1996 Federated Logic Conference

Welcome to the 1996 Federated Logic Conference (FLoC)!

FLoC is modelled after the Federated Computer Research Conference (FCRC), and brings together synergetic conferences that explore connections between logic and computer science. The following conferences will be a part of FLoC:

- CADE: 13th International Conference on Automated Deduction
- CAV: 8th International Conference on Computer-Aided Verification
- LICS: 11th Annual IEEE Symposium on Logic in Computer Science
- RTA: 7th International Conference on Rewriting Techniques and Applications

FLoC takes place from 27 July to 3 August 1996, with LICS-RTA comprising the first four days and CADE-CAV comprising the second four days. In addition to the main conferences, three open-invitation workshops precede FLoC and one follows FLoC. CADE Workshops also occur in the middle of the eight days. In all, one can spend twelve days attending logic-related computer science meetings!

Each conference has chosen its own program via its own program committee in order to preserve its uniqueness. Each conference also has its own set of tutorials or invited talks. To encourage interaction, conference attendees can attend talks from other simultaneous events without cost: a registrant of RTA, for example, may attend LICS talks without paying registration costs for LICS. Certain social events—coffee breaks, lunches, and banquets—will be held jointly. The program also includes three plenary talks, by Gérard Huet, Robin Milner, and John Rushby.

All events will take place on or near the College Avenue Campus of Rutgers University in New Brunswick, New Jersey. The conference site is easily accessible from the Newark International Airport or Amtrak trains from many cities on the East Coast. Accomodations (all air-conditioned) range from the Hyatt Regency to Rutgers University dormitories, all within walking distance of the meeting site.

DIMACS, an NSF Science and Technology Center located at Rutgers University, will host FLoC as part of its Special Year on Logic and Algorithms and has provided significant support for reduced student fees. FLoC is supported also by generous contributions from AT&T Research, Bell Laboratories-Lucent Technologies, IBM Almaden Research, IEEE Computer Society, and the Max-Planck Institute.

We hope that you will join us for this exciting scientific event!

FLoC Committee:
Rajeev Alur–CAV (*Bell Laboratories*)
Leo Bachmair–RTA (*SUNY-Stony Brook*)
Amy Felty–CADE (*Bell Laboratories*)
Douglas J. Howe–Publicity (*Bell Laboratories*)
Stephen Mahaney (*DIMACS*)
Jon G. Riecke–LICS and Chair of Organizing Committee (*Bell Laboratories*)
Moshe Y. Vardi–Chair of Steering Committee (*Rice University*)

Site Arrangements: Priscilla Rasmussen (*ARCS*)
Logo Design: Luca Cardelli (*Digital Equipment Corporation*)

Contents

Location

The conferences will be held at the College Avenue Campus of Rutgers University in downtown New Brunswick, which is easily accessible by air, train, and car. For air travel, New Brunswick is 35 minutes from Newark International Airport, a major U.S. and international airline hub. By rail, the New Brunswick train station is located less than eight blocks from the conference site and is on Amtrak's Northeast corridor. For travel by car, the conference site is approximately three miles from Exit 9 of the New Jersey Turnpike.

A map of the College Avenue Campus is available from the FLoC web page at URL

`http://www.research.att.com/lics/floc`

Conference check-in and on-site registration will take place at the Main Lounge entrance on the second floor of the Rutgers Student Center (#78 on map, follow signs for exact location). Evening registration is possible the day before the beginning of FLoC, Friday, 26 July from 16:00–19:00. On regular conference days, the registration desk will be open from 8:00–18:00; on Monday, 29 July and Tuesday, 30 July, registration hours will be extended to 19:00. Conference sessions will take place in the Rutgers Student Center and Brower Commons (#57 on map). CADE workshops will take place in Scott Hall (#21 on map).

Climate

New Jersey in July and August is typically hot, with average daily highs around 85° F (29° C), and overnight lows around 70° F (21° C). Most days are sunny, but also come prepared for the possibility of occasional rain.

Things to do

The newly opened **Liberty Science Center** is a fun, hands-on science museum located in Liberty State Park, about 30-45 minutes from New Brunswick (201-200-1000). From Liberty State Park, one can also take a ferry to the **Statue of Liberty** and the **Immigration Museum at Ellis Island**.

New York City can be reached in under an hour by rail on New Jersey Transit. Trains run about twice an hour during the week, and once an hour on weekends and at night. Fare is $7.75 one-way, $11.50 round trip excursion.

The **New Jersey shore** is less than an hour from New Brunswick. Points along the shore vary greatly in character. Some, such as Point Pleasant, have long boardwalks with amusement park rides, video arcades, etc. Others, such as Spring Lake, are quiet and uncommercialized with clean and very pretty beaches. Further south, about two hours from New Brunswick, are the casinos of Atlantic City.

You can walk for miles and miles along the towpath of the peaceful **Delaware and Raritan Canal** which runs from New Brunswick south past Princeton.

Your registration packet will include a pass for access to the **College Avenue Gymnasium** (near the dormitories, #77 on map).

Travel

Travel advisory: The 1996 Summer Olympics will take place in Atlanta from 19 July to 3 August, 1996. Travel to the East Coast will be especially heavy during these times. It is strongly recommended that you make airline reservations as early as possible.

By air: Newark International Airport is by far the most convenient. A taxi from the airport to New Brunswick costs about $40 (plus nominal tolls) for up to four passengers. This is the flat-rate fare for a *licensed* taxi from the official-looking taxi stand; it is strongly recommended that you refuse rides offered by unlicensed taxi drivers who may approach you elsewhere in the airport. If renting a car, follow signs out of the airport to New Jersey Turnpike South, and continue with the directions below. By public transportation, take the Airlink bus ($4 exact fare, operates every 20 minutes) to Newark Penn Station and follow the “by rail” directions below. New Jersey Transit train fare is $5.25 one-way or $8 round trip excursion; trains run about twice an hour during the week, and less often in the evening and on weekends.

For those arriving at JFK International Airport, there is a shuttle bus operated by Princeton Airporter (phone 800-468-6696). The shuttle stops at Newark Airport (fare $19; follow the above directions) and the East Brunswick Hilton (fare $29; approximately a $7 cab ride to the conference site). The shuttle leaves JFK at 9:00, 11:00, 13:00, 14:00, 15:00, 16:00, 17:00, 18:00, 19:00, 20:00, 21:00, 22:00. Advance registrations are not possible. For information and reservation contact the ground tranportation center on the baggage level. A taxi from JFK to New Brunswick costs approximately $120 for up to four passengers. Driving from JFK to New Brunswick may take up to two hours, and is not recommended if you are not familiar with the area.

By car: Take the New Jersey Turnpike (south from Newark or New York, north from Philadelphia) to Exit 9. Follow signs onto Route 18 North or West (labeled differently at different spots) toward New Brunswick. Take the Route 27, Princeton exit onto Albany Street (Route 27) into downtown New Brunswick. The Hyatt Regency Hotel will be on your left after the first light. If staying at the Hyatt, turn left at the next light, Neilson Street, and left again into the front entrance of the hotel. If staying in the dorms, continue past this light to the following light, George Street, and turn right. Stay on George Street to just before the fifth street and turn left into the Parking Deck (#55 on map). If staying in the dorms, go directly to the appropriate dormitory. It is a short walk to Hardenbergh (#49 on map) or Stonier (#56 on map). Parking passes will be provided to all conference registrants who need one.

By rail: Take either an Amtrak or a New Jersey Transit train to the New Brunswick train station. This is located at the corner of Albany Street and Easton Avenue. If staying at the Hyatt Regency Hotel, it is a three block walk to the left on Albany Street to the hotel. If staying in the dorms, go directly to the appropriate dormitory. It is about a six block walk to Hardenbergh (#49 on map) or Stonier (#56 on map). There is also a taxi stand in front of the train station on Albany Street.

Social Events

LICS, RTA, and CADE will hold welcome receptions the evening before the start of the conference at the Rutgers University Faculty Club (#63 on map). The LICS and RTA receptions will be held Friday, 26 July, 17:30-19:30; the CADE reception will be held Tuesday, 30 July, 17:30-19:30. CAV will hold a reception in conjunction with its business meeting, Wednesday, 31 July, 20:00-22:00.

A joint banquet for LICS and RTA participants will be held on Monday, 29 July at 19:00 at the Farrington Manor, a banquet site near New Brunswick. Dana Scott will be giving a talk after dinner. The cost of the banquet is $50 per person.

A joint banquet for CADE and CAV participants will be held on Thursday, 1 August on the Spirit of New Jersey Cruise Ship. Buses will leave for the cruise from the Hyatt at 18:30. The boat will cruise the Hudson River with spectacular views of New York City, including downtown Manhattan and the Statue of Liberty. Amir Pnueli will be giving a talk after dinner. The cost of the banquet is $57 per person. Banquet tickets may run out; please sign up as soon as possible to assure your place.

CADE offers an excursion on the afternoon of 2 August at a cost of $25 per person. The fee includes admission to one of the following: New York City's Metropolitan Museum of Art, the Statue of Liberty and the Immigration Museum at Ellis Island, or the Liberty Science Center in Liberty State Park. (For more information, see “Things to do” on p. 3.) For an additional $25, those going to the Metropolitan Museum have the option of staying in New York for the Broadway musical *Phantom of the Opera*. This option also provides you with the opportunity to have dinner in New York; you will be on your own, but we will provide restaurant recommendations. You must register in advance for an excursion by making your choice on the registration form, indicating how many people, and enclosing payment.

Pre-FLoC Workshops

Wednesday-Thursday, 24-25 July 1996

09:00–18:00 *Workshop* FOOL 3

The Third International Workshop on Foundations of Object-Oriented Languages
Hyatt Regency Hotel, New Brunswick, NJ

While object-oriented programming languages have swept the programming community over the last decade, it has taken longer for the language theory community to develop sound theoretical foundations for these languages. However, work over the last several years has provided a better understanding of the key concepts of object-oriented languages, and has led to important developments in the type theory, semantics, and verification of object-oriented languages. This workshop is designed to bring together researchers to share new ideas and results.

The first two workshops in this series were sponsored jointly by the NSF and ESPRIT. They were open by invitation only, with the first held in association with the American Types Jumelage in October, 1993, at Stanford University, and the second held in association with LICS '94 in Paris. A report on the first two meetings appeared in ACM SIGPLAN Notices, March, 1994, pp. 3-11 and February, 1995, pp. 5-11. Both are also available through the FOOL home page at

`http://www.cs.williams.edu/~kim/FOOL`

This third workshop will be held at the Hyatt Regency Hotel in New Brunswick, and will be open to anyone interested in the general area of theoretical foundations of object-oriented languages. The range of topics includes semantics, calculi, type theory, program verification of object-oriented languages, and foundational issues related to concurrent and distributed object-oriented languages. The paper submission deadline has passed. A list of accepted papers will be available from the FOOL home page by mid to late May.

	Workshop Program Committee
Chair:	Kim Bruce (*Williams College*)
	`kim@cs.williams.edu`
Members:	Luca Cardelli (*DEC-SRC*)
	Giuseppe Castagna (*CNRS & Ecole Normale Supérieure*)
	Cliff Jones (*Manchester University*)
	Giuseppe Longo (*CNRS & Ecole Normale Supérieure*)
	John Mitchell (*Stanford University*)
	Benjamin Pierce (*Cambridge University*)
	Didier Rémy (*INRIA*)
Local Organizer:	Jon Riecke (*Bell Laboratories, Lucent Technologies*)

Information on pre-registration and housing, as well as other workshop-related information can be found at the FOOL home page given above. Registration fees will be increased after July 1. Questions should be sent to fool-info@cs.williams.edu.

