

**Annual Report 2001**  
**Work Group**  
***Theoretical Computer Science***

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

January 2002

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) Visiting professors

Xu, Yinfeng, Prof. Dr. ( until January 17th)

### (c) Guests

Tóth, Czaba (until March 31st)

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

Abdo, Hosam (since September 1st)

Braß, Peter, Priv.-Doz. Dr. habil. (Heisenberg scholarship holder)

Broser, Britta, (graduate program *Combinatorics, Geometry, and Computation* , since Oktober, 1st)

Dimitrov, Darko

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

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

Hoffmann, Frank, Dr. (Freie Universität Berlin)

Kaffanke, Astrid (Freie Universität Berlin, until April 30th)

Knauer, Christian (Freie Universität Berlin)

Kortenkamp, Ulrich, Dr. (Freie Universität Berlin)

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

Meißner, Lutz (Freie Universität Berlin)

Morin, Géraldine (Freie Universität Berlin, since October 20th)

Wenk, Carola (DFG - german science foundation)

### (e) Secretary

Knoll, Tamara (Freie Universität Berlin)

### (f) Coordinator of the graduate program

Felsner, Bettina (DFG)

### (g) Student assistants

Scharf, Ludmila (DFG - german science foundation, until October 1st)

Scharf, Leonid (DFG - german science foundation, until October 1st)

## 2. Guests and Lectures

JORGEN BANG-JENSEN

*University of Southern Denmark at Odense* (January 22nd)

Paths and Cycles in Directed Graphs

JON RANDALL

*Bio-Rad Laboratories* (January 28th through 29th)

ANDRÁS FRANK

*Eötvös Loránd University Budapest* (January 29th)

Edge-connecton of graphs and hypergraphs

JÜRIG NIEVERGELT

*ETH Zürich* (February 5th)

Exhaustive search, combinatorial optimization and enumeration: Exploring the potential of raw computing power

STEFAN E. SCHMIDT

*New Mecixo State University* (February 5th)

Block Space-Time Codes in Wireless Communication

JOHANNES BUCHMANN

*Technische Universität Darmstadt* (May 7th)

How secure is public key cryptography?

ILEANA STREINU

*Northhampton, MA* (May 28th)

Pseudo-Triangulations, Rigidity Theory and Efficiently Planning Non-Colliding Robot Arm Motions

MICHIEL SMID

*Universität Magdeburg* (May 28th)

Translating a planar object to maximize point containment: Exact and approximation algorithms

JOHANNES BLÖMER

*Universität Paderborn* (July 9th)

Grids and Cryptography

OTFRIED CHEONG

*Utrecht* (July 9th)

Paths with bounded curvature

TAKESHI TOKUYAMA

*Tohoku University* (December 3rd)

Combinatorics and algorithms on rounding sequences and matrices

BOJAN MOHAR

*University of Ljubljana, Slovenia* (December 17th)

Coloring-flow duality for locally planar graphs

### 3. Projects supported by external grants

- Graduate program COMPUTATIONAL DISCRETE MATHEMATICS financially supported by the German Science Foundation (DFG)

Participating scientists: Helmut Alt (speaker)  
 Günter Rote  
 Coordination: Bettina Felsner  
 Scholarship holders: Laura Heinrich-Litan  
 Duration of the project: October 1991 through September 2000  
 (Auslauffinanzierung bis September 2001)

This is a joint graduate program of scientists of Freie Universität, Humboldt-Universität, Technische Universität, and Konrad-Zuse-Zentrum.

Taking into consideration the algorithmic point of view, discrete mathematics has developed from classical fields like combinatorics or graph-theory into a field which unifies aspects of fundamental as well as of applied science in a unique way. Examples are: coding theory and data security, algorithmic number theory and computational algebra, computational geometry and robotics, network planning, design of algorithms – within all these topics, computational discrete mathematics delivers foundations and leads to the applications. The main goal of the graduate program is to work out contributions to important actual questions within the fundamental principles and applications of science by concentrating research and education.

