

**Annual Report 2002**  
**Work Group**  
*Theoretical Computer Science*

Prof. Dr. Helmut Alt – Prof. Dr. Günter Rote

January 2003

Institut für Informatik  
Fachbereich Mathematik und Informatik  
Freie Universität Berlin  
Takustraße 9  
D-14195 Berlin, Germany

## 1. Members of the Group

### (a) Professors

Alt, Helmut, Dr.

Rote, Günter, Dr.

### (b) Guests

Panagiotis Giannopoulos (September 1st through December 31st)

### (c) Assistants, scientific personnel, scholarship holders

Abdo, Hosam

Braß, Peter, Priv.-Doz. Dr. habil. (Heisenberg scholarship holder, until August 31st)

Brehm, Enno (Freie Universität Berlin, since September 1st)

Broser, Britta (graduate program *Combinatorics, Geometry, and Computation*, until May 19th, Freie Universität Berlin, since May 20th)

Dimitrov, Darko

Felsner, Stefan, Priv.-Doz., Dr. (Freie Universität Berlin)

Heinrich-Litan, Laura (graduate program *Computational Discrete Mathematics*)

Hoffmann, Frank, Dr. (Freie Universität Berlin)

Knauer, Christian, Dr. (Freie Universität Berlin)

Kortenkamp, Ulrich, Dr. (Freie Universität Berlin)

Kriegel, Klaus, Priv.-Doz., Dr. (Freie Universität Berlin)

Lenz, Tobias (Freie Universität Berlin, since September 1st)

Meißner, Lutz (Freie Universität Berlin, until April 30th)

Morin, Géraldine (Freie Universität Berlin, until August 31st)

Ribó Mor, Ares (graduate program *Combinatorics, Geometry, and Computation*, since February 1st)

Sturm, Astrid (Freie Universität Berlin, since June 16th)

### (d) Secretary

Knoll, Tamara (Freie Universität Berlin)

### (e) Coordinator of the graduate program

Felsner, Bettina (DFG, until September 30th)

Hoffkamp, Andrea (DFG, since November 1st)

### (f) Student assistants

Materlik, Dirk (DFG - german science foundation, FZT 86, since October 2002)

## 2. Guests and Lectures

MARKUS GROSS

*ETH Zürich* (February 4th)

Multiresolution Geometric Signal Processing

LORENZ WERNISCH

*Birkbeck College, London* (February 25th)

Genexpressions-Daten als Herausforderung an statistische Algorithmen

KNUT REINERT

*Celera Genomics, Washington* (February 25th)

Vom Genom zu Proteinexpression

GUNTER WEISS

*Technische Universität Dresden* (February 25th)

Aspekte populationsgenetischer und phylogenetischer Datenanalyse

THORSTEN PÖSCHEL

*Humboldt Universität zu Berlin* (February 26th)

Algorithmen zur Korrektur der Statistik endlicher Ensembles

ENNO OHLEBUSCH

*Universität Bielefeld* (February 26th)

Algorithmen für die Genomanalyse

WOLFGANG HUBER

*Department for Molecular Genome Analysis, Heidelberg* (February 26th)

Datenanalyse und Modellierung bei Hochdurchsatzexperimenten in der Genomforschung

SUE WHITESIDES

*School of Computer Science, McGill U., Montreal* (May 6th)

Fixed Parameter Tractability Results for Some Graph Layout Problems

EDOARDO AMALDI

*Politecnico di Milano* (May 6th)

On a new class of capacitated facility location problems arising in UMTS network planning

CSABA TÓTH

*ETH Zürich* (May 13th)

Illuminating disjoint line segments

FRANCISCO SANTOS

*Universidad de Cantabria* (June 17th)

Small point sets with disconnected space of triangulations

VOLKER DIEKERT

*Universität Stuttgart* (June 27th)

Neuere Ergebnisse auf dem Gebiet der Wortgleichungen

FRANZ-ERICH WOLTER

*Lehrstuhl Graphische Datenverarbeitung, Universität Hannover* (June 28th)

Characterizing and Moulding Shape

ROBERT CONNELLY

*Cornell University* (July 1st)

The Kneser-Poulsen Conjecture in the plane

DAVID BREMNER

*Technische Universität München* (July 1st)

Matroid Polytope Completion

VINCENZO MARRA

*University of Milano* (October 15th)

Lattice-ordered Abelian groups, and their neighbours

FRANZ AURENHAMMER

*Technische Universität Graz* (November 4th)

Flips and Surfaces for Pseudo-Triangulierungen

XAVIER VIENNOT

*Université Bordeaux* (November 11th)

Paths, braids, dimers, Young tableaux and reduced decomposition of permutations

GRAHAM BRIGHTWELL

*London School of Economics* (November 18th)

Bounding the Number of Linear Extensions

BETTINA SPECKMANN

*ETH Zürich* (December 9th)

Kinetic Data Structures

BORIS ARONOV

*Polytechnic University, New York* (December 16th)

Incidence problems: some history and new developments

### 3. Projects supported by external grants

- European graduate program COMBINATORICS, GEOMETRY, AND COMPUTATION financially supported by the the German Science Foundation (DFG)

Participating scientists:	Helmut Alt, Günter Rote
Coordination:	Bettina Felsner (until September 30th) Andrea Hoffkamp (since November 1st)
Scholarship holders:	Britta Broser (until May 19th) Ares Ribó Mor (since February 1st)
Duration of the program:	January 2000 through December 2002

This European graduate program, which exists since January 2000, is a joint initiative with scientists from the Departments of Computer Science and Mathematics at ETH Zurich, Switzerland. The existing cooperation between the main partners Berlin and Zurich will be enhanced by other partner institutes in Belgium, Great Britain, the Netherlands, Poland, the Czech Republic, and Hungary. In Berlin the participating institutions are the three universities in Berlin - Free University, Humboldt University, Technical University - and the Konrad Zuse Center for Scientific Computing.