DIMACS Workshop on Partial-Order Methods in Verification
Princeton University, Princeton, NJ

Research in the last few decades on the connection between partial-order semantics and interleaving semantics has resulted in a class of new verification techniques for distributed systems that may prove themselves to be of great practical value in routine industrial applications of formal verification techniques.

Much of the new work in this area is being pursued by people from quite distinct fields, who rarely have an opportunity to meet and exchange ideas directly. These groups include, for instance, verification tool builders, logicians, semantics researchers, and process algebra specialists.

This workshop aims to bring the people from these different disciplines together. The discussion at the workshop will be focused on the following three main topics:

- Experience with the application of verification methods and tools based on partial-order semantics and partial-order reduction techniques.
- Formal description techniques, logics and algebras, based on partial orders.
- Formal specification methods where partial-order semantics are more natural than interleaving semantics.

The workshop will be two and a half days, ending at early afternoon on the last day. It will include invited talks from both practitioners of partial-order methods in verification, and from theoreticians in the areas related to the conference: model-checking, logic, semantics, process algebras.

The proceedings of the workshop will be published in the AMS-DIMACS Series in Discrete Mathematics and Computer Science. Preprints of presented papers and short presentation position statements will be available at the workshop. The workshop will include a tool demonstration.

Organizers: Doron Peled (*Bell Laboratories*) `doron@research.att.com`
Gerard Holzmann (*Bell Laboratories*) `gerard@research.att.com`
Vaughan Pratt (*Stanford University*) `pratt@cs.stanford.edu`

Sponsors: Bell Laboratories, the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), and the Office of Naval Research (ONR).

Updated information will be posted to the theory newsgroup and also announced via the workshop web page

`http://dimacs.rutgers.edu/Workshops/POMIV/index.html`

The POMIV'96 workshop will take place in New Jersey as part of the DIMACS Special Year on Logic and Algorithms, one of whose focus areas is computer-aided verification. The workshop is part of a series of workshops on formal methods and verification. See

`http://dimacs.rutgers.edu/`

for more information.

DIMACS Workshop on Teaching Logic and Reasoning in an Illogical World
Rutgers Busch Campus, NJ

Logic and logical thinking are central to all disciplines and are critical in the mathematical and computer sciences. This symposium will explore the teaching of introductory logic and logical thinking, with a primary focus on the college level and a secondary focus on the high school level. The symposium will be interdisciplinary, emphasizing and contrasting approaches used in mathematics, computer science, natural sciences, and engineering.

The symposium seeks a sharing of ideas, rather than consensus, on how to teach logic, so that all participants gain an appreciation for the fundamental issues and ultimately are better able to motivate the importance of logic and to convey the foundations of logical reasoning to students. Topics of interest include, but are not limited to:

Pedagogical Approaches
Cognitive Models of Logical Reasoning
Empirical Studies
Exemplary Course Material
Innovative Approaches
Courseware for Teaching Logic

Papers were due 1 April 1996. Accepted papers will be published in a locally available proceedings and on the World Wide Web.

Organizers: Susanna Epp (*DePaul University*) `epp@condor.depaul.edu`
David Gries (*Cornell University*) `gries@cs.cornell.edu`
Peter Henderson (*SUNY Stony Brook*) `pbh@cs.sunysb.edu`
Ann Yasuhara (*Rutgers University*) `yasuhara@cs.rutgers.edu`

For further information, contact Peter Henderson, Department of Computer Science, SUNY Stony Brook, Stony Brook, N.Y. 11794-4400 USA. (516) 632-8463, `pbh@cs.sunysb.edu`; or see the workshop web page at

`http://dimacs.rutgers.edu/Workshops/Logic/index.html`

Plenary Sessions

Sunday, 28 July 1996

9:15–10:30 *Invited Lecture* Chair: **E. Clarke**

Design of a Proof Assistant
by
Gérard Huet (INRIA Rocquencourt)

Abstract: We discuss a few architectural design decisions for a general purpose proof assistant, combining a programmable tactics-based proof-checker, a sequent calculus search engine based on logic programming with higher-order unification constraints, a library browser managing modular mathematical developments, and a user interface allowing structural selection in formulas displayed in readable notation. The talk is illustrated with concrete experience issued from various versions of the Coq Proof Assistant for Type Theory. It is intended as a discussion platform for the QED collaborative endeavor.

Biographical Sketch: Gérard Huet worked for the last 25 years in the area of applying formal tools from algebra and logic to computer science problems, ranging from semantics of programming languages and design of logical frameworks to more applied areas such as implementing programming environments, functional languages and proof systems.

He worked in particular on λ-calculus, type theory, higher-order unification, confluence and sequentiality of rewrite systems, and type-theoretic specification languages. He is the co-designer and author of the Mentor programming environment, the CAML programming language, and the Coq Proof Assistant.

Gérard Huet is correspondant de l' Academie des Sciences, member of Academia Europaea. He is Directeur de Recherches at INRIA (French National Research Institute in Computer Science and Control), Rocquencourt branch.

20:00–21:30 *Keynote Lecture* Chair: **M.Y. Vardi**

Calculi for Interaction
by
Robin Milner (Cambridge University)

Abstract: Modern Computer Science is increasingly concerned with distributed systems, mobile connectivity and interaction. Systems with these properties are becoming bewilderingly complex. If we care about understanding their structure, then they need a structural semantic theory just as programming languages do. Intriguingly, the abstract concepts in programming semantics do not clearly extend to play the role.

With this in mind, several years ago with Joachim Parrow and David Walker (extending work by Uffe Engberg and Mogens Nielsen) I designed a calculus of mobile processes, the pi calculus. The strategy behind this move was that, to find the right abstract concepts for mobile interactive systems, one should first distill a bare descriptive notation from the various and intractable ways in which their designers had previously to describe them.

This process of distilling a calculus is not complete. The pi calculus is useful but not canonical. Recently I have introduced a family of calculi, known as action calculi; this contains the pi calculus, Petri nets, the lambda calculus and others, and is therefore a space in which we can hope to distinguish what is adhoc from what is essential in calculi for interaction. Colleagues have also begun to look at a uniform space of interpretations of these calculi.

In my talk I shall illustrate action calculi with simple examples, discuss some of their theory, and indicate how one may attempt to classify them. I shall emphasize their graphical nature, which can be regarded as generalising the interaction nets of Lafont.

Biographical Sketch: Arthur John Robin Gorell Milner was educated at Eton College and Cambridge. He worked for a few years in Ferranti Ltd, then re-entered academic life. He joined the University of Edinburgh in 1973, becoming Professor of Computation Theory in 1984. In 1986, with colleagues, he founded the Laboratory for Foundations of Computer Science at Edinburgh. He was elected Fellow of the Royal Society in 1988, and in 1991 won the A.M. Turing Award.

Milner has worked on computer-assisted reasoning; his system LCF (Logic for Computable Functions) was a model for several later systems. He led a team which designed and defined Standard ML, a widely used programming language. His main contribution has been to the theory of concurrent computation. Some of this work is widely accessible through his book Communication and Concurrency (1989); also, around that time he devised (with two colleagues) the pi calculus, a basic model for mobile communicating systems.

In January 1995, Milner was appointed Professor in the Computer Laboratory at Cambridge, which he now heads.

9:00–10:15 *Invited Lecture* Chair: **M.Y. Vardi**

Automated Deduction and Formal Methods
by
John Rushby (SRI International)

Abstract: Just as computational fluid dynamics uses calculation to examine aerofoil designs, so automated deduction allows specifications and designs for computer systems to be explored and verified through formal calculations. For this approach to be useful, automated deduction must provide methods that are effective for the type and scale of examples that arise in practical applications, and that yield information that is helpful to designers.

Using examples from verifications undertaken by myself and my colleagues in the areas of fault tolerance, protocols, and hardware, I will describe some of the capabilities that we have found useful or necessary. At the lower levels, these include decision procedures for several theories including equality, real and integer linear arithmetic, fast propositional simplification, rewriting, rich typing mechanisms, and the integration of all these. At the higher levels, they include user-directed control strategies, integration of theorem proving with model checking, and automated assistance in the construction of abstractions and invariants.

I will close by speculating on future possibilities, and suggesting some challenging examples.

Biographical Sketch: John Rushby is a program director in the Computer Science Laboratory of SRI International in Menlo Park California, where he leads a research program in formal methods and dependable systems. His group develops mechanized formal verification systems (the latest is called PVS), and applies them to problems in computer security, hardware design, and safety-critical and fault-tolerant systems. PVS is being used in industrial projects applying formal methods and automated verification to aerospace problems at Allied Signal, Honeywell, JPL, Lockheed Martin, and Rockwell-Collins.

Dr. Rushby joined SRI in 1983 and served as Director of its Computer Science Laboratory from 1986 to 1990. Prior to that, he held academic positions at the Universities of Manchester and Newcastle upon Tyne in England. He received BSc and PhD degrees in computing science from the University of Newcastle upon Tyne in 1971 and 1977, respectively. He serves on the program committees for several forthcoming conferences (e.g., Compass, DCCA, FME, and LICS) and is an associate editor for the journals Communications of the ACM and Formal Aspects of Computing. He is the author of the section on formal methods for the FAA Digital Systems Validation Handbook (the guidelines for aircraft certification).

11th Annual IEEE Symposium on Logic in Computer Science (LICS)

The LICS Symposium aims to attract original papers of high quality on theoretical and practical topics in computer science that relate to logic in a broad sense, including algebraic, categorical and topological approaches. The symposium draws papers from a wide range of areas: abstract data types, automated deduction, categorical models, concurrency, constraint programming, constructive mathematics, database theory, domain theory, finite model theory, hybrid systems, logics of knowledge, lambda and combinatory calculi, linear logic, logical aspects of computational complexity, logics in artificial intelligence, logic programming, modal and temporal logics, model checking, program logic and semantics, rewriting, logical aspects of symbolic computing, software specification, type systems, and verification.

Program Chair: E. Clarke (CMU)

Program Committee: S. Buss (UC San Diego), A. Emerson (UT Austin), S. German (IBM Watson), G. Gottlob (TU Vienna), O. Grumberg (Technion), D. Howe (Bell Laboratories), C. Kirchner (INRIA & CRIN), K. Kunen (Wisconsin), P. Lincoln (SRI), J. Mitchell (Stanford), U. Montanari (Univ. Pisa), P. Panangaden (McGill), F. Pfenning (CMU), J. Rushby (SRI), C. Stirling (Edinburgh), A. Stolboushkin (UCLA), G. Winskel (Aarhus).

Conference Chair: J.G. Riecke (Bell Laboratories).

Publicity: A. Felty (Bell Laboratories), D. Howe (Bell Laboratories).

General Chair: M.Y. Vardi (Rice University)

Organizing Committee: M. Abadi, S. Abramsky, S. Artemov, E. Boerger, A. Borodin, W. Brauer, A. Bundy, S. Buss, E. Clarke, R. Constable, A. Felty, U. Goltz, D. Howe, G. Huet, J.-P. Jouannaud, D. Kapur, C. Kirchner, P. Kolaitis, D. Kozen, T. Leighton, D. Leivant, A.R. Meyer, D. Miller, J. Mitchell, Y. Moschovakis, M. Okada, P. Panangaden, J. Remmel, J. Riecke, S. Ronchi della Rocca, A. Scedrov, D. Scott, J. Tiuryn, M.Y. Vardi.