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

Participating scientists: Helmut Alt, Günter Rote  
 Coordination: Bettina Felsner  
 Scholarship holders: Britta Broser (since October 10th)  
 Duration of the program: January 2000 through December 2002

This European graduate program, which exists since January 2000, has basically the same faculty like the old one (Algorithmische Diskrete Mathematik) and 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.

- 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, Carola Wenk,  
 Christof Schultz, 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  
Carola Wenk

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  
Geraldine Morin  
Carola Wenk

Duration of the project: May 1st 2001 through April 30st 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 AND TRAINING NETWORK COMBINATORIAL STRUCTURE OF INTRACTABLE PROBLEMS

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

starting 2002, application and contract preparation in 2001

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

Duration of the project: 2002 – 2007

#### RESEARCH AND TRAINING NETWORK COMBINATORIAL STRUCTURE OF INTRACTABLE PROBLEMS

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. The project has been accepted by the European Union and will start in 2002.

#### 4. Publications and Lectures

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

O. AICHHOLZER, F. AURENHAMMER, C. ICKING, R. KLEIN, E. LANGETEPE, G. ROTE. *Generalized self-approaching curves*. Discrete Applied Mathematics, 109:3–24, 2001.

P. BRASS. *On finding maximum-cardinality symmetric subsets ‘JCDCG 2000’* (Japanese Conf. Disc. Comput. Geom.) (J. Akiyama, M. Kano, M. Urabe, Eds.) Springer LNCS 2098 (2001) 106–112.

P. BRASS, M. LASSAK. *Problems on the approximation by triangles*. Geombinatorics, 10:103–115, 2001.

P. BRASS, J. PACH. *The maximum number of times the same distance can occur among the vertices of a convex  $n$ -gon is  $O(n \log n)$* . ‘J. Combinatorial Theory’ Ser. A 94 (2001) 178–179.

- P. BRASS, G. ROTE, K. J. SWANEPOEL. *Triangles of extremal area or perimeter in a finite planar point set*. Discrete and Computational Geometry, 26:51–58, 2001.
- R. BURKARD, H. DOLLANI, Y. LIN, G. ROTE. *The obnoxious center problem on a tree*. SIAM J. Discrete Mathematics, Vol. 14, No.4, 498–509, 2001.
- S. FELSNER. *Convex drawings of Planar Graphs and the Order Dimension of 3-Polytopes*. Order, (18):19–37, 2001.
- S. FELSNER. *The Skeleton of a Reduced Word and a Correspondence of Edelman and Greene*. Electronic Journal of Combinatorics, 8(R10):21p., 2001.
- S. FELSNER, H. WEIL. *Sweeps, Arrangements and Signotopes*. Discrete Applied Mathematics, 109:67–94, 2001.
- S. FELSNER, G. ZIEGLER. *Zonotopes Associated with Higher Bruhat Orders*. Discrete Mathematics, 241:301–312, 2001.
- F. HOFFMANN, C. ICKING, R. KLEIN, K. KRIEGEL. *The Polygon Exploration Problem*. SIAM Journal on Computing, 31(2):577–600, 2001.
- U. KORTENKAMP. *Dynamische Geometrie*. Mitteilungen der DMV, 3:33–40, 2001.
- G. MORIN, R. GOLDMAN. *On the smooth convergence of subdivision and degree elevation for Bézier curves*. Comput. Aided Geometric Design, 18:657–666, 2001.
- G. MORIN, R. GOLDMAN. *Trimming analytic functions using right sided Poisson subdivision*. Computer Aided Design, 33:813–824, 2001.
- G. MORIN, J. WARREN, H. WEIMER. *On the smooth convergence of subdivision and degree elevation for Bézier curves*. Comput. Aided Geometric Design (Special Issue Subdivision Algorithms), 18(5):657–666, 2001.