Discrete mathematics and theoretical computer science are the main research fields in the program. In particular, geometrical aspects will play an important role. The major scientific goal of the program is to intensify the cooperation and interaction between discrete mathematics, algorithmics, and application areas. Therefore, especially at the partner institute in Zurich, faculty members working in application areas like geographic information systems, computer graphics, computer vision, and operations research, are participating. The program is subdivided into four basic research areas: combinatorics, geometry, optimization, and algorithms and computation. In each of these areas at least one of the partners in the program is an internationally renowned center of expertise.

- European graduate program MARIE CURIE TRAINING SITE  
financially supported by the European Commission

Participating scientists:	Helmut Alt, Günter Rote
Coordination:	Bettina Felsner (until September 30th) Andrea Hoffkamp (since November 1st)
Scholarship holders:	Panagiotis Giannopoulos (September 1st through November 30th)
Duration of the program:	2002 through 2004

The Marie Curie Training Site is connected with the European Graduate Program COMBINATORICS, GEOMETRY, AND COMPUTATION. Young researchers pursuing doctoral studies can be supported. They are provided with the possibility of undertaking part of their doctoral studies in a country other than their own. Applicants must already have an advisor and a dissertation project in mathematics, computer science, or a related area at their home university.

The Marie Curie Training Site is a joint initiative of the three universities of Berlin - Free University, Technical University, Humboldt-University - and the Konrad-Zuse-Research Center.

The scientific program ranges from theoretical fundamentals to applications. The areas of research are combinatorics, geometry, optimization, algorithms and computation.

- Project POINT PATTERN MATCHING FOR THE ANALYSIS OF GEL IMAGES  
financially supported by the German Science Foundation (DFG) until June 30th 2001  
and Bio-Rad Laboratories since July 10th 2001

Participants: Helmut Alt (project leader)  
Klaus Kriegel, Frank Hoffmann,  
Darko Dimitrov

Duration of the project: January 1st 1997 through June 30th 2001 (DFG)  
July 2001 through June 2003 (Bio-Rad)

This project started as a joint project of the Institute of Computer Science of Freie Universität and Deutsches Herzzentrum (German Heart Center) Berlin. The main topics of research are 2-dimensional gel images, that are produced by high-resolution gelelectrophoresis-techniques. The gelelectrophoresis has been established to be a central molecular-biological method for the analysis of the protein/DNA-compound of tissue samples. Each “spot” in a gel image that has been produced by gelelectrophoresis represents one protein appearing in the sample.

Ten years ago, the interpretation of gel images was mainly based on the exact (and time consuming) examination by experienced specialists. Although, in the meanwhile several software packages have been developed, there is still a lot of work to do towards a fully automatical solution of the problem. The main goal of the project is to design and implement algorithms for two essential steps of this analysis procedure: The detection of spots in a given gel image and the gel-matching (assignment of corresponding spots from different pictures).

Within the matching, geometric distortions, that appear when producing protein samples, are to be equilibrated. The corresponding algorithmic problem is a variation of 2-dimensional pattern recognition, where the main difficulty is produced by geometric distortion. The approach developed within this project makes use of methods and data structures of Computational Geometry. Some features of the matching algorithm are completely new (e.g. matching of images which overlap only partially). In the meanwhile these algorithms have proved to be a suitable supplement for some existing gel analysis packages. In consequence, we recently signed a licensing agreement with Bio-Rad Laboratories on the integration and the further development of our algorithms.

- Project ALGORITHMS FOR SHAPE MATCHING AND APPROXIMATION  
financially supported by the German science foundation (DFG)

Participants: Helmut Alt (project leader)  
Christian Knauer, Lutz Meißner,  
Leonid Scharf, Ludmila Scharf

Duration of the project: April 1st 1998 through March 31st 2002

The aim of this project is the development and partial implementation of algorithms for similarity determination and approximation of geometric objects. To achieve this,

methods of computational geometry are applied in order to recognize and approximate patterns and shapes. Earlier works of the work group concerning this topic shall be generalized to higher dimensions and to more general transformations for the matching of shapes, e.g. arbitrary affine mappings. In particular, data structures that allow to determine the most similar one out of a fixed set of shapes shall be developed. The practicability of the complex data structures and methods that most of the algorithms contain, as well as the application of approximation-approaches like for example reference-point-methods, shall also be examined.

- ECG – EFFECTIVE COMPUTATIONAL GEOMETRY FOR CURVES AND SURFACES financially supported by the European Community within the 5th framework programme

Participating scientists: Helmut Alt, Günter Rote (project leaders)  
 Christian Knauer  
 Ulrich Kortenkamp  
 Tobias Lenz (since October 1st)  
 Geraldine Morin (until September 30th)  
 Astrid Sturm (since June 16th)

Duration of the project: May 1st 2001 through April 30th 2004

ECG – Effective Computational Geometry for Curves and Surfaces is a continuation project of GALIA and CGAL. It is a joint project of six work groups in Sophia Antipolis (lead contractor), Zürich, Saarbrücken, Tel Aviv, Groningen and Berlin. The main subject will be the special problems arising with the proper handling of curves and curved surfaces in computational geometry.

- RESEARCH TRAINING NETWORK “COMBINATORIAL STRUCTURE OF INTRACTABLE PROBLEMS”

financially supported by the European Community within the 5th framework programme

Participating scientists: Helmut Alt (subproject leader)  
 Stefan Felsner  
 Günter Rote

Duration of the project: September 1st 2002 through August 31st 2006

This project is an international network aiming for improved mobility and cooperation between member sites in: Barcelona, Berlin, Bielefeld, Bordeaux, Budapest, Oxford, Patras, Pisa and Prague.

The general objective of the project is to build up a framework for the analysis of intractable combinatorial problems focused on the structural aspects of the problems. Toward this goal, we will merge techniques from algebra, logic, geometry, probability and statistical physics. The purpose of such a merging is to gain deeper insight on the intrinsic algorithmic difficulty for the solution of many classical problems in

Combinatorics and Graph Theory. As a major breakthrough, the use of high-level mathematical techniques will provide the means to overcome complexity issues by finding approximate solutions based on the structural knowledge of the problems. Scientific objectives:

- Identifying occurrences of hard instances of combinatorial problems
- Development of structural approaches for the analysis of hard instances of combinatorial problems
- Development of approximate algorithms based on structural knowledge
- Applications to particular hard problems in combinatorics and graph theory

The subproject implemented at our site is entitled “Geometry and order”

To find or to improve a structure on (large) point sets is a general problem which comes up in various applications. A deeper understanding of the combinatorial structure of point sets, geometric graphs and triangulations carries the potential of opening such problems for further investigations with the powerful tools provided by other areas of mathematics.

