

Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis

8559078

204

EUROCAL '85

European Conference on Computer Algebra
Linz, Austria, April 1985

Proceedings Vol. 2: Research Contributions

Edited by Bob F. Caviness



Springer-Verlag
Berlin Heidelberg New York Tokyo

8666078

Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis

204



EUROCAL '85

European Conference on Computer Algebra
Linz, Austria, April 1–3 1985
Proceedings Vol. 2: Research Contributions



E8666078

Edited by Bob F. Caviness



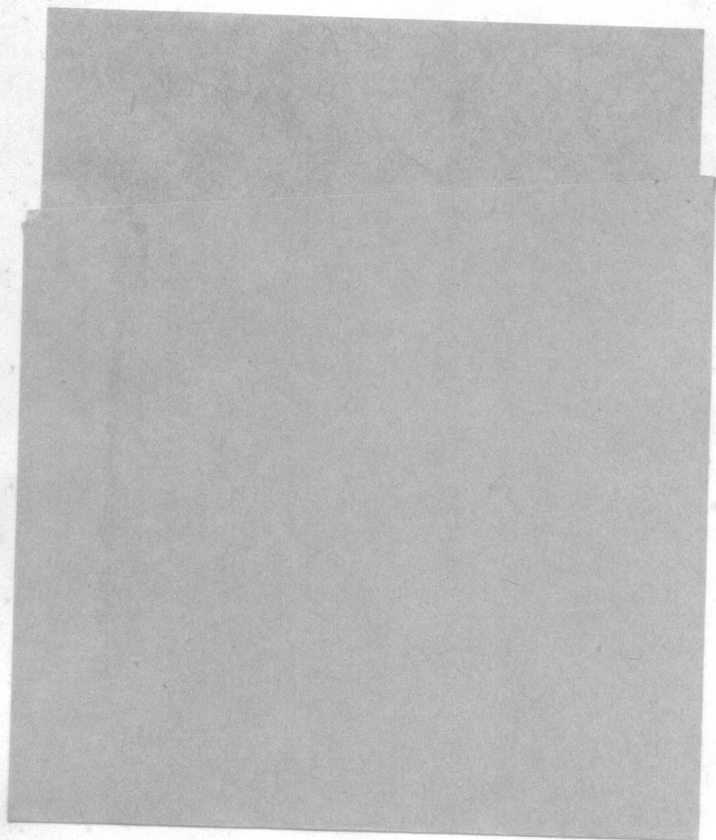
Springer-Verlag
Berlin Heidelberg New York Tokyo

Editorial Board

D. Barstow W. Brauer P. Brinch Hansen D. Gries D. Luckham
C. Moler A. Pnueli G. Seegmüller J. Stoer N. Wirth

Editor

Bob F. Caviness
University of Delaware,
Department of Computer and Information Sciences
Newark, DE 19716, USA



CR Subject Classification (1982): I.1, J.2

ISBN 3-540-15984-3 Springer-Verlag Berlin Heidelberg New York Tokyo
ISBN 0-387-15984-3 Springer-Verlag New York Heidelberg Berlin Tokyo

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically those of translation, reprinting, re-use of illustrations, broadcasting, reproduction by photocopying machine or similar means, and storage in data banks. Under § 54 of the German Copyright Law where copies are made for other than private use, a fee is payable to "Verwertungsgesellschaft Wort", Munich.

© by Springer-Verlag Berlin Heidelberg 1985
Printed in Germany

Printing and binding: Beltz Offsetdruck, Hemsbach/Bergstr.
2145/3140-543210

PREFACE

EUROCAL '85, the European Conference on Symbolic and Algebraic Computation 1985, was jointly organized by the ACM Special Interest Group on Symbolic and Algebraic Manipulation (SIGSAM) and by the Symbolic and Algebraic Manipulation Group in Europe (SAME). EUROCAL 85 is the tenth conference in a sequence of international annual conferences that started in 1966 and crucially structured the field. These conferences were

SYMSAC 1966 Washington, D.C., USA
SYMSAC 1971 Los Angeles, California, USA
EUROSAM 1974 Stockholm, Sweden
SYMSAC 1976 Yorktown Heights, New York, USA
EUROSAM 1979 Marseille, France
SYMSAC 1981 Snowbird, Utah, USA
EUROCAM 1982 Marseille, France
EUROCAL 1983 London, UK
EUROSAM 1984 Cambridge, UK.