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

- H. ALT, L. HEINRICH-LITAN. *Exact  $L_\infty$ -Nearest Neighbor Search in High Dimensions*. Proceedings of the 17th ACM Symposium on Computational Geometry, pages 157–163. Association for Computing Machinery, June 2001.
- H. ALT, C. KNAUER, C. WENK. *Matching polygonal curves with respect to the Fréchet distance*. Proceedings 18th International Symposium on Theoretical Aspects of Computer Science, pages 63–74, 2001.
- C. DUNCAN, A. EFRAT, S. KOBOUROV, C. WENK. *Drawing with Fat Edges*. Proceedings of the 9th International Symposium on Graph Drawing (GD), 2001.
- A. EFRAT, F. HOFFMANN, K. KRIEGEL, C. SCHULTZ, C. WENK. *Geometric Algorithms for the Analysis of 2D-Electrophoresis Gels*. Proceedings of the Fifth Annual International Conference on Computational Molecular Biology (RECOMB), pages 114–123, Montreal, Canada, 2001.
- F. EISENBRAND, G. ROTE. *Fast 2-variable integer programming*. K. Aardal, B. Gerards, editors, IPCO 2001—Proceedings of the 8th Conference on Integer Programming and Combinatorial Optimization, Utrecht, volume 2081 of Lecture Notes in Computer Science, pages 78–89. Springer-Verlag, 2001.



F. EISENBRAND, G. ROTE. *Fast reduction of ternary quadratic forms*. CaLC 2001—Cryptography and Lattices Conference 2001, Providence, Rhode Island, volume 2146 of Lecture Notes in Computer Science, pages 32–44. Springer-Verlag, 2001.

S. FELSNER, G. LIOTTA, S. WISMATH. *Straight-Line Drawings on Restricted Integer Grids in Two and Three Dimensions*. P. Mutzel, M. Jünger, editors, Proceedings of Graph Drawing 2001, Lecture Notes in Comput. Sci., 2001.

U. KORTENKAMP. *Die interaktive Geometrie-Software Cinderella*. U. Beck, W. Sommer, editors, Tagungsband Learntec 2001, volume 2, pages 525–532, Karlsruhe, October 2001.

G. ROTE. *Division-free algorithms for the determinant and the Pfaffian: algebraic and combinatorial approaches*. H. Alt, editor, Computational Discrete Mathematics, volume 2122 of Lecture Notes in Computer Science, pages 123–139. Springer-Verlag, 2001.

(c) Other Publications

H. ALT. *Computational Discrete Mathematics, Advanced Lectures (Ed.)*. volume 2122 of Lecture Notes in Computer Science. Springer, 2001.

H. ALT. *The nearest neighbor*. H. Alt, editor, Computational Discrete Mathematics, volume 2122 of Lecture Notes in Computer Science, pages 13–24. Springer, 2001.

H. ALT, C. KNAUER, C. WENK. *Bounding the Fréchet distance by the Hausdorff distance*. Proceedings of the Seventeenth European Workshop on Computational Geometry, Berlin, Germany, pages 166–169, 2001.

S. FELSNER. *Geodesic Embeddings of Planar Graphs*, 2001. Draft.

L. HEINRICH-LITAN. *Time-Space tradeoffs for exact  $L_\infty$ -Nearest Neighbor Search in High Dimensions*. Proceedings of the Seventeenth European Workshop on Computational Geometry, Berlin, Germany, 2001.

D. RANDALL, G. ROTE, F. SANTOS, J. SNOEYINK. *Counting triangulations and pseudo-triangulations of wheels*. T. Biedl, editor, Proceedings of the 13th Canadian Conference on Computational Geometry, Waterloo, pages 149–152, 2001.

G. ROTE. *Division-free algorithms for the determinant and the Pfaffian: algebraic and combinatorial approaches*. H. Alt, editor, Computational Discrete Mathematics, volume 2122 of Lecture Notes in Computer Science, pages 123–139. Springer-Verlag, 2001.

G. ROTE, F. SANTOS, I. STREINU. *Expansive motions and the polytope of pointed pseudo-triangulations*. September 2001, manuscript, submitted for publication.