Email: `lics96@cs.cmu.edu`

Conference Program

Friday, 26 July 1996

17:30–19:30 *Reception*

Saturday, 27 July 1996

9:00–9:15 *Welcome*

9:15–10:30 *Finite Model Theory I* Chair: **K. Kunen**

A Generalization of Fagin's Theorem. J. Antonio Medina and Neil Immerman (University of Massachusetts)

DATALOG SIRUPs Uniform Boundedness Is Undecidable. Jerzy Marcinkowski (University of Wroclaw)

On the Structure of Queries in Constraint Query Languages. Michael Benedikt and Leonid Libkin (Bell Laboratories)

10:30–11:00	*Coffee Break*	

11:00–12:40	*Concurrency*	Chair: **U. Montanari**

A Fully Abstract Domain Model for the π-Calculus. Ian Stark (University of Aarhus)

A Fully-Abstract Model for the π-Calculus. M.P. Fiore (University of Edinburgh), E. Moggi (Universita di Genova), and D. Sangiorgi (INRIA)

Higher Dimensional Transition Systems. Gian Luca Cattani and Vladimiro Sassone (University of Aarhus)

An Algebraic Theory of Process Efficiency. V. Natarajan and Rance Cleaveland (North Carolina State University)

12:40–14:15	*Lunch Break*	

14:15–15:30	*Types I*	Chair: **J. Mitchell**

The Subtyping Problem for Second-Order Types is Undecidable. Jerzy Tiuryn and Pawel Urzyczyn (Warsaw University)

Subtyping Dependent Types. David Aspinall (University of Edinburgh) and Adriana Compagnoni (University of Cambridge)

Reduction-Free Normalisation for a Polymorphic System. Thorsten Altenkirch (University of Edinburgh) and Martin Hofmann and Thomas Streicher (TH Darmstadt)

15:30–16:00	*Coffee Break*	

16:00–17:40	*Temporal Logic and μ-Calculus*	Chair: **E.A. Emerson**

An Until Hierarchy for Temporal Logic. Kousha Etessami and Thomas Wilke (DIMACS)

Locally Linear Time Temporal Logic. R. Ramanujam (Universität Kiel)

A Modal μ-Calculus for Durational Transition Systems. Helmut Seidl (Universität Trier)

Tarskian Set Constraints. David McAllester (AT&T Research), Robert Givan (MIT AI Laboratory), Dexter Kozen (Cornell University), and Carl Witty (MIT AI Laboratory)

Sunday, 28 July 1996

9:15–10:30	*Plenary Session with RTA*	Chair: **E. Clarke**

Design of a Proof Assistant. Gérard Huet (INRIA Rocquencourt)

10:30–11:00	*Coffee Break*	

11:00–12:40	*Reasoning about Programs*	Chair: **P. Lincoln**

Reasoning about Local Variables with Operationally-Based Logical Relations. Andrew M. Pitts (Cambridge University)

The Essence of Parallel Algol. Stephen Brookes (Carnegie Mellon University)

Games and Full Abstraction for FPC. Guy McCusker (Imperial College)

A Temporal Logic Approach to Binding Time Analysis. Rowan Davies (Carnegie Mellon University)

12:40–14:15 *Lunch Break*

14:15–15:30 *Model Checking I* Chair: **S. German**

Symbolic Protocol Verification with Queue BDDs. Patrice Godefroid and David E. Long (Bell Laboratories)

Reactive Modules. Rajeev Alur (Bell Laboratories) and Thomas A. Henzinger (University of California at Berkeley)

Model-checking of Correctness Conditions for Concurrent Objects. Rajeev Alur (Bell Laboratories), Ken McMillan (Cadence Berkeley Labs), and Doron Peled (Bell Laboratories)

15:30–16:00 *Coffee Break*

16:00–17:40 *Types II* Chair: **D. Howe**

A Semantic View of Classical Proofs: Type-Theoretic, Categorical, and Denotational Characterizations. C.-H. L. Ong (University of Oxford & National University of Singapore)

Syntactic Considerations on Recursive Types. Martffi Abadi (Systems Research Center, Digital Equipment Corporation) and Marcelo P. Fiore (University of Edinburgh)

On the Expressive Power of Simply Typed and Let-Polymorphic Lambda Calculi. Gerd G. Hillebrand (University of Pennsylvania) and Paris C. Kanellakis (Brown University)

A Linear Logical Framework. Iliano Cervesato and Frank Pfenning (Carnegie Mellon University)

20:00–21:30 *Business Meeting*

Monday, 29 July 1996

9:15–10:30 *Tutorial* Chair: **J. Rushby**

The Theory of Hybrid Automata
by
Thomas A. Henzinger (University of California at Berkeley)

Abstract: Hybrid automata, which combine discrete transition graphs with continuous dynamical systems, are mathematical models for digital systems that interact with analog environments. Hybrid automata can be viewed as infinite-state transition systems, and this view gives insights into the structure of hybrid state spaces. For example, for certain interesting classes

of hybrid automata, language equivalence, mutual similarity, or bisimilarity induce finite quotients of infinite state spaces. These results can be exploited by analysis techniques for finite-state systems.

10:30–11:00	*Coffee Break*	

11:00–12:40	*Model Checking II*	Chair: **O. Grumberg**

Partial-Order Methods for Model Checking: From Linear Time to Branching Time. Bernard Willems and Pierre Wolper (Université de Liege)

Efficient Model Checking via the Equational μ-Calculus. Girish Bhat and Rance Cleaveland (North Carolina State University)

General Decidability Theorems for Infinite-State Systems. Parosh Aziz Abdulla (Uppsala University), Kārlis Cerāns (University of Latvia), Bengt Jonsson (Uppsala University), and Yih-Kuen Tsay (National Taiwan University)

Relating Word and Tree Automata. Orna Kupferman (Bell Laboratories), Shmuel Safra (Tel Aviv University), and Moshe Y. Vardi (Rice University)

12:40–14:15	*Lunch Break*	

14:15–15:30	*Finite Model Theory II*	Chair: **G. Gottlob**

More about Recursive Structures: Descriptive Complexity and Zero-One Laws. Tirza Hirst and David Harel (The Weizmann Institute of Science)

On the Expressive Power of Variable-Confined Logics. Phokion G. Kolaitis (University of California, Santa Cruz) and Moshe Y. Vardi (Rice University)

Zero-One Laws for Gilbert Random Graphs. Gregory L. McColm (University of South Florida)

15:30–16:00	*Coffee Break*	

16:00–17:40	*Semantics and Domains*	Chair: **G. Winskel**

When Scott is Weak on the Top. Abbas Edalat (Imperial College)

Integration in Real PCF. Abbas Edalat and Martffi Hötzel Escardó (Imperial College)

Game Semantics and Abstract Machines. Vincent Danos (Paris 7 & CNRS), Hugo Herbelin (Paris 7 & INRIA), and Laurent Regnier (LMD-CNRS Marseille)

Semantics of Normal Logic Programs and Contested Information. Shekhar Pradhan (University of Maryland, College Park & Central Missouri State University)

19:00–22:00	*Joint Banquet with RTA*	Chair: **C.A. Gunter**

Dinner speech by Dana Scott on “Some Reflections on Logic and Logicians”.

Tuesday, 30 July 1996

9:15–10:30 *Tutorial* Chair: **P. Panangaden**

Lattices, Categories and Communication by André Joyal (Université du Québec a Montréal)

Abstract: We describe a theory of communication based on free lattices and free bicomplete categories. It is based on a game-theoretic representation of bicomplete categories. All our results extend to enriched categories. In (*) we associate a two player game to each term representing an element of a free lattice. To a pair of terms we associate a three player game, a mediator facing two opposites. A strategy for the mediator is viewed as a communication strategy between the opposites. A communication strategy is complete iff it is winning. The mediator has a complete communication strategy iff the corresponding terms can be compared in the free lattice. Here we show that the objects and arrows of free bicomplete categories have a similar game-theoretic interpretation. Two communication strategies are operationally equivalent iff they define the same arrow in the free bicomplete category. Many connectives of linear logic have an interpretation in free bicomplete categories. Our work suggests similarities between the world of computing and that of financing.

Reference: (*) "Free lattices, communication and money games". In *Proceedings of the 10th International Congress of Logic, Methodology and Philosophy of Science.* Firenze, August 1995.

10:30–11:00 *Coffee Break*

11:00–12:40 *Lambda Calculus* Chair: **F. Pfenning**

Linear Logic, Monads and the Lambda Calculus. Nick Benton (University of Cambridge) and Philip Wadler (University of Glasgow)

On Order-Incompleteness and Finite Lambda Models. Peter Selinger (University of Pennsylvania)

Confluence and Preservation of Strong Normalisation in an Explicit Substitutions Calculus. César Munoz (INRIA)

Completing Partial Combinatory Algebras with Unique Head-Normal Forms. Inge Bethke (CWI & University of Utrecht), Jan Willem Klop (CWI & Vrije Universiteit), and Roel de Vrijer (Vrije Universiteit)

12:40–14:15 *Lunch Break*

14:15–15:30 *Rewriting and Unification* Chair: **C. Kirchner**

Complexity Analysis Based on Ordered Resolution. David Basin and Harald Ganzinger (Max-Planck-Institut für Informatik)

Solving Linear Equations over Semirings. Paliath Narendran (State University of New York at Albany)

Basic Paramodulation and Decidable Theories. Robert Nieuwenhuis (Technical University of Catalonia)

15:30–16:00	*Coffee Break*	

16:00–17:40	*Complexity and Decidability*	Chair: **A. Stolboushkin**

Counting Modulo Quantifiers on Finite Linearly Ordered Trees. Juha Nurmonen (University of Helsinki)

Simultaneous Rigid E-Unification and Related Algorithmic Problems; Skolemization and Decidability Problems for Fragments of Intuitionistic Logic. Anatoli Degtyarev (Uppsala University), Yuri Matiyasevich (Steklov Institute of Mathematics), and Andrei Voronkov (Uppsala University)

On the Complexity of Abduction. Victor W. Marek (University of Kentucky), Anil Nerode (Cornell University), and Jeffrey B. Remmel (University of California, San Diego)

Decision Problems for Semi-Thue Systems with a Few Rules. Yuri Matiyasevich (Steklov Institute of Mathematics) and Géraud Sénizergues (LaBRI, Université de Bordeaux)

20:00–21:30	*FLoC Plenary Session*	Chair: **M.Y. Vardi**

Calculi for Interactions. R. Milner (Cambridge University, United Kingdom)

End of the Conference

7th International Conference on Rewriting Techniques and Applications (RTA)

Term rewrite systems are one of the main logic concepts for modelling computation by deduction. The themes of the RTA'96 program include the analysis of term rewriting systems, string and graph rewriting, rewrite-based theorem proving, conditional term rewriting, higher-order rewriting, unification, symbolic and algebraic computation and efficient implementation of rewriting on sequential and parallel machines.

Some of the highlights of this year's program are the answers to two problems that have remained open for a long time. Manfred Schmidt-Schauß has proved the decidability of distributive unification, while Ralf Treinen was able to show that the elementary theory of one-step rewriting is undecidable.

RTA'96 has received support by the ESPRIT Basic Research Working Group CCL and the Max Planck Institute for Computer Science.