- RESEARCH PROJECT “CONSTRUCTION OF A TEXT-BASED INPUT MODULE FOR THE INTERACTIVE GEOMETRY SOFTWARE CINDERELLA”  
financially supported by the BMBF via the project “Design of a decentralized internet-supported teaching-learning environment for the mathematics education curriculum” in the framework of the program “Neue Medien in der Hochschule”  
Participating scientists: Ulrich Kortenkamp (subproject leader)  
Dirk Materlik  
Duration of the project: January 2001 through December 2003

In this project we develop an extension to the software Cinderella that is capable of understanding written construction texts as they arise in secondary school mathematics education. The written text is transformed into a syntactically correct, formal description of the construction, which can be used inside the software Cinderella. This leads to new methods that can be applied to the teaching of mathematics and to teacher training.

#### 4. Publications and Lectures

##### (a) Publications in Journals (with a selection procedure)

H. ALT, A. EFRAT, G. ROTE, C. WENK. *Matching planar maps*. July 2002, eingereicht.

H. ALT, C. KNAUER, C. WENK. *Comparison of distance measures for planar curves*. Algorithmica 2002. Special Issue on Shape Algorithmics. Accepted.

P. BRASS, C. KNAUER. *On counting point-hyperplane incidences*. Computational Geometry Theory and Applications, 2002. Special Issue: Selected Papers from the 17th European Workshop on Computational Geometry (EuroCG 2001). Accepted.



P. BRASS, C. KNAUER. *Testing the congruence of  $d$ -dimensional point sets*. International Journal of Computational Geometry and Applications, 12(1/2):115-124, 2002. Special Issue: Selected Papers from the 16th Annual Symposium on Computational Geometry (SoCG 2000).

A. EFRAT, F. HOFFMANN, K. KRIEGEL, C.SCHULTZ, C. WENK. *Geometric Algorithms for the Analysis of 2D-Electrophoresis Gels*. Journal of Computational Biology 9(2),299-316, 2002

A. EFRAT, F. HOFFMANN, C. KNAUER, K. KRIEGEL, G. ROTE, C. WENK. *Covering with Ellipses*. Algorithmica, 2002. Special Issue on Shape Algorithmics. Accepted.

S. FELSNER, G. LIOTTA, S. WISMATH. *Straight-Line Drawings on Restricted Integer Grids in Two and Three Dimensions*. Lecture Notes in Computer Science 2265 (2002), 328-343.

U. KORTENKAMP. *Kegelschnitte und projektive Geometrie*. “mathematik lehren”, 112:16–20, June 2002.

M. NOY, A. RIBÓ MOR. *Recursively Constructible Families of Graphs*. Accepted for publication in a special edition of Advances in Applied Mathematics devoted to the *Workshop on Tutte Polynomials*, Barcelona, Spain, September 12–15, 2001.

(b) Publications in Conference Proceedings (with a selection procedure)

P. BRASS, C. KNAUER. *Computing the symmetries of non-convex polyhedral objects in 3-space (Extended Abstract)*. In Proceedings of the 18th European Workshop on Computational Geometry, Warszawa, Poland, 2002.

R. CONNELLY, E. DEMAINE, G. ROTE. *Infinitesimally locked self-touching linkages with applications to locked trees*. In J. A. Calvo, K. Millett, E. Rawdon, editors, Physical Knotting, Linking, and Unknotting. Proceedings. Contemporary Mathematics. American Mathematical Society, 2002, pp. 287–311.

A. EFRAT, F. HOFFMANN, C. KNAUER, K. KRIEGEL, G. ROTE, C. WENK. *Covering Shapes by Ellipses*. In Proceedings of the Thirteenth ACM-SIAM Symposium on Discrete Algorithms (SODA), San Francisco, USA, 2002, pp 453–454.

R. ELSÄSSER, B. MONIEN, G. ROTE, S. SCHAMBERGER. *Toward optimal diffusion matrices*. International Parallel and Distributed Processing Symposium. IPDPS 2002, Proceedings. 15-19 April 2002, Fort Lauderdale, California. IEEE Computer Society Press 2002;

G. MORIN AND R. GOLDMAN. *Computer Aided Geometric Design*. Volume 9. 621-623. The Affine Invariant Analytic Blossom, 2002. L. HEINRICH-LITAN. *Exact  $L_\infty$ -Nearest Neighbor Search in High Dimensions (Extended Abstract)*. In Proceedings of the 18th European Workshop on Computational Geometry, Warszawa, Poland, 2002.

U. KORTENKAMP, J. RICHTER-GEBERT. *Making the move: The next version of Cinderella*. In Arjeh M. Cohen, Xiao-Shan Gao, and Nobuki Takayama, editors,

Proceedings of the First International Congress of Mathematical Software. World Scientific, 2002. A slightly modified version appeared in the proceedings of CCCG 02.

(c) Other Publications

C. KNAUER. *Algorithms for Comparing Geometric Patterns*. Dissertation, Freie Universität Berlin, 2002.

R. ELSÄSSER, B. MONIEN, G. ROTE, S. SCHAMBERGER. *Toward optimal diffusion matrices*. Technical report ALCOMFT-TR-02-98, Mai 2002.

U. KORTENKAMP, J. RICHTER-GEBERT. *Juni 2002, Kalenderblatt*. “MathInsight 2002”, Springer-Verlag, Heidelberg

A. STURM *A Survey of Methods for Approximating Curves*. ECG-TR-123101-01

G. ROTE. *Crossing the bridge at night*. EATCS Bulletin (Bulletin of the European Association for Theoretical Computer Science), No. 78, October 2002, pp. 241–246.

