp 110–125, Springer-Verlag, 2006.
- César Sánchez, Henny B. Sipma, Zohar Manna and Christopher D. Gill *Efficient Distributed Deadlock Avoidance with Liveness Guarantees*, In Procs. of the 6th ACM & IEEE Conf. on Embedded Software (EMSOFT'06), pp 12–20, ACM Press, 2006.
- Venkita Subramonian, Christopher D. Gill, César Sánchez and Henny B. Sipma: *Reusable Models for Timing and Liveness Analysis of Middleware for Distributed Real-Time Embedded Systems*. In Procs. of the 6th ACM & IEEE Conf. on Embedded Software (EMSOFT'06), pp 252–261, ACM Press, 2006.
- César Sánchez, Henny B. Sipma, Zohar Manna, Venkita Subramonian and Christopher D. Gill: *On Efficient Distributed Deadlock Avoidance for Real-Time and Embedded Systems*, In 20th IEEE Int'l Parallel and Distributed Processing Symp. (IPDPS'06), IEEE Computer Society Press, 2006.
- César Sánchez, Henny B. Sipma, Venkita Subramonian, Christopher Gill, and Zohar Manna: *Thread Allocation Protocols for Distributed Real-Time and Embedded Systems*, In Procs. of the 25th IFIP WG 2.6 Int'l Conf. on Formal Techniques for Networked and Distributed Systems (FORTE'05), vol. 3731 of LNCS, pp 159-173, Springer-Verlag, 2005.
- César Sánchez, Matteo Slanina, Henny B. Sipma, and Zohar Manna: *Expressive Completeness of an Event-Pattern Reactive Programming Language*, In Procs. of FORTE'05, vol. 3731 of LNCS, pp 529-532, Springer-Verlag, 2005.
- César Sánchez, Henny B. Sipma, Matteo Slanina, and Zohar Manna: *Final Semantics for Event-Pattern Reactive Programs*, In Algebra and Coalgebra in Computer Science (CALCO'05), vol 3629 of LNCS, pp 364-378, Springer Verlag, 2005.
- Ben D'Angelo, Sriram Sankaranarayanan, César Sánchez, Will Robinson, Bernd Finkbeiner, Henny B. Sipma, Sandeep Mehrotra, and Zohar Manna *LOLA: Runtime Monitoring of Synchronous Systems*, In Proc. of the 12th Int'l Symp. of Temporal Representation and Reasoning (TIME 2005), pp. 166-174, IEEE Computer Society Press, 2005.
- César Sánchez, Sriram Sankaranarayanan, Henny B. Sipma, Ting Zhang, David Dill, and Zohar Manna, *Event Correlation: Language and Semantics*, In Embedded Software (EMSOFT'03), vol 2855 of LNCS, pp 323-339, Springer Verlag, 2003.
- César Sánchez and Angel Alvarez: *A Lightweight Asynchronous Algorithm for Causal Delivery Using Extra Message Insertion*, Short paper in 14th Int'l Symp. on DIStributed Computing (DISC'2000), 2000.

## Awards

- 2007 **Juan de la Cierva** Fellowship, supporting an early career researcher position at UPM and IMDEA-Software; provided by the Spanish Ministry of Education and Science (MEC).
- 2006 **ACM SIGBED/SIGSOFT Frank Anger Memorial Student Award.**
- 2005 **Best** Theory Lunch **Talk** of the Spring Quarter'05: "Thread Allocation for Distributed Real-Time and Embedded Systems", Stanford University.
- 2000 A check by Don Knuth for \$2.56 for finding an error in Graham, Knuth, Patashnik "Concrete Mathematics", Addison Wesley, 1994.
- 2000 Champion team of the 24th ACM International programming contest (Southwest Europe). 15th place in the world finals.
- 1999 **La Caixa Graduate Fellowship**, from 1999 to 2001. This prestigious Spanish Fellowship provides full funding for the Fellows during two years of graduate studies.
- 1998 UPM **Graduation with Honors** for the MS thesis "Causal Order Communication in Asynchronous Distributed Systems." Thesis adviser: Angel Alvarez.
- 1997 IEEE Award for Outstanding Leaderships and Service.

## Teaching Experience

- Winter* 2003 Teaching fellow, Stanford University, CS department. Independently taught CS156: "Logic and automated reasoning".
- Fall* 2004 Teaching assistant (T.A.) Stanford, CS154: "Introduction to Automata and Complexity Theory". Prof: David Dill.
- Winter* 2003 T.A. Stanford, CS256: "Verification of Reactive Systems". Instr.: Matteo Slanina.
- Fall* 2001 T.A. Stanford, CS157: "Logic and Automated Reasoning". Prof: Zohar Manna.