Program Chair: H. Ganzinger (Saarbrücken)

Program Committee: J. Avenhaus (Kaiserslautern), H. Comon (Orsay), N. Dershowitz (Urbana), P. Lescanne (Nancy), U. Martin (St. Andrews), A. Middeldorp (Tsukuba), P.Narendran (Albany), R. Nieuwenhuis (Barcelona), T. Nipkow (München), F. Otto (Kassel), F. Pfenning (Pittsburgh), D. Plaisted (Chapel Hill), W. Snyder (Boston), H. Zhang (Iowa City).

Local Arrangements Chair: Leo Bachmair (Stony Brook)

Email: `rta96@mpi-sb.mpg.de`

Conference Program

Friday, 26 July 1996

17:30–19:30 *Reception*

Saturday, 27 July 1996

9:00–10:00 *Welcome & Invited Lecture* Chair: **Harald Ganzinger**

Rewrite-based Automated Reasoning: Challenges Ahead. Deepak Kapur (SUNY Albany)

10:00–10:30 Chair: **Robert Nieuwenhuis**

Fine-grained Concurrent Completion. Claude Kirchner, Christopher Lynch, and Christelle Scharff (INRIA Lorraine & CRIN)

10:30–11:00 *Coffee Break*

11:00–12:30 Chair: **Ursula Martin**

AC-complete Unification and its Application to Theorem Proving. Alexandre Boudet, Evelyne Contejean, and Claude Marché (Université de Paris-Sud & CNRS)

Superposition Theorem Proving for Abelian Groups Represented as Integer Modules. Jürgen Stuber (Max Planck Institut für Informatik)

Symideal Gröbner Bases. Manfred Göbel (Wilhelm-Schickard-Institut, Universität Tübingen)

12:30–14:00 *Lunch Break*

14:00–15:30 Chair: **Nachum Dershowitz**

Termination of Constructor Systems. Thomas Arts (Utrecht University) and Jürgen Giesl (TH Darmstadt)

Dummy Elimination in Equational Rewriting. M.C.F. Ferreira (Utrecht University)

On Proving Termination by Innermost Termination. Bernhard Gramlich (Universität Kaiserslautern)

15:30–16:00 *Coffee Break*

16:00–17:30 Chair: **Jürgen Avenhaus**

A Recursive Path Ordering for Higher-Order Terms in η-Long β-Normal Form. Jean-Pierre Jouannaud (CNRS & Université de Paris-Sud) and Albert Rubio (Universitat Politecnica de Catalunya)

Higher-Order Superposition for Dependent Types. Roberto Virga (Carnegie Mellon University)

Higher-Order Narrowing with Definitional Trees. Michael Hanus (RWTH Aachen) and Christian Prehofer (Technische Universität München)

20:00–21:30 *Business Meeting*

Sunday, 28 July 1996

9:15–10:30 *Plenary Session with LICS* Chair: **Edmund Clarke**

Design of a Proof Assistant. Gérard Huet (INRIA Rocquencourt)

10:30–11:00 *Coffee Break*

11:00–11:30 Chair: **David Plaisted**

A Compiler for Nondeterministic Term Rewriting Systems. Marian Vittek (INRIA Lorraine, CRIN & ILOG Gentilly)

11:30–12:40 *System Descriptions* Chair: **David Plaisted**

A New Proof Manager and Graphic Interface for the Larch Prover. Frédéric Voisin (CNRS & Université de Paris-Sud)

ReDuX 1.5: New Facets of Rewriting. Reinhard Bündgen, Carsten Sinz, and Jochen Walter (Wilhelm-Schickard-Institut, Universität Tübingen)

CiME: Completion Modulo E^*. Evelyne Contejean and Claude Marché (Université de Paris-Sud & CNRS)

Distributed Larch Prover (DLP): An Experiment in Parallelizing a Rewrite Rule-based Prover. Mark T. Vandevoorde (Massachusetts Institute of Technology) and Deepak Kapur (SUNY Albany)

EPIC: An Equational Programming Language - Abstract Machine and Supporting Tools. H.R. Walters and J.F.Th. Kamperman (CWI Amsterdam)

SPIKE-AC: a System for Proofs by Induction in Associative-Commutative Theories. Narjes Berregeb, Adel Bouhoula, and Michaël Rusinowitch (INRIA Lorraine & CRIN)

On Gaining Efficiency in Completion-based Theorem Proving. Thomas Hillenbrand, Arnim Buch, and Roland Fettig (Universität Kaiserslautern)

12:40–14:00 *Lunch Break*

14:00–15:30 *System Demonstrations*

15:30–16:00 *Coffee Break*

16:00–18:00 *System Demonstrations*

Monday, 29 July 1996

9:00–10:30 Chair: **Pierre Lescanne**

Combinatory Reduction Systems with Explicit Substitution that Preserve Strong Normalisation. Roel Bloo (University of Technology Eindhoven) and Kristoffer H. Rose (DIKU, University of Copenhagen)

Confluence Properties of Extensional and Non-Extensional λ-calculi with Explicit Substitutions. Delia Kesner (CNRS & Université de Paris-Sud)

On the Power of Simple Diagrams. Roberto Di Cosmo (DMI-LIENS Paris)

10:30–11:00 *Coffee Break*

11:00–12:30 Chair: **Friedrich Otto**

Coherence for Sharing Proof Nets. S. Guerrini (Universita di Pisa), S. Martini (Universita di Udine), and A. Masini (Universita di Pisa)

Modularity of Termination in Term Graph Rewriting. M.R.K. Krishna Rao (Max Planck Institut für Informatik)

Confluence of Terminating Conditional Rewrite Systems Revisited. Bernhard Gramlich and Claus-Peter Wirth (Universität Kaiserslautern)

12:30–14:00 *Lunch Break*

14:00–15:00 *Invited Lecture* Chair: **Paliath Narendran**

Applications of Rewrite Techniques in Monoids and Rings. Klaus Madlener (Universität Kaiserslautern)

15:00–15:30 Chair: **Paliath Narendran**

Compositional Term Rewriting: An Algebraic Proof of Toyama's Theorem. Christoph Lüth (Universität Bremen)

15:30–16:00 *Coffee Break*

16:00–17:30 Chair: **Hubert Comon**

The First-Order Theory of One-Step Rewriting is Undecidable. Ralf Treinen (Université de Paris-Sud)

An Algorithm for Distributive Unification. Manfred Schmidt-Schauß (J.W.-Goethe Universität Frankfurt)

On the Termination Problem for One-Rule Semi-Thue Systems. Géraud Sénizergues (LaBRI Talence)

19:00–22:00 *Joint Banquet with LICS* Chair: **C.A. Gunter**

Dinner speech by Dana Scott on "Some Reflections on Logic and Logicians".

Tuesday, 30 July 1996

9:00–10:30 Chair: **Frank Pfenning**

Efficient Second-Order Matching. Régis Curien (CRIN-CNRS & INRIA Lorraine) and Zhenyu Qian and Hui Shi (Universität Bremen)

Linear Second-Order Unification. Jordi Levy (Universitat Politecnica de Catalunya)

Unification of Higher-Order Patterns in a Simply Typed Lambda-Calculus with Finite Products and Terminal Type. Roland Fettig and Bernd Löchner (Universität Kaiserslautern)

10:30–11:00 *Coffee Break*

11:00–13:00 Chair: **Aart Middeldorp**

Deciding Strong Sequentiality for Orthogonal Term Rewriting Systems is in Co-NP. Irene Durand (LaBRI Talence)

Decidable Approximations of Term Rewriting Systems. Florent Jacquemard (CNRS & Université de Paris-Sud)

Semantics and Strong Sequentiality of Priority Term Rewriting Systems. Masahiko Sakai and Yoshihito Toyama (JAIST Ishikawa)

Higher-Order Families. Vincent van Oostrom (Technische Universität München)

20:00–21:30 *FLoC Plenary Session* Chair: **M.Y. Vardi**

Calculi for Interactions. R. Milner (Cambridge University, United Kingdom)

End of the Conference

Instructions for Registration

Please include the Conference Fee Form, On-Campus Housing Form (if on-campus housing is desired), and this form with payment and mail to

FLoC
c/o Priscilla Rasmussen
P. O. Box 6148
Somerset, NJ 08875 USA

All inquiries should be directed to

Priscilla Rasmussen
Phone: (908) 873-0672 or (908) 873-3898
Fax: (908) 873-0014
Email: rasmusse@cs.rutgers.edu

Please type or print.

Name ____________________ Sex (please circle): Male Female

Affiliation ____________________

Street Address ____________________

City, State, Postal Code ____________________

Country ____________________

Phone(s) ____________________

Fax ____________________

E-mail ____________________

Total Due (Registration and Dormitories): ____________________

Dietary Restrictions (circle if applicable): **Vegetarian** **Kosher**

Payment. Please enclose a money order, personal check, or bank check, drawn in U.S. dollars, for the full amount payable to "Federated Logic Conference 1996" or "FLoC 1996." *All personal checks must be drawn on a U.S. bank.*

Discount for Students: A reduced registration fee is available for students attending the conferences. If you apply for the student fee, please attach a copy of your student identification for the ongoing year or a letter signed by the head of your department confirming that you are a student.

Discount for Members: LICS and CADE offer reduced registration fees for members of certain organizations. CADE offers the possibility of becoming eligible for the reduced fee by joining the Association of Automated Reasoning and enclosing the $7.00 membership fee with your registration. (See next page.)

Member rate justification for LICS (if applicable) ____________________
Member rate justification for CADE (if applicable) ____________________

Conference Fees

All fees are in U.S. currency. Please include this form with your payment. *You must be registered for a conference or workshop for each day you attend.* For instance, if you register for LICS and want to stay to attend CADE and/or CAV sessions, you must register for CADE or CAV.

Group 1: LICS or RTA (Circle at most one fee)

	LICS Registration *Before June 21*	*After June 21*		**RTA Registration** *Before June 21*	*After June 21*
*Member	$295.00	$380.00			
Regular	$375.00	$475.00	Regular	$275.00	$375.00
Student	$100.00	$150.00	Student	$100.00	$150.00

*Includes members of ACM, ASL, EATCS, and IEEE, members of the organizing and program committee, and authors of accepted papers.

Group 2: LICS/RTA Banquet ($50.00 per person)

Number of people: ________ Total Cost: ____________

Group 3: CADE Workshops (circle the appropriate workshops)
(before June 21, $50.00 per workshop; after June 21, $80.00 per workshop)

WP-1 WP-2 WP-3 WP-4 WP-5 WP-6 WP-7

Total Cost: ____________

Group 4: CADE or CAV (Circle at most one fee)

	CADE Registration *Before June 21*	*After June 21*		**CAV Registration** *Before June 21*	*After June 21*
*Member	$300.00	$400.00			
Regular	$330.00	$430.00	Regular	$300.00	$375.00
Student	$100.00	$200.00	Student	$100.00	$150.00

*Includes current and new members of AAR.

Group 5: New AAR Membership for CADE member rate (Circle if applicable)

$7.00

Group 6: CADE/CAV Banquet ($57.00 per person):

Number of people: ________ Total Cost: ____________

Group 7: CADE Excursion (Choose one and indicate number of people):
($50 for Metropolitan Museum & broadway show, $25 all others)

Statue of Liberty/Ellis Island: ____ Liberty Science Center: ____

Met. Museum: ____ Met. Museum & broadway show: ____ Total Cost: ________

On-Campus Housing Form

We have reserved dormitory space in two dorms, both of which are an easy walk to the main conference site. Dorm reservations must be made by the early registration deadline of **21 June 1996**. Both dorms include daily maid service (linens provided first day for the week and daily fresh towels and beds made), and are fully air-conditioned. The **Stonier Hall** dorms (#56 on map) have suites with one shared bedroom and one shared bathroom. Only a block away, the **Hardenbergh Hall** dorms (#49) have single rooms with baths shared on each floor. If you elect Stonier Hall and do not specify a roommate, a roommate of the same sex may be assigned to your suite.