G. ROTE, C. A. WANG, L. WANG, Y. XU. *On constrained minimum pseudotriangulations*. July 2002.

(d) Technical Reports

**B 02-02** C. CONELLY, E. DEMAINE, G. ROTE. *Straightening polygonal arcs and convexifying polygonal cycles*.

**B 02-03** P. AGARWAL, R. KLEIN, C. KNAUER, M. SHARIR. *Computing the Detour of Polygonal Curves*.

**B 02-10** P. BRASS, L. HEINRICH-LITAN. *Computing the center of area of a convex polygon*.

(e) Lectures

HELMUT ALT

– *Geometric Methods for the Recognition and Analysis of Shapes*, Computer Science Colloquium, University of Magdeburg, January 22nd.

– *Geometric Patterns in Astronautics and Medicine*, Long Night of the Sciences, Freie Universität Berlin, June 15th.

– *Geometric Methods for Comparing Patterns and Shapes* 10th Anniversary of the Institute for Foundations of Information Processing, TU Graz, Austria, June 17th.

– *On the complexity of unfolding*, DIMACS Workshop on Geometric Graph Theory, Rutgers University, USA, September 30th.

– *On the complexity of unfolding*, Computer Science Colloquium, University of Bonn, December 9th.

BRITTA BROSER

– *Complex Tracing*, Colloquium of the graduate program *Combinatorics, Geometry, and Computation*, Freie Universität Berlin, June 17th.

## STEFAN FELSNER

- *Orthogonale Darstellungen planarer Graphen*, Mathematisches Institut, Georg-August-Universität Göttingen, January 9th.
- *Orthogonale Einbettungen planarer Graphen*. Mathematisches Institut, Technische Universität Berlin, April 25th.
- *Embedding Planar Graphs on Grid Surfaces*. CBMS Conf. on Geometric Graph Theory, Denton, USA, May 30th.
- *3-restricted geometric graphs*. Midsummer Combinatorial Workshop IX, Prag, CZ, July 30th.
- *Planare Graphen und Schnyder Färbungen*. DMV-Jahrestagung, Martin-Luther-Universität Halle-Wittenberg, September 16th.
- *Grid Surfaces, Planar Graphs and Lattices*. COMBSTRU Meeting, Prag, CZ, October 26th.
- *Diskrete Mathematik*. Herder Oberschule, Berlin, November 11th.

## LAURA HEINRICH-LITAN

- *Exact  $L_\infty$  Nearest Neighbor Search in High Dimensions*, 18th European Workshop on Computational Geometry in Warszawa, April 10th through 12th.
- *Nearest neighbor search in high dimensions*, Technische Universität Braunschweig, September 16th.
- *Sorting by reversals*, Disputation, Freie Universität Berlin, November 4th.

## FRANK HOFFMANN

- *On-line exploration of polygonal environments*, Colloquium of the graduate program "Combinatorics, Geometry, and Computation", Freie Universität Berlin, November 11th.

## CHRISTIAN KNAUER

- *Ein polynomielles Approximationsschema für das Rundreiseproblem in der Ebene*, Disputation Freie Universität Berlin, May 2nd.
- *The complexity of (un)folding*, Berliner Algorithmntag, Freie Universität Berlin, July 12th.
- *Computing the detour of polygonal curves*, Jeju CG Workshop, August 29th.
- *The complexity of (un)folding*, Seminar KIST, September 5th.

## ULRICH KORTENKAMP

- *New developments in Cinderella*, EIDMA Seminar Combinatorial Theory, TU Eindhoven (Prof. Arjeh Cohen), January 23rd.
- *Neueste Entwicklungen zum computerunterstützten Geometrieunterricht*, Nürnberger Kolloquium zur Didaktik der Mathematik 2002, Uni Nürnberg (Prof. Thomas Weth), February 14th.
- *Dynamische Geometrie mit Cinderella: Hintergründe, Möglichkeiten und Perspektiven*, Fortbildungsveranstaltung Mathematik für Realschulen und Gymnasien, Uni Würzburg (Prof. Hans-Georg Weigand), February 14th.
- *Dynamische Geometrie mit modernen Medien*, MNU Tagung, Hannover, March 25th.
- *Integration von Computeralgebra und Geometrie Computeralgebra in Lehre, Aus-*

- bildung und Weiterbildung III*, Kloster Schöntal, April 3rd.
- *Visualization of Geometry*, 38e Nederlands Mathematisch Congres, Minisymposium Visualisatie van wiskunde, TU Eindhoven, May 5th.
  - *Mathematische Grundlagen der Dynamischen Geometrie*, Fachschaftstagung Diskrete Mathematik des Cusanuswerk, Uder, May 11th.
  - *Automatisches Beweisen*, Fachschaftstagung Diskrete Mathematik des Cusanuswerk, Uder, May 12th.
  - *Was macht Cinderella heute?*, Geometrie! Studieninformationstage, Freie Universität Berlin, May 15th.
  - *Visualization of Riemann Surfaces*, VisMath 2002, Berlin, May 21st.
  - *Elektronische Arbeitsblätter mit Cinderella*, (Workshop) Lehrerfortbildung Baden-Württemberg, Speyer, June 3rd through 4th.
  - *Will Dynamic Geometry software make Descriptive Geometry easier, or will Dynamic Geometry software make Descriptive Geometry obsolete?*, NEXUS 2002 Relationships Between Architecture and Mathematics, Obidos, June 18th.
  - *Visual Construction of Interactive Learning Environments for Geometry*, CECM02 Computationally assisted mathematics and advanced collaborative environments, Simon Fraser University Vancouver (Prof. Jonathan Borwein), August 9th.
  - *Cinderella: Computation, Complexity, Geometry*, 14th Canadian Conference on Computational Geometry, Lethbridge, Canada (Prof. Steven Wismath), August 13th.
  - *Making the move: The next version of Cinderella*, International Congress of Mathematical Software, MMRC Beijing, August 17th.
  - *Appletfactory und Cinderella: Ein gutes Team*, Workshop Multimediale Mathematikausbildung, TU Berlin, October 9th.
  - *Experimental Mathematics and the Role of Proof in the Classroom*, Discrete Mathematics and Proof in the High School, MFO Oberwolfach, November 5th.
  - *Vorstellung des Bereichs Ausbildung*, Eröffnungsveranstaltung DFG-Forschungszentrum Berlin, November 20th.
  - *Experimentieren, Forschen, Lernen*, Vorstellungsvortrag, Universität Jena, November 11th.