The joint annual conferences organized by SIGSAM and SAME are intended to reflect the scientific progress of symbolic and algebraic computation (computer algebra) made in the respective year. This becomes more important since the vigor of the field steadily increases and, hence, there is a tendency for multiple conferences on symbolic and algebraic computation to be organized in a given year to emphasize the different aspects of the field or to bring together researchers from particular geographical regions. To emphasize the integrating role of the joint SIGSAM/SAME conferences, the proceedings of EUROCAL 85 for the first time include a brief table of contents of other more specialized conferences (or sessions at other conferences) organized immediately before or after EUROCAL 85. This makes the proceedings of EUROCAL 85 a unique reference for the international research effort in symbolic and algebraic computation in 1984/85. It is a pleasure for us to acknowledge the immediate agreement of the editors of the proceedings of the other conferences to include these tables in the present proceedings. These conferences are:

- Conference on Computer Algebra as a Tool for Research in Mathematics and Physics, 5-6 April 1984, New York, USA
- Third MACSYMA User's Conference, 23-25 July 1984, Schenectady, NY, USA
- 2nd International Symposium on Symbolic and Algebraic Computation by Computers, 21-22 August 1984, RIKEN, Saitama, Japan
- 1984 National Meeting of the American Chemical Society (Session on Computer Algebra), 26-31 August 1984, Philadelphia, USA
- 1984 Conference on Applied Algebra and Error Correcting Codes, 1-5 October 1984, University P. Sabatier, Toulouse, France
- 1985 Conference on Applied Algebra and Error Correcting Codes, 15-19 July 1985, Grenoble, France.

EUROCAL 85 had five different types of contributions:

- invited lectures (collected in companion volume)
- full papers
- extended abstracts
- informal contributions
- demos of software and hardware systems

The role and mutual interplay of the invited lectures is described in detail in the companion proceedings. The full papers were refereed by two independent referees. Of 90 full papers

submitted, 38 were finally accepted. The extended abstracts are short versions (maximally two pages) of original papers on symbolic and algebraic computation that had appeared in other sources in the period between EUROSAM 84 and EUROCAL 85. The informal contributions are short reports (maximally two pages) on ongoing research. The demos were intended to reflect the present state of the art in symbolic and algebraic computation software systems. The extended abstracts, the informal contributions and the demo descriptions were reviewed by the program committee members. By including the extended abstracts and the informal contributions we hope that the proceedings will serve even more as a main pointer to relevant research activities for 1984/85. On the other hand, the high publication standards of the Springer Lecture Notes in Computer Science series must not be affected by the inclusion of informal contributions and extended abstracts. Therefore the category of each papers is clearly indicated in the table of contents.

At EUROCAL 85, special emphasis was placed on promoting interactions of computer algebra with contiguous fields, in particular with automated theorem proving, automatic programming and algorithmic geometry. Finally, the traditional close interaction of mathematical and software technological aspects in computer algebra was demonstrated by a software exhibition with eleven participants and by nineteen software demos during the lectures.

EUROCAL 85 was attended by 430 participants. This marks a tremendous increase of interest in computer algebra and we hope this is the beginning of a trend that will continue in the future.

Acknowledgement The production of these proceedings was supported by a grant from SIE-MENS Munchen (Dr. H. Schwartzel). The subject index was compiled by J. Gärnter, P. Hintenhaus, H. Hofbauer, H. Stadlbauer, and S. Stifter of the working group CAMP-LINZ.

B. Buchberger
Program Chairman
and Co-Editor

B. Caviness
Co-Editor

EUROCAL '85
(European Conference on Symbolic and Algebraic Computation)
April 1-3, 1985, Linz, Austria

Organized by: ACM-SIGSAM, SAME

Sponsored by: Bundesministerium für Wissenschaft und Forschung,
Land Oberösterreich, Stadt Linz, Linzer Hochschulfonds,
Kammer der Gewerblichen Wirtschaft,
Academic Press, Allgemeine Sparkasse Linz, DEC Österreich,
IBM Österreich, Olivetti AT&T Österreich, Rank XEROX Österreich,
SIEMENS Österreich, Springer Verlag Wien - New York,
Symbolics GmbH, VOEST-Alpine Linz.

Conference and Program Chairman:

Bruno Buchberger, Universität Linz, Institut f. Mathematik,
A-4040 Linz, Austria.