## Invited Lectures

- April* 5, 2007 EPFL, Lausanne, Switzerland. "Distributed Deadlock Avoidance".
- February* 26, 2007 NASA, Ames Research Center, Mountain View, CA, USA. "Distributed Deadlock Avoidance".
- December* 19, 2006 VERIMAG, Grenoble, France. "Deadlock Avoidance for Distributed Real-Time and Embedded Systems".
- December* 18, 2006 TU Munich, Germany. "Deadlock Avoidance for Distributed Real-Time and Embedded Systems".
- September* 21, 2005 Facultad Informática, UCM, Madrid, Spain. "Final Semantics of Event-Pattern Reactive Programs".
- September* 20, 2005 ETSI Telecomunicación, UPM, Madrid, Spain. "Thread Allocation for Distributed Real-Time and Embedded Systems".
- September* 12, 2005 Facultad Informática, UPM, Madrid, Spain. "Final Semantics of Event-Pattern Reactive Programs".
- May* 8, 2002 ETSI Telecomunicación, UPM, Madrid, Spain. "Introduction to Term-Rewriting Systems".

## Conference Lectures

- March 28, 2007* FASE'07: "A Family of Distributed Deadlock Avoidance Protocols and their Reachable State Spaces", Braga, Portugal.
- December 12, 2006* OPODIS'06: "Distributed Priority Inheritance for Real-Time and Embedded Systems", Bordeaux, France.
- October 23, 2006* EMSOFT'06: "Efficient Distributed Deadlock Avoidance with Liveness Guarantees", Seoul, South Korea.
- April 28, 2006* IPDPS'06: "On Efficient Distributed Deadlock Avoidance for Real-Time and Embedded Systems", Rhodas, Greece.
- October 5, 2005* FORTE'05: "Thread Allocation Protocols for Distributed Real-Time and Embedded Systems", Taipei, Taiwan.
- October 5, 2005* FORTE'05: "Expressive Completeness of an Event-Pattern Reactive Programming Language", Taipei, Taiwan.
- September 4, 2005* CALCO'05: "Final Semantics for Event-Pattern Reactive Programs", Swansea, Wales.
- October 15, 2003* EMSOFT'03: "Event Correlation: Language and Semantics", Philadelphia, PA, USA.
- October 6, 2000* DISC'00: "A Lightweight Asynchronous Algorithm for Causal Delivery Using Extra Message Insertion", Toledo, Spain.

## Other Lectures

- February 8, 2007* Stanford University, Stanford, CA, USA. Theory Lunch Talk: "Regular Linear Temporal Logic".
- May 18, 2006* Stanford University, Stanford, CA, USA. Theory Lunch Talk: "Distributed Deadlock Avoidance with Liveness Guarantees".
- March 9, 2006* Stanford University, Stanford, CA, USA. Theory Lunch Talk: "On the Distributed Banker's algorithm".
- December 8, 2005* Stanford University, Stanford, CA, USA. Theory Lunch Talk: "Lola: Runtime Monitoring of Synchronous Systems".
- May 19, 2005* Stanford University, Stanford, CA, USA. Theory Lunch Talk: "Thread Allocation for Distributed Real-Time and Embedded Systems". **Best talk** of the Spring Quarter.
- April 1998* Third GNU/Linux Seminar, organized by the IEEE student branch of UPM, Madrid.
- March 1997* Second GNU/Linux Seminar, organized by the IEEE student branch of UPM, Madrid.
- March 1996* First GNU/Linux Seminar, organized by the IEEE student branch of UPM, Madrid.

## Other Publications

- 2003 In Steven S. Skiene, Miguel A. Revilla: “Programming Challenge: The Programming Contest Training Manual”. Springer, 2003. Section 7.6.2: “Carmichael Number”, pp 158–158.
- July 2000–September 2001 A series of articles regarding the problems and solutions of the 24th ACM International Programming Contest, for “Novatica” (ISSN: 0211-2124).
- January 1997–August 1999 A series of articles regarding the Ada programming language and the GNU/Linux Operating System in the magazines “Solo Programadores” (ISSN: 1134-4792), “Programación Actual” (ISSN: 1137-5531) and “Linux Actual”. (ISSN:1138-9443).

## Professional Experience

- 1997–1998 Lucent Technologies Development Center in Tres Cantos (Spain). Software Engineer position, developed components for Telecommunication equipment, in C.
- 1994–1996 Telematics Department, UPM, Madrid. Software Developer for the teleconference project ISABEL. Developed video codecs for multimedia infrastructure, in C++.

## Skills

- Programming languages: C, C++, Ada, ML, Java, Scheme, Pascal.
- Other computer software: Proficient in the GNU/Linux operating system, programming in bash, awk, (La)TeX.
- Languages: Native speaker of Spanish. Bilingual in English.

## Service

- 2002–2005 President (2004–2005), Vice-president (2003–2004) and Treasurer (2002–2003) of Iberia, Association of Spanish Students at Stanford.
- 1994–1996 Vice-president of the IEEE Student Branch, UPM, Madrid.

## Interests

Reading, traveling and cooking. General science, specially mathematics and teaching mathematics. Math riddles (solved some of the IBM Ponder problems). Listening to all kinds of music, especially live. Skiing and distance running; outdoors activities. Also like playing board games, especially Go.

Member of ACM, ACM SIGBED, the IEEE Computer Society, and Mensa.

## References

Available from

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