(d) Technical Reports

**B 01-01** S. FELSNER, N. MORAWE. *Infeasibility of Systems of Halfspaces*.

- B 01-07** H. ALT, P. BRASS, M. GODAU, C. KNAUER, C. WENK. *Computing the Hausdorff distance of geometric patterns and shapes.*
- B 01-08** A. EFRAT, F. HOFFMANN, C. KNAUER, K. KRIEGEL, G. ROTE, C. WENK. *Covering with Ellipses.*
- B 01-09** H. ALT, C. KNAUER, C. WENK. *Comparison of distance measures for geometric shapes.*
- B 01-10** P. BRASS, C. KNAUER. *Nearest neighbour search in Hausdorff distance pattern spaces.*

(e) Lectures

## HELMUT ALT

- *Wie bestimmt man die 1000000000000000. Stelle von  $\pi$  ? (How to determine the 1000000000000000th digit of  $\pi$  ?)*, Urania Berlin, March 13th.
- *Geometric Methods in Shape Recognition and Matching* Workshop on Shape-Based Retrieval & Analysis of 3D Models, Princeton University, USA, October 30th.
- *Geometric Methods in Shape Recognition and Matching*, Colloquium, Department of Computer Science, Arizona State University, Tempe, USA, November 30th.

## PETER BRASS

- *Combinatorial geometry problems in pattern matching*, AMS 2001 Spring Southeastern Meeting, Columbia, SC, USA, March 16th through 18th.
- *Combinatorial geometry problems in pattern matching*, Computational Geometry, Dagstuhl Seminar 11121, March 18th through 23rd.
- *Another lower bound on Hopcroft's problem*, European Symposium on Computational Geometry, Berlin, March 26th through 28th.
- *Diskrete Extremalprobleme aus der Mustererkennung*, Kolloquiumsvortrag (Bewerbungsvortrag Professur Algorithmische und Diskrete Mathematik) an der TU Chemnitz, July 3rd.
- *Punktmengen mit vielen homothetischen Teilmengen*, DMV-Jahrestagung, Wien, Austria, September 16th through 22nd.
- *Algorithmische Probleme der Punktmustererkennung*, Kolloquiumsvortrag (Bewerbungsvortrag Professur Algorithmische und Diskrete Mathematik) an der Universität Magdeburg, October 2nd.
- *On point sets without  $k$  collinear points*, Kolloquium über Kombinatorik, Braunschweig, November 16th through 17th.

## STEFAN FELSNER

- *Infeasibility in Systems of Halfspaces*, 17th European Workshop on Computational Geometry Freie Universität Berlin, March 26th-28th.
- *Zeichnen planarer Graphen und Dimension von Polytopen*. Jahrestreffen GIBU, Schloß Dagstuhl, April 4th.
- *Drei Viertel über Halbordnungen*. Technische Universität Chemnitz, July 4th.
- *Representations of Arrangements of Pseudolines*. Elbe Sandstones Geometry Workshop, Rynartice, Czech Republic, July 28th.

- *Planare Graphen auf orthogonalen Flächen*. Fakultät für Informatik, Universität Magdeburg, October 1st.
- *Straight-line drawings on restricted integer grids*. Colloquium on Combinatorics, Braunschweig, November 11th.
- *Orthogonale Darstellungen planarer Graphen*. Institut für Mathematik, Universität Hannover, December 14th.

## LAURA HEINRICH-LITAN

- *Nearest neighbor search in high dimensions*, Graduiertenkolleg Algorithmische Diskrete Mathematik, Freie Universität Berlin, January 29th.
- *Nearest neighbor search in high dimensions*, Dagstuhl Seminar on Computational Geometry, March 21st.
- *Time-Space tradeoffs for exact  $L_\infty$  Nearest Neighbor Search in High Dimensions*, 17th European Workshop on Computational Geometry Freie Universität Berlin, March 26th-28th.
- *Nearest neighbor search in high dimensions*, Workshop on Combinatorics, Geometry, and Computation, Ascona, May 13th.
- *Exact  $L_\infty$  Nearest Neighbor Search in High Dimensions*, 17th ACM Symposium on Computational Geometry, Medford, June 4th.

## FRANK HOFFMANN

- *On the Polygon Exploration Problem*, Institutskolloquium, Math. Institut Universität Gdańsk, March 6th.