Program Committee:

A. Balaban (Bukarest, Rumania), W. Bibel (München, FRG),
A. Borodin (Toronto, Canada), N.K. Bose (Pittsburgh, USA),
G.E. Collins (Madison, USA), H. Coelho (Lisbon, Portugal),
J. Davenport (Bath, U.K), R. Fateman (Berkeley, USA; SIGSAM
chairman), I. Frick (Stockholm, Sweden), G. Huet (Le Chesnay,
France), E.V. Krishnamurthy (Bangalore, India), U. Kulisch
(Karlsruhe, FRG), W. Laßner (Leipzig, GDR), T. Legendi
(Szeged, Hungary), A.K. Lenstra (Amsterdam, The Netherlands),
H.W. Leopoldt (Karlsruhe, FRG), R. Llopis de Trias (Caracas,
Venezuela), H. Lüneburg (Kaiserslautern, FRG), Z. Manna
(Stanford, USA), R. Nakajima (Kyoto, Japan), J. Neubüser
(Aachen, FRG), M. Newman (Canberra, Australia), J. Nievergelt
(Zürich, Switzerland), L. Robbiano (Genova, Italy), H. van
Hulzen (Enschede, The Netherlands; SAME chairman), H.G. Zimmer
(Saarbrücken, FRG).

Local Arrangements and Demo Coordination:

Bernhard Kutzler (Manager),

G. Funk, J. Gärtner, P. Hintenaus, G. Hochreiter,
H. Hofbauer, F. Lichtenberger, H. Stadlbauer, S. Stifter,
T. Streicher, F. Winkler (all Linz, Austria).

Proceedings Editors:

Bruno Buchberger, Universität Linz, Austria
Bob J. Caviness, University of Delaware, USA.

PROGRAM AND CONTENTS

Introduction to Computer Algebra

Session Chairman: G. E. Collins, Univ. of Wisconsin-Madison, USA

Computer Algebra: Past and Future (Invited).....companion volume
B. F. Caviness, U. of Delaware, Newark, USA

MACSYMA: Capabilities and Applications to Problems in
Engineering and Science (Invited).....companion volume
R. Pavelle, Symbolics Inc., Cambridge, Mass., USA

Session Chairman: A. C. Hearn, The Rand Corporation, Santa Monica, USA

A Preview of the Next IMB-PC Version of muMATH (Invited).....companion volume
D. R. Stoutemyer, Soft Warehouse Inc., Honolulu, USA

Computer Algebra as a Research Tool in Physics (Invited).....companion volume
J. M. Drouffe, CEN-SACLAY, France

Computer Algebra and Interactions with Other Fields I

Session Chairman: H. Zassenhaus, Ohio State Univ, Columbus, USA

Computational Geometry: Selected Algorithms and Paradigms
(Invited).....companion volume
Th. Ottmann, U. of Karlsruhe, FRG

Algebraic and Symbolic Computation in Digital Signal
Processing, Coding and Cryptography (Invited).....companion volume
Th. Beth, U. of London, UK.

Session Chairman: H. W. Leopoldt, Univ. of Karlsruhe, FRG

Computer Algebra and Practical Analysis (Invited).....companion volume
N.J. Lehmann, U. of Dresden, GDR

An Introduction to Quantifier Elimination and Cylindrical
Algebraic Decomposition (Invited; No manuscript)
G. E. Collins, U. of Wisconsin-Madison, USA

Session Chairman: J. M. Drouffe, CEN-SACLAY, France

A New Arithmetic for Scientific Computation with Exact
Evaluation of Expressions (Invited).....companion volume
U. Kulisch, U. of Karlsruhe, FRG

Computer Algebra and Interactions with Other Fields II

Session Chairman: M. F. Newman, Univ. of Canberra, Australia

Algorithmic Methods in Automatic Programming (Invited).....companion volume
A. W. Biermann, Duke U., Durham, USA

Proof Theory and the Synthesis of Programs: Potential and
Limitations (Invited).....companion volume
G. Kreisel, Stanford U., USA

- Computer Algebra and Chemistry (Invited).....companion volume
A. Balaban, U. of Bucarest, Rumania
- Session Chairman: J. Neubüser, Univ. of Aachen, FRG
- Constructions: A Higher Order Proof System for Mechanizing
Mathematics (Invited).....companion volume
G. Huet, INRIA, France
- Scientific Computation: The Integration of Symbolic, Numeric
and Graphic Computation (Invited).....companion volume
E. Engeler, ETH-Zürich, Switzerland

Algebraic Algorithms I

Session Chairman: B.F. Caviness, Univ. of Delaware, USA

- Algorithms for Polynomial Division (Extended abstract)..... 1
D. Bini, U. of Pisa, Italy,
V. Pan, SUNY Albany, New York, USA
- Sparse Hensel Lifting (Full paper)..... 4
E. Kaltofen, RPI, New York, USA
- HEUGCD: How Elementary Upperbounds Generate Cheaper Data (Full paper).. 18
J. Davenport, J. Padget, U. of Bath, England
- Analysis and Improvement of the Euclidean Algorithm for Gaussian
Integers (Informal contribution; No manuscript)
G. E. Collins, University of Wisconsin-Madison, USA
- Gaussian Elimination over a Euclidean Ring (Informal contribution).... 29
C. S. Iliopoulos, New Jersey Inst. of Technology, USA
- Symbol Manipulation and Symmetry Breaking (Informal contribution)..... 607
H. Zassenhaus, Ohio State U., Columbus, USA