## KLAUS KRIEGEL

- Algorithmen zur Analyse von Elektrophorese-Gelbildern, Kolloquium über künstliche Intelligenz der TU Berlin, January 15th.

## TOBIAS LENZ

- *Efficient Construction of Contour Trees Using Monotonic Paths*, ECG Workshop on Computational Topology, INRIA Sophia Antipolis, Frankreich, October 21st through 25th.

## GÉRALDINE MORIN

- *Filtering for parametric curves*, ECG—Effective Computational Geometry of Curves and Surfaces, general workshop, Zürich, May 22nd through 24th.
- *Filtering intersection of circular arcs*, Curves and Surfaces, St Malo, June 27th

through July 3rd.

- *Geometric filtering using the distance to the control polygon*, Dagstuhl Seminar on Geometric Modeling, Dagstuhl, May 12th through 17th.
- *Algorithme de Subdivision pour Objets Circulaires*, Groupe de travail en Modélisation Géométrique, Nantes, April 23rd through 25th.
- *Subdivision Algorithms*, Berliner Algorithmstag (BAT) Technische Universität Berlin, February 15th.

ARES RIBÓ MOR

- *Locked and Unlocked Self-Touching Linkages*, Annual Workshop of the Graduate Program “Combinatorics, Geometry and Computation”, Hiddensee, October 10th.
- *Self-Touching Linkages*, Frist Meeting of the European Network “Combinatorial Structure of Intractable Problems” (COMBSTRU I), Prague, Czech Republic, October 26th.
- *Locked and Unlocked Self-Touching Configurations*, Colloquium of the Graduate Program “Combinatorics, Geometry and Computation”, Freie Universität Berlin, November 18th.

GÜNTER ROTE

- *Determinants without divisions*, ECG—Effective Computational Geometry of Curves and Surfaces, general workshop, Zürich, May 22nd through 24th.
- *Pseudotriangulations, polytopes, and how to expand linkages*, (invited talk), 18th International Symposium on Computational Geometry, Barcelona, June 5th through 7th.
- *Integer programming in low dimensions*, (seminary lecture), Operations Research 2002, Klagenfurt, September 2nd through 5th.
- *Pursuit-evasion games with imprecise target location and buffer minimization in on-line scheduling*, 2nd Workshop on Combinatorics, Geometry, and Computation, Hiddensee, October 9th through 12th.
- *Pursuit-evasion and buffer minimization in online scheduling*, Workshop on Combinatorial Optimization. Oberwolfach, November 25th through 29th.

(f) Posters

BRITTA BROSER, ARES RIBÓ MOR

- poster presentation: *European graduate program COMBINATORICS, GEOMETRY, AND COMPUTATION*.  
Review Meeting June 24th.

**5. Courses, Seminars, Exercises and Laboratories (WS 01/02 and SS 02)**

H. ALT, G ROTE, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Lectures of the graduate program* Combinatorics, Geometry, and Computation, (winter semester 01/02).

P. BRASS, C. KNAUER, *Datenstrukturen*, course, (winter semester 01/02).

S. FELSNER, *Einführung in die Diskrete Mathematik (Introduction to Discrete Mathematics)*, course and exercises, (winter semester 01/02).

- S. FELSNER, *Mathematik für Informatiker III (Mathematics for computer scientists)*, course and exercises, (winter semester 01/02).
- F. HOFFMANN, *Informatik A*, course and exercises, (winter semester 01/02).
- F. HOFFMANN, C. KNAUER, *Algorithmen und Datenstrukturen (für Bioinformatik) (Algorithms and Data Structures)*, course and exercises, (winter semester 01/02).
- K. KRIEGEL, *Mathematik für Informatiker I (Mathematics for computer scientists)*, course and exercises, (winter semester 01/02).
- G. ROTE, C. KNAUER, L. MEISSNER, *Entwurf und Analyse von Algorithmen (Design and Analysis of Algorithms)*, course and exercises, (winter semester 01/02).
- R. ROTE, *Graphentheoretische Algorithmen (Graph Theoretic Algorithms)*, course and exercises, (winter semester 01/02).
- H. ALT, P. BRASS, S. FELSNER, K. KRIEGEL, G. ROTE, *Diplomanden- und Doktoranden-seminar der Theoretischen Informatik (Seminar for M.S. and Ph.D. students in theoretical computer science)*, seminar, (winter semester 01/02).
- S. FELSNER, K. KRIEGEL, *Ausgewählte Kapitel der Bioinformatik (Selected chapters of bioinformatics)*, seminar, (winter semester 01/02).
- G. ROTE, *Seminar über Algorithmen (Seminar about Algorithms)*, seminar, (winter semester 01/02).
- U. KORTENKAMP, *Programmieren mit Java (Programming with JAVA)*, laboratory, (winter semester 01/02).
- G. ROTE, U. KORTENKAMP, *Effiziente Algorithmen (Efficient Algorithms)*, laboratory, (winter semester 01/02).
- H. ALT, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Colloquium of the graduate program Combinatorics, Geometry and Computation*, colloquium, (winter semester 01/02).
- H. ALT, G. ROTE, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Lectures of the graduate program Combinatorics, Geometry and Computation*, (summer semester 02).
- H. ALT, C. KNAUER, *Algorithmische Geometrie (Algorithmic Geometry)*, course and exercises, (summer semester 02).
- P. BRASS, *Gittererzeugung (grid generation)*, course, (summer semester 02).
- S. FELSNER, *Graphentheorie (graph theory)*, course and exercises, (summer semester 02).
- F. HOFFMANN, *Informatik B*, course and exercises, (summer semester 02).
- K. KRIEGEL, *Mathematik für Informatiker II (mathematics for informatics II)*, course and exercises, (summer semester 02).
- K. KRIEGEL, *Grundlagen der Theoretischen Informatik (basics of theoretical computer scienc)*, course and exercises, (summer semester 02).
- C. KNAUER, *Komplexitätstheorie (complexity theory)*, course and exercises, (summer semester 02).