Please specify your dorm preference on your registration form; we will assign space accordingly on a first come, first served basis as long as rooms are available. Unfortunately, because there are only a finite number of rooms within each dormitory, we can neither guarantee your choice of dormitory nor your preference of dates. Check-in will take place at each dormitory. Check-in hours will be 14:00-22:00 on 26 July and 16:00-22:00 on 29-30 July.

Note that the accomodations include breakfasts and some dinners (on those nights that do not have banquets). Sorry, but we cannot give rates on rooms without meals, or on rooms on different dates other than those listed below.

All fees are in U.S. Currency. *Please circle the applicable fee. Payment due with registration.* Please include this form with your payment.

First night	Checking out	Total nights	Meals included	Fee
July 26	July 30	4	4 breakfasts, 3 dinners	$160
July 26	July 31	5	5 breakfasts, 4 dinners	$200
July 29	August 3	5	5 breakfasts, 3 dinners	$200
July 30	August 3	4	4 breakfasts, 2 dinners	$160
July 26	August 3	8	8 breakfasts, 5 dinners	$320

Preferred Dormitory (circle one): **Stonier** **Hardenbergh**

Preferred Roommate (if Stonier Hall is preferred): ______________________

Actual Arrival Date ______________________

Actual Departure Date ______________________

Hotel Information

We have established the group rate of $89/night for one single, double, triple, or quadruple room at the **Hyatt Regency Hotel** (about eight blocks from the conference site). This rate is only guaranteed through **28 June 1996**, and, due to limited availability, it is strongly recommended that you make reservations as soon as possible. To reserve a room, please contact the Hyatt directly at

Hyatt Regency Hotel
2 Albany Street
New Brunswick, NJ 08901 USA
Phone: (908) 873-1234 or (800) 233-1234
Fax: (908) 873-1382

Reservations must be guaranteed by either a check, money order, or credit card. Please be sure to reference FLoC 1996. Parking is available at the hotel for a discounted $2/night.

13th International Conference on Automated Deduction (CADE)

The 1996 International Conference on Automated Deduction (CADE-13) is the 13th conference in this series. CADE is the major forum for the presentation of new research results in all aspects of automated deduction and includes descriptions of working reasoning systems and problem sets that provide innovative, challenging tests for automated reasoning systems.

The contributed presentations at CADE-13 include 46 refereed papers and 15 refereed systems abstracts to be given in two parallel sessions. Demonstrations of these systems will be held during CADE as is now traditional. CADE-13 will also feature two plenary addresses from Dana Scott and Harald Ganzinger, a plenary address with CAV from John Rushby and a panel on the future of automated deduction being organised by Don Loveland and Deepak Kapur. One highlight of the conference is likely to be the Theorem Proving Competition being organised by Geoff Sutcliffe and Christian Suttner. The proceedings of CADE will be published by Springer-Verlag.

Program Chairs: Michael McRobbie, John Slaney (Australian National University)

Local Arrangements Chair: Amy Felty (Bell Laboratories)

Program Committee: O. Astrachan (Duke), J. Avenhaus (Kaiserslautern), L. Bachmair (Stony Brook), D. Basin (Max-Planck), W. Bibel (Darmstadt), B. Buchberger (Linz), F. Bry (Munich), R. Caferra (Grenoble), K. S. Choi (KAIST), A. Cohn (Leeds), L. Farinas del Cerro (Toulouse), W. Farmer (MITRE), A. Felty (Bell Laboratories), M. Fitting (CUNY), M. Fujita (MRI), S. Garland (MIT), F. Giunchiglia (IRST), E. Gunter (Bell Laboratories), R. Hasegawa (Kyushu), L. Henschen (North Western), L. Hines (Texas), S. Hölldobler (Dresden), M. Kaufmann (Motorola), A. Leitsch (Vienna), E. Lusk (Argonne), U. Martin (St. Andrews), D. McAllester (AT&T Research), W. McCune (Argonne), H.-J. Ohlbach (Max-Planck), J. Posegga (Karlsruhe), W. Pase (ORA Canada), F. Pfenning (Carnegie Mellon), F. Pirri (Rome), D. Plaisted (North Carolina), U. Reddy (Illinois), M. Rusinowitch (INRIA), K. Satoh (Hokkaido), J. Schumann (Munich), C. Schwind (Marseille), N. Shankar (SRI), J. Siekmann (Saarbrücken), A. Smaill (Edinburgh), G. Smolka (Saarbrücken), M. Stickel (SRI), G. Sutcliffe (James Cook), E. Tiden (Siemens), A. Voronkov (Uppsala), L. Wallen (Oxford), D. Wang (Grenoble), H. Zhang (Iowa).

Email: `cade13@cisr.anu.edu.au` (general), `cade13-la@cisr.anu.edu.au` (local arrangements)

CADE Workshop Program

The Workshop Program consists of six workshops and one tutorial. These workshops are open to everyone. If you wish to attend a workshop you must first contact the Workshop Organizing Committee.

The registration fee for a workshop is $50.00 for registration by 21 June, 1996. The registration fee for registration after this date is $80.00.

Workshops will only be held if there are a minimum of 10 registrants by 21 June, 1996.

Tuesday, 30 July 1996

9:00–17:00 *Workshop* WP-1

Term Schematizations and Their Applications

A common phenomenon throughout all areas dealing with first order terms (particularly in automated deduction) are infinite sequences of structurally similar terms. One characteristic of computer science is its emphasis on finite structures. Consequently, various formalisms and methods have been proposed to capture these sequences by finite means, among them schematizations of terms.

A schematization is a finite expression together with a mechanism for effectively generating the elements of the set. In addition, it should be possible to compute the unifying intersection of infinite term sets by manipulating their finite schematizations.

The aim of the workshop is to bring together researchers working on schematizations and to discuss the different approaches as well as their applications in clausal theorem proving, term rewriting, unification theory, finite model building, and other areas.

Workshop Program Committee

Members: Miki Hermann (*CRIN-CNRS Nancy & INRIA Lorraine, France*)
Gernot Salzer (*Technische Universität Wien, Austria*)
email: `schema@logic.tuwien.ac.at`

For further informations see:
`http://logic.tuwien.ac.at/cade13/schematizations.html`

9:00–17:00 *Workshop* WP-2

Visual Reasoning

The idea behind the workshop is to help make automated reasoning more widely accepted and applicable. Visualization can help achieve this. To obtain the best results researchers in the field of automated reasoning should actively participate in the development of the required tools and techniques. The workshop will be a forum to bring together the scattered attempts that have been pursued along these lines in a number of locations. The application of visualization in the context of formal reasoning certainly covers a broader audience, so we encourage participants to also enroll in other parts of the Federated Logic Conference.

The workshop addresses all issues involved with applying visiualization in the context of formal reasoning, specification, or verification. Such topics include, but are not limited to:

- Visualization of logical inferences
- Visual presentations of proofs
- State-charts and event-trace-diagrams
- Reasoning with diagrams
- Visualization of specifications
- Graphical approaches to deriving specifications
- Visual logic programming languages
- Animation of transition systems

Workshop Program Committee

Members:
Gerard Allwein (*Indiana University, USA*)
email: `gtall@phil.indiana.edu`
Joachim Posegga (*Deutsche Telekom Research, Germany*)
email: `Posegga@FZ.Telekom.DE`
Peter H. Schmitt (*University of Karlsruhe, Germany*)
email: `PSchmitt@ira.uka.de`

For further information see:
`http://i12www.ira.uka.de/cade-vr`

9:00–17:00 *Workshop* WP-3

Automation of Proofs by Mathematical Induction

The workshop will cover research on mathematical induction and its applications within formal methods. It will consist of debates on several `hot topics'. Speakers will be chosen who represent different viewpoints on these topics. After they have introduced the arguments, the debate will be thrown open for general discussion. The exact list of topics is still to be determined, but might include:

- The extension of formalisms for inductive inference
- Inductive completion vs. explicit induction
- Applications to formal methods, computer aided verification and issues arising from these applications
- Heuristics for controlling inductive inference
- Type inference and inductive proofs

Workshop Program Committee

Members:
Dieter Hutter (*DFKI, Germany*)
email: `hutter@dfki.uni-sb.de`
David McAllester (*AT&T Research, USA*)
email: `dmac@research.att.com`
Christoph Walther (*Technische Hochschule Darmstadt, Germany*)
email: `walther@inferenzsysteme.informatik.th-darmstadt.de`

For further information see:
`http://www.dfki.uni-sb.de/vse/cade-13/`

Empirical Studies in Logic Algorithms

Implementation and experimentation are vital tasks in automated theorem proving research. Heuristics, strategies, and even proof procedures have to show their advantages in implementations and, if appropriate, in comparison to other systems. On the other hand experimental results have influence on theoretical studies, e.g. heuristics for Davis-Putnam algorithms, resolution strategies, or indexing techniques.

This workshop should give helpful hints and tips to such major tasks as:

- theoretical issues: questions that experiments help to answer; effects on research
- implementational issues: minimizing implementation time; bases for implementation (languages, libraries, systems); crucial aspects
- experimentational issues: appropriate formula sets; organizing tests; presenting results; comparison of approaches (measures, environments, ...)

Workshop Program Committee

Members: Ulf Dunker (*University of Paderborn, Germany*)
email: `dunker@uni-paderborn.de`
Hans Kleine Büning (*University of Paderborn, Germany*)
email: `kbcsl@uni-paderborn.de`
Theo Lettman (*University of Paderborn, Germany*)
email: `lettmann@uni.paderborn.de`

For further information see:

`http://www.uni-paderborn.de/`
`fachbereich/AG/agklbue/staff/lettmann/cade-wp4.html`

Mechanization of Partial Functions

Many practical applications of deduction systems in mathematics and computer science rely on the correct and efficient treatment of partial functions. There is a rich variety of approaches for dealing with partial functions and the undefined expressions that often result from their application. Ranging from workarounds for concrete situations to proper general treatments, these approaches have their own advantages and disadvantages. For example, some can be used in standard logical formalisms, while others require new formalisms. The purpose of the workshop is to discuss the different approaches and to compare their advantages and disadvantages.

Workshop Program Committee

Members: William Farmer (*MITRE Corporation, USA*)
email: `farmer@mitre.org`
Manfred Kerber (*University of Birmingham, UK*)
email: `M.Kerber@cs.bham.ac.uk`
Michael Kohlhase (*University of the Saarlandes, Germany*)
email: `kohlhase@cs.uni-sb.de`

For further information see:

Proof Search in Type-Theoretic Languages

Much recent work has been devoted to type theory and its applications to proof and program development in various logical frameworks. This workshop focuses on proof search in type-theoretic languages. Such languages are logical frameworks, issued from classical, intuitionistic or linear logics, for representing proofs and in some cases formalizing connections between proofs and programs.

The purpose of this workshop is to discuss recent results in the area and to bring together researchers interested in all aspects of proof search in type-theoretic languages and their underlying logics, including, but not limited to, the following topics: foundations of proof search, techniques and concepts related to proof construction, logic programming, proof synthesis vs program synthesis, applications, equational theories and rewriting, decision procedures, environments for formal proof development.