Demos of General Purpose Computer Algebra Systems

Session Chairman: J.A. van Hulzen, Twente Univ. of Technology, The Netherlands

- Demonstration of REDUCE3 as Implemented on a Stand-Alone MOTOROLA
68000 Based Microcomputer (Demonstration)..... 31
M. Taraniuk, P. C. Mackeonis, Metacomco Company, Bristol, England
- The Scratchpad II Computer Algebra Language and System (Demonstration) 32
R. S. Sutor, IBM Research Center, Yorktown Heights, NY, USA
- The Maple Symbolic Computation System (Demonstration; No manuscript)
B. Char, K. Geddes, G. Gonnet, U. of Waterloo, Canada
- The SAC-2 Computer Algebra System (Demonstration)..... 34
G. E. Collins, U. of Wisconsin-Madison, USA
- DOE-MACSYMA: Progress Report (Informal contribution; Demonstration)... 36
G. J. Carrette, L. P. Harten, Paradigm Associates, Inc.,
Cambridge, Mass., USA.

Automated Theorem Proving

Session Chairman: G. Huet, INRIA, France

Towards Practical Implementations of Syllogistic (Full paper).....	40
S. Ghelfo, E. G. Omodeo, ENIDATA S.p.A., Bologna, Italy.	
Path Resolution and Semantic Graphs (Full paper).....	50
N. V. Murray, E. Rosenthal, SUNY Albany, New York, USA	
Fast Subsumption Algorithms (Full paper).....	64
G. Gottlob, Istituto di Matematica, Genova, Italy, A. Leitsch, Wirtschaftsuniversität Wien, Austria	
Substitution Expressions: Extracting Solutions of Non-Horn Clause Proofs (Full paper).....	78
K. Aspetsberger, U. of Linz, Austria	
The Complexity of Elementary Problems in Archimedean Ordered Groups (Extended abstract).....	87
V. Weispfenning, Yale University, Connecticut, USA	

Applications I

Session Chairman: D. M. Klimov, Academy of Sciences, Moscow, USSR

Progress on the Equivalence Problem (Full paper).....	89
J.E. Aman*, R.A. d'Inverno ⁺ , G.C. Joly*, M.A.H. MacCallum*, * Queen Mary College, London, UK ⁺ University of Southampton, UK	
Symbol Representations of Noncommutative Algebras (Full paper).....	99
W. Lassner, Karl-Marx-Universität, Leipzig, GDR.	
Algebraic Computations in Elementary Catastrophe Theory (Full paper)..	116
K. Millington, F.J. Wright, Queen Mary College, London, UK	
Bifurcation Theory and Computer Algebra: An Initial Approach (Full paper).....	126
D. Armbruster, U. of Tübingen, FRG	

Algebraic Algorithms II

Session Chairman: J.H. Davenport, Univ. of Bath, UK

Factorization of Polynomials by Transcendental Evaluation (Full paper)	138
M-P. van der Hulst, U. of Amsterdam, The Netherlands, A. K. Lenstra, U. of Chicago, USA	
Factorization of Rational Polynomials in the Zassenhaus-Norm (Informal contribution).....	146
F. Goebbels, U. of Köln, FRG	
On Decomposable and Commuting Polynomials (Informal contribution).....	148
R. Lidl, U. of Tasmania, Australia	
Fast Polynomial Decomposition Algorithms (Informal contribution).....	150
V. S. Alagar, M. Thanh, Concordia U., Montreal, Canada	
A Program System for Root Finding (Informal contribution).....	154
W. Riedel, TH Karl-Marx-Stadt, GDR	

