UNIVERSITY OF LONDON

ROYAL HOLLOWAY AND BEDFORD NEW COLLEGE

in association with
LONDON MATHEMATICAL SOCIETY,
HEWLETT PACKARD
and
S.E.R.C Logic Initiative

ALGEBRA AND AUTOMATED DEDUCTION

7th-8th January 1988

Programme

ALL LECTURES WILL TAKE PLACE IN THE ARTS BUILDING LECTURE THEATRE AND ALL MEALS WILL BE IN THE ATHLONE DINING ROOM OF THE NEW HALLS COMPLEX

Thursday 7 January

10.30 Registration and coffee

11.00 Manfred Broy, University of Passau,

Algebraic Specification

12.15 Harold Simmons, University of Aberdeen

The S.E.R.C. "Logic in Information Technology" Initiative

12.30 Lunch

2.15 Derek Coleman, Hewlett Packard,

The role of Algebraic Specification in Software Engineering

3.15 Tea

3.45 David Epstein, University of Warwick

Fast algorithms for the word problem using finite state automata

5.15 Derek Holt, University of Warwick,

Knuth-Bendix methods for constructing finite state automata in groups

6.00 Shuttle mini-bus to Egham station

6.30 Sherry Reception

7.30 Dinner

8.30 Demos (McCrea 118)

Friday 8 January

8.45–9.15 Shuttle mini-bus from Egham station

9.30 Pierre Lescanne, University of Nancy,

Theorem proving in Equational Theories based on Rewriting

10.45 Coffee

11.15 Klaus Madlener, University of Kaiserslautern

String rewriting methods for groups

12.30 Lunch

2.00 Jeremy Dick, Rutherford Appleton Laboratory,

The Term Rewriting System ERIL (Equational Reasoning: an Interactive Laboratory)

2.45 Tea

3.15 Geoff C Smith, University of Bath,

Rewriting problems in group theory

4.00 Shuttle mini-bus to Egham station

4.00 Possibility of further software demonstrations

ABSTRACTS

Algebraic Specification

Manfred Broy,
Fakultät für Mathematik und Informatik,
Universität Passau, F. R. G.

Abstract
Algebraic specifications are used to define algebraic structures by logical formulas as they typically occur in computer science. Often restricted syntactic forms such as Horn clause formulas are used for that purpose. Typical principles are used in algebraic methods in computer science such as particular structuring concepts including "The principle of hierarchical algebras", "The principle of term-generated algebras" as well as algebras with partial functions. Furthermore classical structures from computing science, such as partially ordered sets and monotonic functions are also studied in the framework of algebraic specifications. Algebraic specifications can be used for specifying typical data-structures and their characteristic operations, as well as for the specification of the semantics of programming languages. In both cases a property oriented model independent description of typical structures in computer science is obtained and also a logical framework for reasoning about properties of such specifications and the associated algebras.

The role of Algebraic Specification in Software Engineering

Derek Coleman
Software Engineering Department
HP Laboratories
Bristol UK.

Abstract
Software quality and productivity is a major concern for many corporations including Hewlett Packard. Current computer aided software engineering products concentrate on improving the book-keeping and project management aspects of software development. Important as these issues are, progress in the longer term relies on improving the technology of software production by utilising the underlying science (i.e. mathematics). A promising approach is to develop tools and methods based on a combination of algebraic specification and Hoare program-logic.

Knuth-Bendix methods for constructing finite state automata in groups

Derek Holt,
University of Warwick

Abstract
At Warwick, we are currently attempting to use Knuth-Bendix type methods on presentations of a number of specific groups, including Coxeter groups. The idea is to find a confluent system of equations for the presentation, and to use this to build a finite state automaton that accepts a unique word for each group element. When successful, this can lead to a very fast method of solving the word problem in the group. At present, the confluent system can either be finite, or it may contain finitely many infinite families of the form $ab^nc \rightarrow de^nf$, for all $n \geq 0$.

String Rewriting Methods for Groups

Klaus Madlener,
FB Informatik,
Universität Kaiserslautern, F. R. G.

Abstract
Critical pair completion procedures of Knuth-Bendix type have been extensively used for realising effective computations in algebraic structures. For groups this kind of approach has a long tradition: Dehn's algorithm for solving the word problem in small cancellation groups and the Todd-Coxeter coset enumeration method can be viewed as special completion procedures of string rewriting systems. One important aspect is what kind of group theoretical information can be inferred from the existence of a complete string rewriting system of special type for a group. We will give an overview of existing results in this direction and also some areas where further research is needed.

The Term Rewriting System ERIL (Equational Reasoning: an Interactive Laboratory)

A. J. J. Dick, Rutherford Appleton Laboratory, Didcot

Abstract
ERIL is a highly configurable order-sorted term rewriting system. Its design facilitates experimentation with a wide range of Knuth-Bendix completion algorithms.