Workshop Program Committee

Members:

D. Galmiche (*CRIN-CNRS Nancy, France*)
email: Didier.Galmiche@loria.fr
F. Pfenning (*Carnegie Mellon University, USA*)
N. Shankar (*SRI, USA*)
J. Smith (*Chalmers Univ Göteborg, Sweden*)
L. Wallen (*Oxford University, UK*)

For further information see:

http://www.loria.fr/~galmiche/cade96-wp6.html

Equality Reasoning in Semantic Tableaux and Other Sequent-Based Calculi

by
Anatoli Degtyarev (Uppsala University, Sweden)
Andrei Voronkov (Uppsala University, Sweden)
email: `voronkov@csd.uu.se`

The treatment of equality in sequent-based machine-oriented calculi has a long history started by Kanger in 1957. The theoretical basis for handling equality in sequent-based calculi has been developed by Swedish logicians in the 1950s (Kanger and Prawitz) and by Soviet logicians in the 1960s (Orevkov, Maslov et.al.).

The next generation of work in this area is based on rigid unification (Gallier et.al.) formulated in 1987. Recently, this area witnessed rapid development of new results and techniques (Degtyarev and Voronkov, Matiyasevich, Voda and Komara, Plaisted), including new results on rigid unification, the equality elimination method, rigid superposition and rigid paramodulation.

The techniques of equality reasoning presented in the tutorial are applicable to all known sequent-based methods of automated deduction, including the tableau method, the connection method, model elimination and the inverse method. We shall illustrate main results and ideas on the tableau method and on the inverse method (as a typical non-local top-down and a typical local bottom-up search method in sequent calculi).

CADE Conference Program

Tuesday, 30 July 1996

17:30–19:30 *Reception*

20:00–21:30 *FLoC Plenary Session* Chair: **M.Y. Vardi**

Calculi for Interactions. R. Milner (Cambridge University, United Kingdom)

Wednesday, 31 July 1996

9:00–10:15 *Invited Lecture* Chair: **J. Slaney**

Saturation-based Theorem Proving: Past Successes and Future Potential by Harald Ganzinger (MPI Saarbrücken, Germany)

Abstract: Saturation means to compute the closure of a given set of formulas under a given set of inference rules. Resolution, Knuth/Bendix completion, and Superposition are major examples of saturation-based, automated theorem proving methods. More recently, considerable progress has made in this area. New theoretical insight has been gained. In particular the nature of redundancy and of mechanisms for avoiding redundancy is now better understood. This has many applications, both in theory and in practice. New provers based on these ideas are emerging and seem to perform well, outperforming existing automated provers in many respects. The talk surveys some of the theoretical results, describes experience gained from experimentation, and outlines problems and potential for future research.

10:15–10:45 *Coffee Break*

10:45–12:15 *Parallel Session 1A* Chair: **J. Avenhaus**

A resolution theorem prover for intuitionistic logic. T. Tammet (University of Goteborg, Sweden)

Proof-terms for classical and intuitionistic resolution. D. Pym (University of London, UK), E. Ritter (Oxford University, UK), and L. Wallen (Oxford University, UK)

On the proof-search in intuitionistic logic with equality, or back to simultaneous Rigid E-Unification. A. Voronkov (Uppsala University, Sweden)

10:45–12:15 *Parallel Session 1B* Chair: **D. Basin**

Extensions to a generalization critic for inductive proof. A. Ireland (Heriot-Watt University, Scotland) and A. Bundy (University of Edinburgh, Scotland)

Learning domain knowledge to improve theorem proving. J. Denzinger (University of Kaiserslautern, Germany) and S. Schulz (TU München, Germany)

Patching faulty conjectures. M. Protzen (Technische Hochschule Darmstadt, Germany)

12:15–14:00	*Lunch Break*	

14:00–15:30	*Parallel Session 2A*	Chair: **D. McAllester**

Internal analogy in theorem proving. Erica Melis (University of the Saarlandes, Germany) and Jon Whittle (University of Edinburgh, UK)

Termination of theorem proving by reuse. T. Kolbe (Technische Hochschule Darmstadt, Germany) and C. Walther (Technische Hochschule Darmstadt, Germany)

Termination of algorithms over non-freely generated data types. C. Sengler (DFKI, Germany)

14:00–15:30	*Parallel Session 2B*	Chair: **W. Farmer**

ABSFOL: A proof checker by abstraction. F. Giunchiglia (IRST, Italy) and A. Villafiorita (Stanford University, USA)

SPASS & FLOTTER. C. Weidenbach (MPI Saarbrücken, Germany), B. Gaede (MPI Saarbrücken, Germany), and G. Rock (MPI Saarbrücken, Germany)

The design of the CADE-13 ATP system competition. C. Suttner (TU München, Germany) and G. Sutcliffe (James Cook University, Australia)

SCAN - Elimination of predicate quantifiers system description. H.J. Ohlbach (MPI Saarbrücken, Germany)

GEOTHER: A geometry theorem prover. Dongming Wang (LIFIA Institut Imag, France)

15:30–16:00	*Coffee Break*	

16:00–17:30	*Parallel Session 3A*	Chair: **U. Martin**

Structuring metatheory on inductive definitions. D. Basin (MPI Saarbrücken, Germany) and S. Matthews (MPI Saarbrücken, Germany)

An embedding of Ruby in Isabelle. O. Rasmussen (Technical University of Denmark, Denmark)

Mechanical verification of mutually recursive procedures. P. Homeier (UCLA, USA) and D. Martin (UCLA, USA)

16:00–17:30	*Parallel Session 3B*	Chair: **G. Sutcliffe**

FasTraC - A decentralized traffic control system based on logic programming. G. Felici (University of Texas, USA), G. Rinaldi (CNR-IASI, Italy), and K. Truemper (University of Texas, USA)

Presenting machine-found proofs. X. Huang (University of the Saarlandes, Germany) and A. Fiedler (University of the Saarlandes, Germany)

MUltlog 1.0: Towards an expert system for many-valued logics. G. Salzer (TU Wien, Austria)

CtCoq: a system presentation. J. Bertot (INRIA Sophia-Antipolis, France) and Y. Bertot (INRIA Sophia-Antipolis, France)

An introduction to geometry expert. Shang-Ching Chou (Wichita State University, USA), Xiao-Shan Gao (Wichita State University, USA), and Jing-Zhong Zhang (Wichita State University, USA)

SiCoTHEO: Simple Competitive Parallel Theorem Provers. J. Schumann (Techniche University of München, Germany)

Thursday, 1 August 1996

9:00–10:15 *Invited Lecture* Chair: **M. McRobbie**

What Can We Hope to Achieve From Automated Deduction? by Dana S. Scott (Carnegie Mellon University, USA)

Abstract: We have been fortunate that the capacity and speed of computers has increased so quickly over the last decade. Many research groups around the world have been able to make new, stronger implementations and to solve new problems. Many limitations still exist, however, and as a field we must decide on the designs and objectives for the next period of work. Should we give more attention to user interfaces? Should we make better connections to computer algebra? Should we make strong efforts to construct large-scale knowledge bases? Should we investigate non-standard or non-classical logics? Should we be concerned with pedagogical applications? Where should we look for other applications? All of these questions – and others – need to be answered, and a survey of possibilities will be presented.

10:15–10:45 *Coffee Break*

10:45–12:15 *Parallel Session 4A* Chair: **M. Rusinowitch**

Unification algorithms cannot be combined in polynomial time. M. Hermann (CRIN (CNRS), France) and P.G. Kolaitis (UC Santa Cruz, USA)

Unification and matching modulo nilpotence. Q. Guo (SUNY Albany, USA), P. Narandran (SUNY Albany, USA), and D. Wolfram (ANU, Australia)

An improved lower bound for the elementary theories of trees. S. Vorobyov (MPI Saarbrücken, Germany)

10:45–12:15 *Parallel Session 4B* Chair: **F. Giunchiglia**

INKA: The next generation. D. Hutter (DFKI, Germany) and C. Sengler (DFKI, Germany)

XRay: A prolog technology default theorem prover. T. Schaub (Université d' Angers, France), S. Bruning (ZB Informationssysteme, Germany), T. Linke (University of Bremen, Germany), and P. Nicolas (Université d' Angers, France)

IMPS: An Updated System Description. W. Farmer (The Mitre Corporation, USA), J. Guttman (The Mitre Corporation, USA), and J. Thayer (The Mitre Corporation, USA)

The tableau-based theorem prover 3 TAP, version 4.0. B. Beckert (University of Karlsruhe, Germany), R. Hahnle (University of Karlsruhe, Germany), P. Oel (University of Karlsruhe, Germany), and M. Sulzmann (University of Karlsruhe, Germany)

Generating models by SEM. J. Zhang (University of Iowa, USA) and H. Zhang (University of Iowa, USA)

12:15–14:00 *Lunch Break*

14:00–15:30 *Parallel Session 5A* Chair: **A. Felty**

Optimizing proof search in model elimination. J. Harrison (Åbo Akademi University, Finland)

An abstract machine for fixed-order dynamically stratified programs. K. Sagonas (SUNY Stony Brook, USA), T. Swift (SUNY Stony Brook, USA), and D. Warren (SUNY Stony Brook, USA)

Unification in pseudo-linear sort theories is decidable. C. Weidenbach (MPI Saarbrücken, Germany)

14:00–15:30	*Parallel Session 5B*	Chair: **S. Garland**

Theorem proving with group presentations: Examples and questions. U. Martin (University of St. Andrews, Scotland)

Transforming termination by self-labelling. A. Middledorp (University of Tsukuba, Japan), H. Ohsaki (University of Tsukuba, Japan), and H. Zantema (Utrecht University, Netherlands)

Theorem proving in cancellative abelian monoids (extended abstract). H. Ganzinger (MPI Saarbrücken, Germany) and U. Waldmann (MPI Saarbrücken, Germany)

15:30–16:00	*Coffee Break*

16:00–17:30	*Parallel Session 6A*	Chair: **J. Schumann**

On the practical value of different definitional translations to normal form. U. Egly (TU Wien, Austria) and T. Rath (Technische Hochschule Darmstadt, Germany)

On converting non-classical matrix proofs into sequent-style systems. C. Kreitz (Technische Hochschule Darmstadt, Germany) and S. Schmitt (Technische Hochschule Darmstadt, Germany)

Efficient model generation through compilation. H. Schuetz (Ludwig-Maximilians University of München, Germany) and T. Geisler (Ludwig-Maximilians University of München, Germany)

16:00–17:30	*Parallel Session 6B*	Chair: **D. Wang**

Algebra and automated deduction. S. Linton (University of St. Andrews, Scotland), U. Martin (University of St. Andrews, Scotland), P. Prohle (University of St. Andrews, Scotland), and D. Shand (University of St. Andrews, Scotland)

On Shostak's decision procedure for combinations of theories. N. Shankar (SRI International, USA), D. Cyrluk (SRI International, USA), and P. Lincoln (SRI International, USA)

Ground resolution with group computations on semantic symmetries. T. Boy de la Tour (LIFIA-IMAG, France)

18:30–23:00	*Joint Banquet with CAV*

Dinner speech by Amir Pnueli (Weizmann Institute, Israel), “The Potential and Sensible Scopes of Formal Methods.”