U. KORTENKAMP, *Kombinatorische Geometrie (combinatorial geometry)*, course and exercises, (summer semester 02).

G. MORIN, *Computer-Graphik (computer graphics)*, course and exercises, (summer semester 02).

R. ROTE, *Kombinatorische Optimierung (combinatorial optimization)*, course and exercises, (summer semester 02).

H. ALT, P. BRASS, S. FELSNER, K. KRIEGEL, G. ROTE, *Diplomanden- und Doktoranden-seminar der Theoretischen Informatik (Seminar for M.S. and Ph.D. students in theoretical computer science)*, seminar, (summer semester 02).

H. ALT, *Algorithmen für Quantencomputer (Algorithms for quantum computers)*, seminar, (summer semester 02).

G. ROTE, *Seminar über Graphenalgorithmien (seminar on graph algorithms)*, seminar, (summer semester 02). U. KORTENKAMP, *Software-Praktikum*, (summer semester 02).

U. KORTENKAMP, *Praktikum Effiziente Algorithmen (efficient algorithms)*, (summer semester 02).

H. ALT, G. ROTE, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Colloquium of the graduate program Combinatorics, Geometry and Computation*, colloquium, (summer semester 02).

## 6. Organisation of scientific events

REVIEW MEETING OF THE GRADUATE PROGRAM *Combinatorics, Geometry and Computation*, June 24th.

Organization: H. Alt, B. Felsner.

28. BERLINER ALGORITHMENTAG BAT, July 12th.

Organization: H. Alt.

ANNUAL WORKSHOP OF THE GRADUATE PROGRAM “*Combinatorics, Geometry, and Computation*”, Hiddensee, October 9th through 12th.

Organization: H. Alt, B. Broser.

## 7. Doctoral Graduations

CHRISTIAN KNAUER:

*Algorithms for Comparing Geometric Patterns*,

Disputation (May 2nd) on: *A PTAS for the traveling salesman problem*

Supervisor: Helmut Alt.

LAURA HEINRICH-LITAN:

*Exact  $L_\infty$  Nearest Neighbor Search in High Dimensions*,

Disputation (November 4th) on: *Bounds of the Topological Method*

Supervisor: Helmut Alt.

CAROLA WENK:

*Geometrical Recognition of Pattern in Higher Dimensions*,  
Disputation (December 16th) on: *Software Watermarking*  
Supervisor: Helmut Alt.

## 8. Diplomas

EKATERINA LANGER.

Implementieren von parametrisierten Kurven für CGAL  
(Implementation of parametrized curves for CGAL)  
Supervisor: Helmut Alt.

TOBIAS LENZ.

Effiziente Konstruktion von Konturbäumen in beliebigen Dimensionen  
(Efficient Construction of Contour Trees in Arbitrary Dimensions)  
Supervisor: Günter Rote.

MARTIN MIELICH.

Binäre Zerlegungen der Ebene  
(Binary Decompositions of the Plane)  
Supervisor: Stefan Felsner.

ANETTE RÜCKERT.

Zweidimensionales Puzzleproblem  
(A Two-dimension puzzle-problem)  
Supervisor: Helmut Alt.

OLIVER SANDER.

Constructing Boundary and Interface Parametrizations for Finite Element Solvers  
Supervisor: Stefan Felsner.

## 9. Miscellaneous

HELMUT ALT

- Speaker of the graduate program *Combinatorics, Geometry, and Computation*.
- Speaker of the *Section Theoretical Informatics* (Fachausschuss Theoretische Informatik) of Gesellschaft für Informatik (GI).
- Speaker of the Research Training Network *Combstru* in Berlin.
- Member of the editorial board of *ORDER*.
- Member of the departmental council (Fachbereichsrat) mathematics and computer science, FU Berlin.
- Chair of the Ph.D. committee for Christian Knauer.
- Chair of the Ph.D. committee for Laura Heinrich-Litan.
- Chair of the Ph.D. committee for Carola Wenk.
- Member of the Ph.D. committee for Sven Behnke.



- Member and vice chair of the program committee for Symposium on Theoretical Aspects of Computer Science, STACS 2002, Antibes, France.
- Chair, Program Committee of Symposium on Theoretical Aspects of Computer Science (STACS 2003), Freie Universität Berlin.
- Co-editor of Proceedings *Symposium on Theoretical Aspects of Computer Science*, STACS 2002.
- Editor of Springer Lecture *notes in Computer Science*, Vol. 2285.
- Editor Special Issue of *Computational Geometry, Theory and Applications* with selected contributions from the European Workshop on Computational Geometry CG01
- Referee for DFG - Deutsche Forschungsgemeinschaft (German Science Foundation)
- Referee for various journals and conferences
- Co-Referee for the diploma thesis of Tobias Lenz.
- Organization of the Annual Workshop of the graduate program *Combinatorics, Geometry, and Computation*”, Hiddensee, October 9th through 12th.

## BRITTA BROSER

- Member of the Ph.D. committee for Manfred Stelzer.
- Organization of the Annual Workshop of the graduate program *Combinatorics, Geometry, and Computation*”, Hiddensee, October 9th through 12th.
- Referee for *STACS 2003*.
- Referee for *STOC 2003*.
- Presentation of the *Cinderella Projekt* at the Long Night of the Sciences, Freie Universität Berlin, June 15th.
- Poster presentation at the review meeting of the Graduate Program “Combinatorics, Geometry and Computation”, Berlin, June 24th.
- Coordination of the talks in the Noon Seminar.