A brief summary of order-sorted rewriting will be given. The elements of the ERIL system will then be described using several example configurations for Knuth-Bendix completion

UNIVERSITY OF LONDON

ROYAL HOLLOWAY AND BEDFORD NEW COLLEGE

ALGEBRA AND AUTOMATED DEDUCTION

7th-8th January 1988

LIST OF PARTICIPANTS

L. Aleeson, Long Ashton.
J. Baines, SERC.
M.H. Beilby, Department of Mathematics, University of Birmingham.
J. Bicarregui, Rutherford Appleton Laboratory.
N. Biggs, Department of Mathematics, RHBNC.
K. Blackburn,ICL, Wokingham.
R. Brown, Department of Pure Mathematics, University College, Bangor.
M. Broy, FB Mathematik und Informatik, University of Passau, FRG.
C. Campbell, Department of Mathematics, University of St Andrews.
J. Campin, Department of Computing Science, University of Glasgow.
D. Cohen, Department of Mathematics, Queen Mary College.
D. Cohen, Department of Computer Science, RHBNC.
D. Coleman, Hewlett Packard, Bristol.
E. Cusack, British Telecom, Ipswich.
T. Denvir, Praxis Systems, Bath.
J. Dick, Rutherford Appleton Laboratory.
V. Edneral, Department of Mathematics, University of Bath.
M. Edjvet, Department of Mathematics, University of Nottingham.
D. Epstein, Mathematics Institute, University of Warwick.
M. Fairtclough, Department of Mathematics, University of Leeds.
J. Fountain, Department of Mathematics, University of York.
A. Galton,Department of Computer Science, University of Exeter.
T. Gardiner,Department of Mathematics, University of Birmingham.
C. George, STC, Harlow.
N. Gilbert, Department of Pure Mathematics, University College, Bangor.
T. Griggs, School of Mathematics and Statistics, Lancashire Polytechnic.
D. Harper, Computer Laboratory, University of Liverpool.
J. Harris, Computing Services, Huddersfield Polytechnic.
H. Haughton, SCIT, Wolverhampton Polytechnic.
D. Hayes, Department of Mathematics, University of Leicester.
P. Heggie, Department of Mathematics, University of St Andrews.
P. Hill, Department of Computer Science, University of Bristol.
W. Hodges, Department of Mathematics, Queen Mary College.
D. Holt, Mathematics Institute, University of Warwick.
A. Holme, Department of Mathematics, University of Bergen, Norway.
B. Homer, ICL, Wokingham.
R. Horan, Department of Mathematics, Plymouth Polytechnic.
J. Humphreys, Department of Mathematics, University of Liverpool.
C. Jervis, ICL, Wokingham.
R. Jones, ICL, Wokingham.
J. Kalmus, Rutherford Appleton Laboratory.
A. Keedwell, Department of Mathematics, University of Surrey.
R. Knott, Department of Mathematics, University of Surrey.
M. Lai,Department of Computer Science, RHBNC.
D. Lane, Reigate, Surrey.
C. Leedham-Green,Department of Mathematics, Queen Mary College.
P. Lescanne, CRIN, Nancy, France.

S. Lloyd, Racal Research, Reading.
K. Madlener, FB Informatik, Kaiserslautern, FRG.
U. Martin,Department of Computer Science, RHBNC.
S. Matthews, Department of Computer Science, Hatfield Polytechnic.
A. McIntyre, Mathematical Institute, University of Oxford.
K. Meinke, Department of Computer Studies, University of Leeds.
H. Mohamed, Department of Computer Science, University of Manchester.
B. Monahan, IST, Cambridge.
M. Navarro, Facultad de Informatica, San Sebastian, Spain.
R. Nieuwenhuis, Departamento de Programacion, Barcelona, Spain.
K. Parramore, Department of Mathematics, Brighton Polytechnic.
R. Pitt, Sheffield.
A. Pitts, Mathematics Division, University of Sussex.
P. Pleasants, Department of Pure Mathematics, University College, Cardiff.
H. Rafsanjani, British Telecom, Ipswich.
C. Reade,Department of Computer Science, Brunel University.
S. Rees, Mathematics Institute, University of Warwick.
G. Ringwood, Department of Computer Science, Imperial College.
E. Robertson, Department of Mathematics, University of St Andrews.
A. Sanchez, Facultad de Informatica, San Sebastian, Spain.
R. Sandling, Department of Mathematics, University of Manchester.
D. Scrutton, GCHQ, Cheltenham.
J. Segal, Department of Mathematics, Brighton Polytechnic.
R. Sharp, Department of Mathematics, University of Sheffield.
J. Shawe Taylor, Department of Computer Science, RHBNC.
W. Simmonds, Mathematics Institute, University of Warwick.
H. Simmons,Department of Mathematics, University of Aberdeen.
R. Sirey, SERC, Swindon.
D. Smith,
G. Smith,Department of Mathematics, University of Bath.
L. Soicher, Department of Mathematics, QMC.
V. Stavridou, Department of Computer Science, University of Manchester.
H. Stephens, Worthing.
R. Stokes, ICL, Wokingham.
V. Stokes, London SW6.
B. Stonebridge, Department of Computer Science, University of Bristol.
M. Tangora, Mathematical Institute, University of Oxford.
M. Thomas, Department of Computer Science, University of Stirling.
S. Tobin, Department of Mathematics, University College, Galway.
T. Walker, Department of Mathematics, University of St Andrews.
P. Watson, Department of Computer Science, RHBNC.
D. Weir, Department of Mathematics, University of Glasgow.
B. Whitaker, School of Molecular Sciences, University of Sussex.
R. Whitehouse, Department of Mathematics, University of Keele.
M. Worboys, Department of Computing Studies, University of Leicester.
M. Wray, IST, Cambridge.
C. Wright, Department of Mathematics, University of Birmingham.
D. Wright, CSR, The City University.
H. Zand, Open University.