Friday, 2 August 1996

9:00–10:15	*Plenary Session with CAV*	Chair: **M.Y. Vardi**

Automated Deduction and Formal Methods. J. Rushby (SRI International, USA)

10:15–10:45 *Coffee Break*

10:45–12:15 *Parallel Session 7A* Chair: **D. Plaisted**

A new method for logical compilation: the achievement by cycle search. Olivier Roussel (LIFL CNRS, France) and Philippe Mathieu (LIFL CNRS, France)

Rewrite semantics for production rule systems: theory and applications. W. Snyder (Boston University, USA) and J.G. Schomolze (Tufts University, USA)

Experiments in the heuristic use of past proof experience. Matthias Fuchs (University of Kaiserslautern, Germany)

10:45–12:15 *Parallel Session 7B* Chair: **U. Reddy**

Lemma Discovery in automating induction. D. Kapur (SUNY Albany, USA) and M. Subramaniam (SUNY Albany, USA)

Advanced indexing operations on substitution trees. P. Graf (MPI Saarbrücken, Germany) and C. Meyer (MPI Saarbrücken, Germany)

Semantic trees revisted - some new completeness results. C.G. Fermuller (Stanford University, USA)

12:15–13:30 *Lunch Break*

13:30– *Excursion*

Saturday, 3 August 1996

9:00–10:15 *Panel* Chair: **Don Loveland & Deepak Kapur**

Does Automated Deduction have a Future?

Abstract: Does the field of automated deduction have to sharply shift its research focus to keep its credibility (and its funding)? A panel will explore the nature and goals of automated deduction, its present and future applications, and linkages with other fields. It will attempt to identify areas where automated deduction can be expected to make significant contributions and problems that must be surmounted in order to do so. It will kick-off with a summary of the discussion of an NSF-sponsored workshop on the future directions of automated deduction held in April in Chicago. Panelists would include members of the workshop steering committee as well as other researchers. The panel presentation will be short enough to leave most of the time for discussion with audience participation.

10:15–10:45 *Coffee Break*

10:45–12:15 *Parallel Session 8A* Chair: **L. Farinas del Cerro**

Building decision procedures for modal logics from propositional decision procedures - the case study of modal K.* F. Giunchiglia (IRST, Italy) and R. Sebastiani (University of Genoa, Italy)

Resolution-based calculi for modal and temporal logics. A. Nonnengart (MPI Saarbrücken, Germany)

Tableaux and algorithms for propositional dynamic logic with converse. G. De Giacomo (Universta di Roma, Italy) and F. Massacci (Universta di Roma, Italy)

10:45–12:15	*Parallel Session 8B*	Chair: **L. Wallen**

Reflection of formal tactics in a deductive reflection framework. H. Ruess (University of Ulm, Germany)

Walther Recursion. D. McAllester (AT&T Research, USA) and K. Arkoudas (MIT, USA)

Proof search with set variable instantiation in the calculus of constructions. A. Felty (Bell Laboratories, USA)

12:15–14:00	*Lunch Break*

14:00–15:30	*Parallel Session 9A*	Chair: **A. Voronkov**

Search strategies for resolution in temporal logic. C. Dixon (Manchester Metropolitan University, UK)

Optimal axiomatizations for multiple-valued operations and quantifiers based on semi-lattices. G. Salzer (TU Wien, Austria)

Grammar Specification in Categorical Logics and Theorem Proving. S. Luz-Filho (Edinburgh University, Scotland)

14:00–15:30	*Parallel Session 9B*	Chair: **E. Gunter**

Path Indexing for AC-Theories. P. Graf (MPI Saarbrücken, Germany)

More Church-Rosser Proofs (in Isabelle/HOL). T. Nipkow (TU München, Germany)

Partitioning methods for satisfiability testing on large formulas. Tai Joon Park (UC Santa Cruz, USA) and A. van Gelder (UC Santa Cruz, USA)

15:30–16:00	*Coffee Break*

16:00–17:30	*Business Meeting*

End of the Conference

CADE Automated Theorem Proving Competition

Thursday, 1 August 1996

In order to stimulate ATP system development and to expose ATP systems to interested researchers, an ATP competition will be held at CADE-13. The competition will evaluate the performance of sound fully automatic ATP systems, on first-order CNF theorems chosen from the TPTP Problem Library. The evaluation will be in terms of the number of theorems proved, and the time taken; in the context of a specified time limit for each proof attempt, and a bounded number of eligible TPTP theorems. An overview of the competition and the rules is available on the WWW:

```
http://wwwjessen.informatik.tu-muenchen.de/
          ~suttner/Competition.html
```

and full details are given in the competition technical report, accessible through the WWW page. Enquiries can be sent to the competition organizers.

ARPA-owned and maintained machines will be provided for the competition by the Center for Computer Aids for Industrial Productivity, Rutgers University.

Competition Organizing Committee

Members:

Christian Suttner (*TU München, Germany*)
email: `suttner@informatik.tu-muenchen.de`
Geoff Sutcliffe (*James Cook University, Australia*)
email: `geoff@cs.jcu.edu.au`

The competition schedule is below. A continuous overview of current results will be displayed while the competition is in progress. System demonstrations will also be possible while the competition is in progress.

10:30	*Meeting of Competitors*
10:45–12:15	*Competition in Progress*
12:15–14:00	*Lunch Break*
14:00–17:00	*Competition in Progress*
17:45	*Announcement of Competition Results by Competition Panel*

8th International Conference on Computer-Aided Verification (CAV)

Computer-Aided Verification (CAV) '96 is the eighth annual conference in a series dedicated to the advancement of the theory and practice of computer-assisted formal analysis methods for software and hardware systems. The conference covers the spectrum from theoretical results to concrete applications, with an emphasis on verification tools and the algorithms and techniques that are needed for their implementation.

The contributed presentations at CAV '96 include 32 regular papers and 20 short presentations on tools and case studies. The program also includes invited lectures by Michael Rabin and Bill Roscoe, FLoC plenary addresses by Robin Milner and John Rushby, an after-dinner speech by Amir Pnueli, and a morning session with six invited talks by representatives from industry.

Student registration at CAV '96 is subsidized due to financial support from Cadence Berkeley Labs, Lucent Technologies, and Siemens Corporate Research and Development. The proceedings of CAV '96 are published by Springer-Verlag.

Program Chairs: R. Alur, T.A. Henzinger.

Program Committee: R.K. Brayton, K. Cerāns, D.L. Dill, E.A. Emerson, O. Grumberg, K.G. Larsen, D.E. Long, K.L. McMillan, A.K. Mok, D. Peled, A. Pnueli, C.-J.H. Seger, J. Sifakis, S.A. Smolka, M.K. Srivas, W. Thomas, F. Vaandrager, M.Y. Vardi, and P. Wolper.

Steering Committee: E.M. Clarke, R.P. Kurshan, A. Pnueli, J. Sifakis.

Email: `cav96@research.att.com`

Conference Program

Tuesday, 30 July 1996

18:00–19:00 *Registration*

20:00–21:30 *FLoC Plenary Session* Chair: **M.Y. Vardi**

Calculi for Interactions. R. Milner (Cambridge University, United Kingdom)

Wednesday, 31 July 1996

9:00–9:50 *Industrial Session I* Chair: **R.K. Brayton**

Formal methods in the IC industry: trends and directions. J. Harlow and P. Verhofstadt (Semiconductor Research Corporation, USA)

From wired homes to automated highways: a perspective on verification in the 21st century. P. Scaglia (Cadence Berkeley Labs, USA)

9:50–10:15 *Coffee Break*

10:15–11:05 *Industrial Session II* Chair: **D.L. Dill**

Formal verification at Siemens: achievements, problems, trends. W. Büttner (Siemens Corporate Research and Development, Germany)

User experiences with FormalCheck. G. de Palma (Lucent Technologies, USA)

11:05–11:30 *Coffee Break*

11:30–12:20 *Industrial Session III* Chair: **C.-J.H. Seger**

Formal and informal functional verification in a commercial environment. C. Pixley (Motorola, USA)

Model checking at work. S. Ben-David (IBM Haifa Research Laboratory, Israel)

12:20–14:00 *Lunch Break*

14:00–15:15 *Session 1A* Chair: **D.E. Long**

Symbolic verification of communication protocols with infinite state spaces using QDDs. B. Boigelot (Université de Liege, Belgium) and P. Godefroid (Bell Laboratories, USA)

A conjunctively decomposed boolean representation for symbolic model checking. K.L. McMillan (Cadence Berkeley Labs, USA)

Symbolic model checking using algebraic geometry. G.S. Avrunin (University of Massachusetts at Amherst, USA)

15:15–15:45 *Session 1B* Chair: **D.E. Long**

The state of SPIN. G.J. Holzmann and D. Peled (Bell Laboratories, USA)

The Murϕ verification system. D.L. Dill, A.J. Hu, C.H. Yang, A. Drexler, R. Melton, S. Park, C.N. Ip, and U. Stern (Stanford University, USA)

15:45–16:10 *Coffee Break*

16:10–17:00 *Session 2A* Chair: **K.G. Larsen**

A partition refinement algorithm for the π-calculus. M. Pistore (University of Pisa, Italy) and D. Sangiorgi (INRIA Sophia-Antipolis, France)

Polynomial-time algorithms for testing probabilistic bisimulation and simulation. C. Baier (Universität Mannheim, Germany)

17:00–18:00 *Session 2B* Chair: **K.G. Larsen**

The NCSU Concurrency Workbench. R. Cleaveland and S.T. Sims (North Carolina State University, USA)

The Concurrency Factory: an integrated environment for specification, simulation, verification, and implementation of real-time concurrent systems. R. Cleaveland (North Carolina State University, USA) and P.M. Lewis, S.A. Smolka, and O. Sokolsky (SUNY at Stony Brook, USA)

XVERSA: an integrated graphical and textual toolset for the specification and analysis of resource-bound real-time systems. D. Clarke, H. Ben-Abdallah, I. Lee, and H. Xie (University of Pennsylvania, USA) and O. Sokolsky (Computer Command and Control Company, USA)

EVP: integration of FDTs for analysis and verification of communication protocols. P.M. Gómez and J.M.T. Linero (Universidad de Málaga, Spain)

20:00–22:00	*Reception and Business Meeting*	

Thursday, 1 August 1996

9:00–10:15	*Invited Lecture*	Chair: **A. Pnueli**

Randomization and protocol verification. M.O. Rabin (Harvard University, USA, and Hebrew University, Israel)

10:15–10:40	*Coffee Break*	

10:40–12:20	*Session 3*	Chair: **W. Thomas**

Pushdown processes: games and model checking. I. Walukiewicz (Aarhus University, Denmark)

Module checking. O. Kupferman (Bell Laboratories, USA) and M.Y. Vardi (Rice University, USA)

Automatic verification of parameterized synchronous systems. E.A. Emerson and K.S. Namjoshi (The University of Texas at Austin, USA)

HORNSAT, model checking, verification, and games. S.K. Shukla, H.B. Hunt III, and D.J. Rosenkrantz (SUNY at Albany, USA)

12:20–14:00	*Lunch Break*	

14:00–15:15	*Session 4A*	Chair: **K.L. McMillan**

Verifying the SRT division algorithm using theorem proving techniques. E.M. Clarke (Carnegie Mellon University, USA), S.M. German (IBM T.J. Watson Research Center, USA), and X. Zhao (Carnegie Mellon University, USA)

Modular verification of SRT division. H. Rueß, M.K. Srivas, and N. Shankar (SRI International, USA)

Mechanically verifying a family of multiplier circuits. D. Kapur and M. Subramaniam (SUNY at Albany, USA)

15:15–15:45	*Session 4B*	Chair: **K.L. McMillan**

PVS: combining specification, proof checking, and model checking. S. Owre, S. Rajan, J.M. Rushby, N. Shankar, and M.K. Srivas (SRI International, USA)