## STEFAN FELSNER

- Editor for *ORDER*
- Member of the Ph.D. committee for Hans Mielke.
- Co-organizer of *22. Kolloquium über Kombinatorik* , November 15th through 16, Magdeburg
- Referee for *ICALP 02*.
- Referee for *SIAM J. Discrete Mathematics*.
- Referee for *STACS 2003*.
- Referee for *STOC 2003*.
- Referee for *Discrete Mathematics*.
- Referee for *Algorithmica*.
- Referee for *ORDER*.
- Ranking on lists for professorates:
  - 2nd: C3 Theoretische Informatik – Univ. Göttingen
  - 2nd: C4 Diskrete Mathematik – Univ. Hannover
  - 1st: C3 Diskrete Mathematik – Techn. Univ. Berlin

LAURA HEINRICH-LITAN

- Referee for *STACS 2003*.
- Referee for *ESA 2002*

FRANK HOFFMANN

- Member of the audit committee for informatics at the FU Berlin.
- Member of the audit committee for bioinformatics at the FU Berlin.
- Member of the joint committee for bioinformatics at the FU Berlin.
- Member of the selection committee for the position of professor in Computational Stochastics.
- Referee for *ICALP 2002*.
- Referee for *SoCG 2002*.
- Referee for *ESA 2002*.
- Referee for *STOC 2003*.
- Referee for *STACS 2003*.
- Referee for the *Journal of Automata, Languages and Combinatorics*.
- Referee for the journal *International Journal on Computational Geometry and Applications*.
- 3rd place Award for best teaching in summer semester 2002, (Informatik B)

CHRISTIAN KNAUER

- Referee for *IEE Proceedings Vison, Image and Signal Processing*.
- Referee for *SoCG 2002*.
- Referee for *ESA 2002*.
- Referee for *STACS 2003*.
- Referee for *STOC 2003*.
- Member of the Ph.D. committee for Laura Heinrich-Litan.
- Member of the Ph.D. committee for Carola Wenk.
- Member of the EDV-Committee of the Institut für Mathematik und Informatik, Freie Universität Berlin.
- Organisation of STACS 2003, Freie Universität Berlin.

KLAUS KRIEGEL

- Member of the institute council (Institutsrat) mathematics and computer science, Freie Universität Berlin.
- Referee for *STACS 03*.
- Referee for *STOC 03*.
- Referee for the journal *Computational Geometry: Theory and Applications*.

ULRICH KORTENKAMP

- Council Member of the Workgroup *Computeralgebra of GI, DMV, GAMM*.
- Member and co-aplicant of the research center *Modellierung, Simulation und Optimierung (Modelling, Simulation and Optimization)* Berlin.
- Member of the departmental council (Fachbereichsrat) mathematics and computer science, Freie Universität Berlin.
- Research visit at TU Eindhoven (Prof. Arjeh Cohen), Netherlands, January 21st through 25th.

- Research visit at CECM, Burnaby (Prof. Jon Borwein), Canada, July 28th through August 11th.

TOBIAS LENZ

- Referee for *STOC 2003*.

ARES RIBÓ MOR

- Poster presentation at the review meeting of the Graduate Program “Combinatorics, Geometry and Computation”, Berlin, June 24th.
- Member of the local organizing committee for the 18th International Symposium on Computational Geometry, Barcelona, June 5th through 7th
- Referee for *ESA 2002*.
- Referee for *STACS 2003*.
- Referee for *STOC 2003*.

GÜNTER ROTE

- Editor of the journal *Computing*.
- Member and chairman of the selection committee for the position of professor in bioinformatics algorithms.
- Member of the selection committee for the position of professor in mathematical image processing.
- Member of program committee for 18th International Symposium on Computational Geometry, Barcelona, June, 5th through 7th 2002.
- Member of program committee for ESA 2002, 10th Annual European Symposium on Algorithms, Rom, September 17th through 21st 2002.
- Member of program committee for STOC 2003, 35th Annual ACM Symposium on Theory of Computing, San Diego, June 9th through 11th 2003.
- Coordinator of the Erasmus/Socrates student exchange program for the departments of mathematics and computer science.
- Referee for International Conference on Computational Science’01, San Francisco, May 2001.
- Referee for ICALP’2002, (28th Annual International Colloquium on Automata, Languages and Programming).
- Referee for Mathematical Foundations of Computer Science (MFCS), 2001.
- Referee for Combinatorics, Graph Theory, and Applications, EUROCOMB 01, Barcelona.
- Referee for STACS’2003, (20th Annual Symposium on Theoretical Aspects of Computer Science).
- Referee for the journal *Random Structures and Algorithms*.
- Referee for the journal *Computing*.
- Referee for the journal *Mathematical Programming*.
- 2nd Referee for the diploma thesis of Ekaterina Langer.
- 2nd Referee for the diploma thesis of Philipp Metzner.
- Co-Referee for the Ph.D. thesis of Csaba Dávid Tóth (ETH Zürich).

ASTRID STURM

- Referee for *ESA 2002*.
- Referee for *STACS 2003*.
- Referee for *STOC 2003*.

## Appendix:

Talks in the *Noon Seminar* 12.00 a.m.

- January 8th: ULLI KORTENKAMP  
Enumeration of Chirotopes
- January 10th: KLAUS KRIEGEL  
On polyhedral graphs
- January 15th: CHRISTIAN KNAUER  
Computing the Hausdorff distance for semialgebraic sets
- January 17th: HELMUT ALT  
Man, dog, and two graphs
- January 22th: GÜNTER ROTE  
Online Fréchet distance
- January 24th: ANDREAS PAFFENHOLZ, UNIVERSITÄT BONN  
Rigidity and the Marked Length Spectrum on Surfaces.
- January 29th: STEFAN FELSNER  
3-Orientierungen und 3-zusammenhängende planare Graphen
- January 31st: LAURA HEINRICH-LITHAN  
Sparse Delaunay Triangulations
- February 5th: GÉRALDINE MORIN  
Multiplying points
- February 7th: PETER BRASS  
On the generalized orchard problem
- February 12th: KLAUS KRIEGEL  
Searching for mobile intruders in polygons
- February 14th: BRITTA BROSER  
A Homotopy Method for Polynomial Root-Finding
- February 19th LUTZ MEISSNER  
Lattice Paths and Directed-Convex Polyominoes
- February 21st: FRANK HOFFMANN  
Sweeping Simple Polygons with a Chain of Guards
- February 28th: ULRICH KORTENKAMP  
12209
- March 5th: GÜNTER ROTE  
Obnoxious facility location in trees
- March 7th: DARKO DIMITROV  
Feature-based Matching of Triangular Meshes
- March 12th: HELMUT ALT  
The Sunset Problem

March 14th: STEFAN FELSNER

Circular Arc Graphs

March 19th NEBOJSA LAZIC

Virtual reality: der virtuelle Flug des Satelliten BIRD — Visualisierung und Interaktion auf der Basis von VRML und Javascript