A Program System for Factorization of Polynomials with Rational Coefficients (Informal contribution).....	155
M. Kreißig, TH Karl-Marx-Stadt, GDR	
THKLISP as a Base of Formula Manipulation Systems (Informal contribution).....	156
P. Richter, TH Karl-Marx-Stadt, GDR	
Demos of Special Purpose Computer Algebra Systems	
Session Chairman: J. Calmet, LIFIA, Grenoble, France	
AMP: A System for Algebraic Computations (Demonstration).....	157
J. M. Drouffe, CEN-Saclay, Gif-sur-Yvette, France	
The Program ORTOCARTAN for Applications in Einstein's Relativity Theory (Demonstration).....	159
A. Krasinski, Polish Academy of Sciences, Warszawa, Poland	
SHEEP and Classification in General Relativity (Demonstration).....	161
I. Frick, U. of Stockholm, Sweden,	
J. E. Aman, Queen Mary College, London, UK	
NORCAN - A Computer Calculus Program (Demonstration).....	163
A. Hornaas, T. Wahl, Norwegian Defence Research Establishment, Kjeller, Norway	
STENSOR (Demonstration).....	165
L. Hörnfeldt, U. of Stockholm, Sweden	
Visual Environments for Symbolic Computation (Informal contribution)..	166
S. K. Abdali, G. Cherry, Tektronix, Oregon, USA	
Rule-Based Programming in SMP (Demonstration; No manuscript)	
J. Greif, Inference Corporation, Los Angeles, USA	
Constructive and Combinatory Logic	
Session Chairman: H. Coelho, LNEC, Lisboa, Portugal	
Syntactic Equivalences Inducing Semantic Equivalences (Full paper)....	168
P.-L. Curien, CNRS-U. Paris VII, France	
The ALGOS Computational System (Informal contribution).....	179
H. Graves, L. Blaine, San Jose State U., California, USA	
Non-Numerical Modelling in Combinatory Algebras (Informal contribution; No manuscript)	
E. Engeler, ETH Zürich, Switzerland	
Retrieval in a Module Library Using Formal Specifications: Preliminary Search Using Syntactic Properties (Full paper).....	181
W. Gaube, H. C. Mayr, P. C. Lockemann, U. of Karlsruhe, FRG	
The J-Machine: Functional Programming with Combinators (Extended abstract; Demonstration).....	197
J. Gibert, University of Melbourne, Australia	

Applications II

Session Chairman: W. Lassner, Univ. of Leipzig, GDR

Symbolic Algebra in Problems of Non-Linear Mechanics (Extended abstract).....	199
D. M. Klimov, USSR Academy of Sciences, Moscow, USSR	
MACSYMA's Computation of Dirac-Bergmann Algorithm for Hamiltonian Systems with Constraints (Informal contribution).....	201
Ph. Tombal, A. Moussiaux, Fac. Univ. N.D. de la Paix, Namur, Belgium	
Infinite Dimensional Computer Lie Algebra? (Informal contribution)....	203
T. Wahl, NDRE, Kjeller, Norway	
Application of Computer Algebra to the Theory of the Vibration- Rotational Spectra of Diatomic Molecules (Informal contribution).....	205
J. F. Ogilvie, The Australian National U., Canberra, Australia	

Computational Group Theory

Session Chairman: H.G. Zimmer, Univ. of Saarbrücken, FRG

Algorithms for the Character Theory of the Symmetric Group (Full paper).....	206
Ö. Egecioglu, U. of California, Santa Barbara, USA	
Worst-Case Analysis of Algorithms for Computational Problems on Abelian Permutation Groups (Informal contribution).....	225
C. S. Iliopoulos, New Jersey I. of Technology, Newark, USA	
A Completion of some Coxeter Groups (Full paper).....	229
P. Le Chenadec, INRIA, Les Chesnay, France	
A Cayley File of Finite Simple Groups (Extended abstract).....	243
C. M. Campbell, E. F. Robertson, U. of St. Andrews, Scotland	
On Some Laws in $PSL(2, q)$ (Informal contribution).....	245
D. B. Nikolova, Bulgarian Academy of Sciences, Sofia, Bulgaria	
Symbolic Computation in some Lie Algebras (Informal contribution: No manuscript)	
M. F. Newman, Australian Nat. U., Canberra, Australia	

Algebraic Algorithms III

Session Chairman: M. Mignotte, Univ. of Strasbourg, France

An Adjacency Algorithm for Cylindrical Algebraic Decompositions of Three-Dimensional Space (Full paper).....	246
D.S. Arnon, Xerox PARC, Palo Alto, California, USA, G.E. Collins, U. of Wisconsin-Madison, USA, S. McCallum, U. of Toronto, Canada	
A Cluster-Based Cylindrical Algebraic Decomposition Algorithm (Full paper).....	262
D.S. Arnon, Xerox PARC, Palo Alto, California, USA	
On Mechanical Quantifier Elimination for Elementary Algebra and Geometry: Solution of a Non-Trivial Problem (Informal contribution)...	270
D.S. Arnon, Xerox PARC, Palo Alto, California, USA	

Gröbner Bases Using SAC-2 (Informal contribution: Demonstration).....	272
W. Böge, R. Gebauer, H. Kredel, U. of Heidelberg, FRG	