STeP: deductive-algorithmic verification of reactive and real-time systems. N. Bjørner, A. Browne, E. Chang, M. Colón, A. Kapur, Z. Manna, H.B. Sipma, and T.E. Uribe (Stanford University, USA)

15:45–16:10 *Coffee Break*

16:10–17:00 *Session 5A* Chair: **M.K. Srivas**

Verifying systems with replicated components in Murϕ. C.N. Ip and D.L. Dill (Stanford University, USA)

Verification of arithmetic circuits by comparing two similar circuits. M. Fujita (Fujitsu Laboratories, USA)

17:00–18:00 *Session 5B* Chair: **M.K. Srivas**

Symbolic model checking. E.M. Clarke (Carnegie Mellon University, USA), K.L. McMillan (Cadence Berkeley Labs, USA), and S. Campos and V. Hartonas-Garmhausen (Carnegie Mellon University, USA)

COSPAN. R.H. Hardin (Bell Laboratories, USA), Z. Har'El (The Technion, Israel), and R.P. Kurshan (Bell Laboratories, USA)

VIS: a system for verification and synthesis. R.K. Brayton, A. Sangiovanni-Vincentelli, A. Aziz, S.-T. Cheng, S. Edwards, S. Khatri, Y. Kukimoto, S. Qadeer, R.K. Ranjan, T.R. Shiple, G. Swamy, and T. Villa (University of California at Berkeley, USA), G.D. Hachtel, F. Somenzi, and A. Pardo (University of Colorado at Boulder, USA), and S. Sarwary (Lattice Semiconductor, USA)

MDG tools for the verification of RTL designs. Z. Zhou and X. Song (Université de Montréal, Canada), F. Corella (Hewlett-Packard, USA), M. Langevin (GMD, Germany), and E. Cerny and S. Tahar (Université de Montréal, Canada)

18:30–23:00 *Joint Banquet with CADE*

Dinner speech by Amir Pnueli (Weizmann Institute, Israel), "The Potential and Sensible Scopes of Formal Methods."

Friday, 2 August 1996

9:00–10:15 *Plenary Session with CADE* Chair: **M.Y. Vardi**

Automated Deduction and Formal Methods. J. Rushby (SRI International, USA)

10:15–10:40 *Coffee Break*

10:40–12:20 *Session 6* Chair: **E.A. Emerson**

A platform for combining deductive with algorithmic verification. A. Pnueli and E. Shahar (Weizmann Institute, Israel)

Verifying invariants using theorem proving. S. Graf and H. Saïdi (VERIMAG, France)

Deductive model checking. H.B. Sipma, T.E. Uribe, and Z. Manna (Stanford University, USA)

Automated verification by induction with associative-commutative operators. N. Berregeb, A. Bouhoula, and M. Rusinowitch (INRIA Lorraine, France)

12:20–14:00	*Lunch Break*	

14:00–15:15	*Session 7A*	Chair: **S.A. Smolka**

Analysis of timed systems based on time-abstracting bisimulations. S. Tripakis and S. Yovine (VERIMAG, France)

Verification of an audio protocol with bus collision using UPPAAL. J. Bengtsson (Uppsala University, Sweden), D. Griffioen (CWI, The Netherlands), K. Kristoffersen and K.G. Larsen (Aalborg University, Denmark), and F. Larsson, P. Pettersson, and W. Yi (Uppsala University, Sweden)

Selective quantitative analysis and interval model checking: verifying different facets of a system. S. Campos and E.M. Clarke (Carnegie Mellon University, USA) and O. Grumberg (The Technion, Israel)

15:15–15:45	*Session 7B*	Chair: **S.A. Smolka**

CADP (CÆSAR/ALDÉBARAN Distribution Package): a protocol validation and verification toolbox. J.-C. Fernandez, H. Garavel, A. Kerbrat, R. Mateescu, L. Mounier, and M. Sighireanu (INRIA/VERIMAG, France)

The FC2Tools set. A. Bouali, A. Ressouche, V. Roy, and R. de Simone (INRIA Sophia-Antipolis, France)

15:45–16:10	*Coffee Break*	

16:10–17:00	*Session 8A*	Chair: **F. Vaandrager**

Verifying continuous-time Markov chains. A. Aziz (The University of Texas at Austin, USA), K. Sanwal (Bell Laboratories, USA), V. Singhal (Cadence Berkeley Labs, USA), and R.K. Brayton (University of California at Berkeley, USA)

Verifying safety properties of differential equations. M.R. Greenstreet (University of British Columbia, Canada)

17:00–18:00	*Session 8B*	Chair: **F. Vaandrager**

The real-time graphical interval logic toolset. L.E. Moser, P.M. Melliar-Smith, Y.S. Ramakrishna, G. Kutty, and L.K. Dillon (University of California at Santa Barbara, USA)

The METAFrame'95 environment. B. Steffen, T. Margaria, A. Claßen, and V. Braun (Universität Passau, Germany)

Verification support environment. F. Koob, M. Ullmann, and S. Wittmann (Bundesamt für Sicherheit in der Informationstechnik, Germany)

Marrella: a tool for simulation and verification. D. Ambroise (Université de Caen, France) and B. Rozoy (Université de Paris XI, France)

Saturday, 3 August 1996

9:00–10:15	*Invited Lecture*	Chair: **J. Sifakis**

Refinement-based model checking. A.W. Roscoe (Oxford University, United Kingdom)

10:15–10:40 *Coffee Break*

10:40–12:20 *Session 9* Chair: **P. Wolper**

Temporal verification by diagram transformations. L. de Alfaro and Z. Manna (Stanford University, USA)

Protocol verification by aggregation of distributed actions. S. Park and D.L. Dill (Stanford University, USA)

Atomicity refinement and trace reduction theorems. E.P. Gribomont (Université de Liege, Belgium)

Powerful techniques for the automatic generation of invariants. S. Bensalem (VERIMAG, France), Y. Lakhnech (Christian-Albrechts-Universität Kiel, Germany), and H. Saïdi (VERIMAG, France)

12:20–14:00 *Lunch Break*

14:00–15:15 *Session 10A* Chair: **D. Peled**

Saving space by fully exploiting invisible transitions. H. Miller and S. Katz (The Technion, Israel)

Model checking local properties of distributed systems. F. Wallner and J. Esparza (Technische Universität München, Germany)

Using on-the-fly verification techniques for the generation of conformance test suites. J.-C. Fernandez (INRIA/VERIMAG, France), C. Jard (CNRS Rennes, France), T. Jéron (INRIA/IRISA, France), and G. Viho (Université de Rennes I, France)

15:15–15:45 *Session 10B* Chair: **D. Peled**

Verifying the safety of a practical concurrent garbage collector. G. Gonthier (INRIA Rocquencourt, France)

Verification by behavior abstraction: a case study of service interaction detection in intelligent telephone networks. C. Capellmann (Deutsche Telekom, Germany) and R. Demant, R. Galvez-Estrada, F. Fatahi-Vanani, U. Nitsche, and P. Ochsenschläger (GMD, Germany)

15:45–16:10 *Coffee Break*

16:10–17:00 *Session 11* Chair: **O. Grumberg**

Automatic translation of natural-language system specifications into temporal logic. R. Nelken (Tel-Aviv University, Israel) and N. Francez (The Technion, Israel)

Verification of fair transition systems. O. Kupferman (Bell Laboratories, USA) and M.Y. Vardi (Rice University, USA)

End of the Conference

Post-FLoC Workshop

Monday, 5 August 1996

9:00–17:00 *Workshop* SPIN96

1996 SPIN Workshop
DIMACS, Rutgers Busch Campus, NJ

SPIN is a reachability analysis tool designed for the verification of distributed systems. First made available publicly in 1991, SPIN is widely used both for teaching and for industrial applications. It has inspired many other model checking tools in various ways.

The SPIN95 workshop, held on 16 October 1995 in Montreal, created a first opportunity for SPIN users to meet and exchange experiences, ideas, theories, wishes, gripes about formal verification tools.

The SPIN96 workshop will take place in New Jersey as part of the DIMACS Special Year on Logic and Algorithms, one of whose focus areas is computer-aided verification. The workshop is part of a series of workshops on formal methods and verification. See

`http://dimacs.rutgers.edu/`

for more information.

The workshop will be held at Rutgers University Busch campus on Monday, August 5, 1996. Details on transportation between the FLoC conference site and Busch campus will be provided later.

Demo sessions of extensions, restrictions, and variations of SPIN will be organized (or of any comparable tool that is suggested).

Keynote speaker: Moshe Y. Vardi, Rice University

Papers: Papers can be up to 20 pages in length and can be either a report on work in progress or a regular research paper on work that is somehow related to the SPIN system.

Demos: Tool demonstrations, of extensions, restrictions variations, or alternatives, to SPIN, are invited. Please tell us as early as possible if you plan to demonstrate software so that we can make sure we can set it up properly and make it work.

Dates: The deadline for all contributions is: Saturday, 15 June 1996. Papers can be submitted electronically, in PostScript form to any one of the organizers. We will make available a proceedings of the workshop in both printed and also, for the authors that permit us to do so, in electronic form.

Organizers: Jean-Charles Grégoire (`gregoire@inrs-telecom.uquebec.ca`)
Doron Peled (`doron@research.att.com`)
Gerard Holzmann (`gerard@research.att.com`)

More information is available at

`http://netlib.att.com/netlib/spin/news.html`

Sponsor: DIMACS, the Center for Discrete Mathematics and Theoretical Computer Science

FLoC at a Glance

		CADE	CAV	LICS	RTA
	morning				
Friday (7/26)	*afternoon*				
	evening			R	R
	morning			S, S	I/S, S
Saturday (7/27)	*afternoon*			S, S	S, S
	evening				BM
	morning			*I*, S	*I*, S/SD
Sunday (7/28)	*afternoon*			S, S	D, D
	evening			BM	
	morning			T, S	S, S
Monday (7/29)	*afternoon*			S, S	I/S, S
	evening			*B*	*B*
	morning	W[4]		T, S	S, S
Tuesday (7/30)	*afternoon*	W[4]		S, S	
	evening	R,*I*	*I*	*I*	*I*
	morning	I, S	IS, IS, IS		
Wednesday (7/31)	*afternoon*	S/SD,S/SD	S/SD, S/SD		
	evening		R/BM		
	morning	I, S/SD	I, S		
Thursday (8/1)	*afternoon*	S,S	S/SD, S/SD		
	evening	*B*	*B*		
	morning	*I*, S	*I*, S		
Friday (8/2)	*afternoon*	E[4]	S/SD, S/SD		
	evening	E[4]			
	morning	P, S	I, S		
Saturday (8/3)	*afternoon*	S, BM	S/SD, S		
	evening				
Morning Start		09:00	09:00	09:15[1]	09:00[2]
Break		10:15	10:15[5]	10:30	10:30
Lunch		12:15	12:20	12:40	12:30[3]
Afternoon Start		14:00	14:00	14:15	14:00
Break		15:30	15:45	15:30	15:30

Key. **B**anquet, **B**usiness **M**eeting, **D**emos, **E**xcursion, **I**nvited Lecture, **I**ndustrial **S**ession, **P**anel Discussion, **R**eception, **S**ession, **S**ystem **D**escriptions, **T**utorial, and **W**orkshops. Italicized events are plenary. Breaks are 30 min. except CAV (25).

Notes. *1*: 9:00 Saturday. *2*: 9:15 Sunday. *3*: 12:40 Sunday, 13:00 Tuesday. *4*: times in table do not apply to this event. *5*: 9:50 and 11:05 Wednesday.