March 21st: KLAUS KRIEGEL

Simplicial Decomposition and Graph Coloring

March 26th: PETER BRASS

Exact nearest-neighbour search for the Hausdorff distance

March 28th: FRANK HOFFMANN

The complexity of link diagrams

April 4th: TOBIAS LENZ

Efficient Generation of Contour Trees in Two Dimensions

April 9th: MARTIN KUTZ

Of Kings and Orders – Reachability in Tournaments

April 11th: ASTRID STURM

Retargierbarkeit von CAD-Werkzeugen mit graphischen Benutzeroberflächen

April 16th: BRITTA BROSER

Complex Tracing

April 18th: GÜNTER ROTE

Locked Linkages and Rigidity of Self-Touching Frameworks

April 23rd: GÉRALDINE MORIN

Upper bound on approximation of polynomials and splines by their control polygon

April 25th: ULRICH KORTENKAMP

Visualization of Riemann Surfaces

April 30th: HARRY COONCE

Mathematical Genealogy Project

May 2nd: PETER BRASS

Approximation by primitive lattice vectors

May 7th: HELMUT ALT

Where Hausdorff meets Fréchet

May 14th: DARKO DIMITROV

Efficient variants of the ICP algorithm

May 16th: SUE WHITESIDES

Folding the Carpenter's Ruler

May 21st: CHRISTIAN KNAUER

Nearest Neighbor Data Structures for Nice Pattern Spaces

- May 28th: ULRICH KORTENKAMP  
Visualization of Riemann Surfaces II
- May 30th: FRANK HOFFMANN  
Coloring of Quadrilaterizations
- June 4th: GÉRALDINE MORIN  
The Convex Hull of rational Plane Curves
- June 6th: STEFAN FELSNER  
Pairwise Intersections
- June 11th: ASTRID STURM  
Optimal polygonal approximation of digitized curves using the sum of square deviations criterion
- June 13th: CSABA TOTH  
Alternative Path Through Disjoint Line Segments
- June 18th: BHATT  
A Novel Data-structure to Compute Dominating Set and Convex Hull in a Plane
- June 20th: PETER BRASS  
Maximal axis-aligned ellipses in simple polygons
- June 25th: KLAUS KRIEGEL  
Even triangulations
- June 27th: BETTINA SPECKMANN  
Maintenance of Context-Sensitive Hierarchical Representations for Disjoint Simple Polygons
- July 2nd: MIGUEL DOMINGO  
Zufaellige Euler-Touren (Random Euler Tours)
- July 4th: STEFAN FELSNER  
 $K_6$  and Witt-Designs
- July 9th: BRITTA BROSER  
Euler's Formula: A Topological Theorem
- July 11th: GÜNTER ROTE  
Crossing the Bridge at Night
- July 16th: HELMUT ALT  
Unfolding trees and graphs, if possible
- July 18th: DARKO DIMITROV  
The Power Crust
- July 23rd: CHRISTIAN KNAUER  
Towards More Efficient Algorithms for Computing the Fréchet Distance (in some cases)
- July 25th: MANUEL BODIRSKY  
Efficiently Generating Random Outerplanar Graphs
- August 1st: ASTRID STRUM  
On the bit complexity of minimum link paths: Superquadratic algorithms for problems solvable in linear time

August 20th: STEFAN FELSNER  
Orientations of planar graphs

August 22nd: MARTIN KUTZ  
Mate in Two - Biased Positional Games on 3-Uniform Hypergraphs

August 27: PETER BRASS  
Open Problems

August 29th: PHILIPP METZNER  
Polyedrische Karten mit wenigen Kanten

September 10th: TOBIAS LENZ  
Schnelle Konstruktion von Kontourbäumen

September 12th: PANOS GIANNOPOULOS  
Approximating the maximum area of overlap of unions of discs

September 17th: FRANK HOFFMANN  
Even triangulations (without algebra)

September 19th: ASTRID STURM  
On the bit complexity of minimum link paths

September 24th: ARES RÍBO MOR  
Locked and unlocked self-touching linkages

September 26th: STEFAN FELSNER  
Lattice Structures for Orientations of Graphs

October 1st: LAURA HEINRICH-LITAN  
Computing the center of area of a convex polygon in linear time

October 17th: HOSAM ABDO  
Computing the volume of the spherical Tetrahedra

October 22nd: KLAUS KRIEGEL  
On sleeping bags for baby snakes

October 24th: ULRICH KORTENKAMP  
Encoding Math with OpenMath

October 29th: BRITTA BROSER  
A useful tool in Dynamic Geometry?

October 31st: HELMUT ALT  
About the first order theory of the reals

November 5th: ANDREAS WENDLEDER  
Simulation optischer Effekte von Auge und Kamera / Kamerakalibrierung

November 7th: GÜNTER ROTE  
Pursuit-Evasion Games with Imprecise Target Location and Buffer Minimization in  
On-Line-Scheduling: Second Attempt

November 12th: CHRISTIAN KNAUER  
Collecting coupons and sorting in external memory

November 14th: STEFAN FELSNER  
Schnyder in Bordeaux



- November 19th: EKATERINA LANGER  
Implementierung parametrischer Kurven für CGAL (Implementation of parametric curves for CGAL)
- November 21st: DARKO DIMITROV  
Surface matching by point's fingerprint
- November 26th: FRANK HOFFMANN  
Colored Pebbles in Art Galleries I
- November 28th: ASTRID STURM  
Shortest-Path without Wavelength Conversion Requirements
- December 3rd: GÜNTER ROTE  
Strictly convex drawings of graphs on small grids
- December 5th: GÜNTER ROTE  
Incremental constructions con brio
- December 10th: BETTINA SPECKMANN  
The Path of Pseudo-Triangulations
- December 12th: PAWEL ZYLINSKI  
The Guarded Guards Problem in Art Galleries
- December 17th: BORIS ARONOV  
Predicting the Effort of Ray-Shooting
- December 19th: PANOS GIANNOPOULOS  
Overlapping Unit Discs Under Translations: Second attempt and improved algorithms