Algebraic Algorithms IV

Session Chairman: T. Mora, Univ. of Genova, Italy

A Polynomial Time Algorithm for the Topological Type of a Real Algebraic Curve (Extended abstract).....	275
D.S. Arnon, Xerox PARC, Palo Alto, California, USA, S. McCallum, U. of Toronto, Canada	

An Improved Projection Operation for Cylindrical Algebraic Decomposition (Extended abstract).....	277
S. McCallum, U. of Toronto, Canada	

Arithmetic in Quadratic Fields with Unique Factorization (Full paper).	279
E. Kaltofen, RPI, Troy, New York, USA, H. Rolletschek, Kent State University, Ohio, USA	

About a New Method for Computing in Algebraic Number Fields (Informal contribution).....	289
J. della Dora, C. Dicrescenzo, D. Duval, TIM3 & Inst. Fourier, Grenoble, France	

Computer Algebra Systems Implementation I

Session Chairman: I. Frick (Univ. of Stockholm, Sweden)

An Algebraic Implementation of Packages (Full paper).....	291
S. Agnarsson, M.S. Krishnamoorthy, RPI, Troy, New York, USA, B. D. Saunders, U. of Delaware, Newark, USA	

The SMP Pattern Matcher (Full paper).....	303
J.M. Greif, Inference Corporation, Los Angeles, California, USA	

An Expression Compression Package for REDUCE based on Factorization and Controlled Expansion (Informal contribution).....	315
B.J.A. Hulshof, J.A. van Hulzen, Twente U. of Technology, Enschede, The Netherlands	

STENSOR Uses Disc Automatically for Very Large Computations (Informal contribution).....	317
L. Hörnfeldt, U. of Stockholm, Sweden	

Current Developments in LISP (Invited).....	companion volume
J. Padget, U. of Bath, UK	

Symbolic/Numeric Interface I

Session Chairman: U. Kulisch, U. of Karlsruhe, FRG

Numerical Methods with Automatic Verification (Extended abstract).....	318
S.M. Rump, IBM Development and Research, Böblingen, FRG	

ACRITH - High Accuracy Arithmetic Subroutine Library (Demonstration)..	320
S.M. Rump, IBM Development and Research, Böblingen, FRG	

Floating-Point Computation in PASCAL-SC with Verified Results (Extended abstract).....	322
J.W. von Gudenberg, U. of Karlsruhe, FRG	

PASCAL-SC Demonstration: Accurate Arithmetic for Verified Results (Demonstration).....	325
J.W. von Gudenberg, U. of Karlsruhe, FRG	

A Solution to the Polynomial Hensel-Code Conversion Problem (Informal contribution).....	327
A. Mukhopadhyay, Concordia U., Montreal, Canada	

A Posteriori Interval Analysis (Full paper).....	328
Yu.V. Matijasevich, Steklov Institute of Math., Leningrad, USSR	

Symbolic Manipulations on a Computer and Their Application to Generation and Investigation of Difference Schemes (Full paper).....	335
V.G. Ganzha, S.I. Mazurik, V.P. Shapeev, USSR Academy of Sciences, Novosibirsk, USSR	

Rewrite Rules and the Completion Procedure

Session Chairman: E. Engeler, ETH, Zürich, Switzerland

Completeness in Data Type Specifications (Full paper).....	348
E. Kounalis, CRIN, Nancy, France	

On Solving the Equality Problem in Theories Defined by Horn Clauses (Full paper).....	363
E. Paul, Centre national d'etudes des Telecommunications, Issy les Moulineaux, France	

Reducing the Complexity of the Knuth-Bendix Completion Algorithm: A "Unification" of Different Approaches (Full paper).....	378
F. Winkler, U. of Delaware, Newark, USA	

A Confluence Criterion Based on the Generalised Newman Lemma (Full paper; Demonstration).....	390
W. Küchlin, ETH Zürich, Switzerland	

ERIL - Equational Reasoning: an Interactive Laboratory (Demonstration)	400
A.J.J. Dick, Rutherford Appleton Laboratory, Oxon, UK	

Implementation of a General Completion Procedure Parameterized by Built-in Theories and Strategies (Informal contribution; Demonstration).....	402
C. Kirchner, H. Kirchner, CRIN, Nancy, France	

Applications III

Session Chairman: J. Ogilvie, The Austral. Nat. Univ., Canberra, Australia

Computer Algebra in Norway (Informal contribution).....	405
A. Hornaas, NDRE, Kjeller, Norway	

GOPPA Codes: Algorithmic Problems (Informal contribution).....	407
M. Becker, G. Schellenberger, U. of Erlangen-Nürnberg, FRG	

Inauguration of Prof. H. Zassenhaus as Honorary Professor at the Johannes Kepler University in Linz

Session Chairman: A. Miola, CNR, Roma, Italy

Laudatio: M. Pohst, U. of Düsseldorf, FRG
Inauguration Ceremony: P. Rechenberg, Dean of the School of Technical Sciences,
University of Linz, Austria.

Symbol Manipulation: A Constructive Challenge to Mathematicians and Scientists (Invited; No manuscript)

H. Zassenhaus, Ohio State U., Columbus, USA

Algebraic Algorithms V

Session Chairman: D. Lazard, Univ. Paris VI, France

GCD's and Factoring Multivariate Polynomials Using Gröbner Bases (Informal contribution).....	409
P. Gianni, U. of Pisa, Italy,	
B. Trager, IBM Research Center, Yorktown Heights, NY, USA	
A Note on the Complexity of Constructing Standard Bases (Informal contribution).....	411
M. Giusti, Ecole Polytechnique, Palaiseau, France	
Some Algorithmic Questions on Ideals of Differential Operators (Full paper).....	413
A. Galligo, Faculté des Sciences, Nice, France	
On Improving Approximate Results of Buchberger's Algorithm by Newton's Method (Extended Abstract).....	608
W. Trinks, U. of Karlsruhe, FRG	

Rewrite Rules and the Completion Procedure II

Session Chairman: B. Trager, IBM, New York, USA

Obtaining Complete Sets of Reductions and Equations Without Using Special Unification Algorithms (Extended abstract).....	422
J. Pedersen, U. of California at Los Angeles, USA	
An Overview of Completion Algorithms (Informal contribution).....	424
R. Llopis de Trias, U. Simon Bolivar, Caracas, Venezuela	

Computer Algebra Systems Implementation II

Session Chairman: K. Geddes, Univ. of Waterloo, Canada

The Optimisation by "Code Motion" of User Programs for an Algebraic Manipulation System (Extended abstract).....	429
P.D. Pearce, Kingston Polytechnic, UK	
R.J. Hicks, N.E. Surrey College of Technology, UK	
An Improved Plotting Package for VAXIMA (Informal contribution).....	431
D.A. Young, P.S. Wang, Kent State U., Ohio, USA	

Automatic Programming I

Session Chairman: K. Mätzel, TH Karl-Marx-Stadt, GDR

On Logic Programs with Data-Driven Computations (Full paper).....	433
N. Heck, IBM Böblingen, FRG,	
J. Avenhaus, U. of Kaiserslautern, FRG	
DARWIN, a System designed for the Study of Enumerative Combinatorics (Informal contribution).....	444
F. Bergeron, U. of Québec, Montreal, Canada	
C. Pichet, Centre de recherche informatique, Montpellier, France	

Correctness Proofs of the Implementation of Abstract Data Types (Extended abstract).....	446
B. Hohlfield, AEG Telefunken, Ulm, FRG	
Using Prolog for Constructing Geometric Objects defined by Constraints (Full paper).....	448
B. Brüderlin, ETH Zürich, Switzerland	

Applications IV

Session Chairman: P.S. Wang, Kent State Univ. Ohio, USA

The Role of Symbolic Computation in the Management of Scientific Information (Informal contribution).....	460
S. Bandyopadhyay, U. of Windsor, Ontario, Canada	
J.S. Devitt, U. of Saskatchewan, Canada	
CIM (Computer Integrated Manufacturing) - A Challenge for Symbolic Computation (Informal contribution).....	462
H. Exner, VOEST-ALPINE Linz, Austria	
F.D. Fischer, Montanuniversität Leoben, Austria	
Symbolic and Algebraic Computation May Support Secondary Education (Informal contribution).....	464
H. Coelho, LNEC, Lisboa, Portugal	
Software Toolkit for Input Stage Measurement in Symbolic Computation (Informal contribution).....	466
M. Caciotta, F. Iannucci, U. of Roma "La Sapienza", Italy	
The Algebraic Manipulation Systems on the Electrical Power Systems (Informal contribution).....	468
P. Boninfante, G.M. Veca, U. of Roma "La Sapienza", Italy	

Computational Number Theory

Session Chairman: H. Lüneburg, Univ. of Kaiserslautern, FRG

A New Method of Computing Fundamental Units in Algebraic Number Fields (Full paper).....	470
U. Fincke, M. Pohst, U. of Düsseldorf, FRG	
The Generalized Voronoi-Algorithm in Totally Real Algebraic Number Fields (Full paper).....	479
J. Buchmann, U. of Köln, FRG	
An Algorithm for the Computation of Perfect Polyhedral Cones over Real Quadratic Number Fields (Extended abstract).....	487
H. Ong, U. of Frankfurt, FRG,	
D. Golke, IBM Frankfurt, FRG	
Explicit Determination of Non-Trivial Torsion Structures of Elliptic Curves over Quadratic Number Fields (Extended abstract).....	489
M.A. Reichert, U. des Saarlandes, Saarbrücken, FRG	
P-Adic Algorithms and the Computation of Zeros of P-Adic L-Functions (Full paper).....	491
K. Lamprecht, H.G. Zimmer, U. des Saarlandes, Saarbrücken, FRG	

On the Solution of the Diophantine Equation $G_n = p^z$ (Full paper).....	503
A. Pethő, Kossuth Lajos U., Debrecen, Hungary	

Algebraic Algorithms VI

Session Chairman: M. Pohst, Univ. of Düsseldorf, FRG

Term Orderings on the Polynomial Ring (Full paper).....	513
L. Robbiano, U. of Genova, Italy	
An Algorithmic Approach to Local Rings (Full paper).....	518
F. Mora, U. of Genova, Italy	
A Reduction Strategy for the Taylor Resolution (Full paper).....	526
H.M. Möller, FernUniversität Hagen, FRG	
From Polynomials to Galois Groups (Informal contribution).....	535
D. Ford, J. McKay, Concordia U., Montreal, Canada	

Parallel Symbolic and Algebraic Computation

Session Chairman: D. Stoutemyer, Univ. of Hawai, Honolulu, USA

Cellular Algorithms and Machines: An Overview (Informal contribution: No manuscript)	
T. Legendi, Hungarian Academy of Sciences, Szeged, Hungary	
A System for Parallel Computer Algebra Programs (Informal contribution)	537
S.M. Watt, U. of Waterloo, Canada	
Unification in Parallel with Refined Linearity Test: An Example of Recursive Network Structure in FP2, A Functional Parallel Programming Language (Informal contribution).....	539
R. Caferra, P. Jorrand, LIFIA IMAG, Grenoble, France	
The Parallel L-Machine for Symbolic Computation (Extended abstract)...	541
B. Buchberger, U. of Linz, Austria	

Automatic Programming II

Session Chairman: A. Biermann, Duke Univ., Durham, North-Carolina, USA

Unification in Conditional Equational Theories (Full paper).....	543
H. Hussmann, U. of Passau, FRG	
Mechanical Translation of Set Theoretic Problem Specifications into Efficient RAM Code - A Case Study (Full paper).....	554
R. Paige, F. Henglein, Rutgers U., New Jersey, USA	
A Methodology for Automatic Programming Based on the Constructive Matching Strategy (Informal contribution).....	568
M. Franová, LRI, Orsay, France	
The Structural Synthesis of Programs: New Means (Extended abstract).....	570
A. Sakharov, Leningrad U., USSR	

Symbolic/Numeric Interface II

Session Chairman: H. Exner, VOEST-ALPINE, Linz, Austria

Taking Advantage of Symmetry in the Automatic Generation of Numerical Programs for Finite Element Analysis (Full paper).....	572
P.S. Wang, Kent State U., Ohio, USA	

Automatic Generation of Optimized Programs (Informal contribution)....	583
B.L. Gates, J.A. van Hulzen, Twente U. of Technology, Enschede, The Netherlands	

Computer Analysis

Session Chairman: N.J. Lehmann, Techn. Univ. of Dresden, GDR

Canonical Form for Rational Exponential Expressions (Full paper).....	585
M. Karr, Software Options, Cambridge, Mass., USA	

Elementary and Liouvillian Solutions of Linear Differential Equations (Extended abstract).....	595
M.F. Singer, North Carolina State U., Raleigh, USA, J.H. Davenport, U. of Bath, UK	

Analytical Decoupling, Decision of Compatibility and Partial Integration of Systems of Non-Linear Ordinary and Partial Differential Equations (Extended abstract).....	597
Th. Wolf, U. of Jena, GDR	

Symbolic Integration of Exponential Polynomials (Extended abstract)...	599
K. Nehr Korn, TH Karl-Marx-Stadt, GDR	

A REDUCE Package for Determining First Integrals of Autonomous Systems of Ordinary Differential Equations (Extended abstract: Demonstration).....	601
F. Schwarz, GMD, St. Augustin, FRG	

A Package of Tools for Manipulation of Sums and Series (Informal contribution).....	603
M. Arcieri, A. Miola, F. Panasiti, CNR Roma, Italy	

Theory of Summation in Finite Terms (Extended abstract).....	605
M. Karr, Software Options, Cambridge, Mass., USA	

Subject Index	613
---------------	-----

Author Index	634
--------------	-----

Referees	636
----------	-----

Table of Contents of Other Computer Algebra Conferences in 1984/85	638
--	-----