## CHRISTIAN KNAUER

- *Matching polygonal curves with respect to the Fréchet distance*, STACS 2001, Dresden,
- *Matching polygonal curves with respect to the Fréchet distance*, Seminar on Computational Geometry, Dagstuhl,
- *Computing the detour of polygonal curves* Workshop 'Computer Algebra for Geometric Computing', Leiden, Netherlands

## ULRICH KORTENKAMP

- *Auf den Spuren der Geometrie*, Kolloquium Universität Oldenburg, February 8th.
- *Geometric Straight-line Programs*, Seminar Computational Geometry, IBFI Schloss Dagstuhl, March 18th through 21st.
- *Die Wiederbelebung des Konkreten*, Mathematik-Kolloquium Universität Paderborn, May 15th.
- *Cinderella – intelligente Geometrie*, Tag der Mathematik, Humboldt-Universität Berlin, May 19th.
- *Dynamische Geometrie*, Didaktisches Kolloquium Universität Kaiserslautern, May 29th.
- *Auf den Spuren der Geometrie*, Kolloquium PH Karlsruhe, May 30th.
- *Auf den Spuren der Geometrie*, Mathematikdidaktisches Kolloquium Universität Dortmund, May 31st.
- *Eine unvergessliche Geometriestunde. Geometrie und Physik mit Cinderella interaktiv und multimedial erfahren*, Michaeli-Gymnasium München, June 21st.

- *Eine unvergessliche Geometriestunde. Geometrie und Physik mit Cinderella interaktiv und multimedial erfahren*, Kultusministerium Bayern, München, June 22nd.
- *Orientations and Continuity*, Berliner Algorithmen-Tag (BAT), July 6th.
- *Experimentierkästen aus dem Computer*, T<sup>3</sup>-Regionaltagung „Medien, Werkzeuge, Lernumgebungen“, Wuppertal, September 22nd.
- *Neue Eingabetechnik(en) für Geometrie*, 19. Herbsttagung des Arbeitskreises „Mathematikunterricht und Informatik“ der GDM, Dillingen, September 28th through 30th.
- *Integrating Cinderella with Computer Algebra Software*, Seminar Integration of Algebra and Geometry Software Systems, IBFI Schloss Dagstuhl, October 15th through 19th.
- *Zur Komplexität dynamischer Geometrie*, Informatik-Kolloquium, Universität Bonn (Prof. Clausen), December 3rd.

## KLAUS KRIEDEL

- *Geometric Algorithms for the Analysis of 2D-Electrophoresis Gels* RECOMB'01, Montreal, Canada, April 25th.
- *Geometrische Methoden zur Analyse von Elektrophorese-Gelbildern*, Bioinformatik-Kolloquium der Universität Göttingen, May 14th.
- *Rechnen mit Zufall ist mehr als zufälliges Rechnen*, Vortrag für Schüler am Tag der offenen Tür, May 16th.

## GÉRALDINE MORIN

- *Analytic Functions in Geometric Modeling*, Journées de cloture Visi3D et COSTIC, Paris, France, December 11th.
- *Analytic Functions in Computer Aided Geometric Design*, Rice University, Houston, Texas, November 15th.
- *An Extended Domain for the Analytic Blossom*, SIAM Conference on Geometric Design and Computing, Sacramento, November 5th.

## GÜNTER ROTE

- *Division-free algorithms for determinants and Pfaffians*, Max-Planck-Institut für Informatik, Saarbrücken, January 3rd.
- *Integer Programming in low dimensions*, ETH Zürich, Institut für Informatik, March 2nd.
- *Towards more efficient algorithms for integer programming in two and three dimensions*, “Heureka, You Shrink!” 5th Aussois Workshop on Combinatorial Optimization, Aussois, France, March 5th through 9th.
- *Integer programming in two variables*, A<sup>3</sup>DiM<sup>3</sup>O-Workshop, Trier, March 15th through 16th.
- *The polytope of minimum pseudotriangulations and the quest for the Delaunay pseudotriangulation*, Internationales Begegnungs- und Forschungszentrum für Informatik, Schloss Dagstuhl, March 19th through 23rd.
- *Unfolding of polygons — recent developments*, Workshop on Combinatorics, Geometry, and Computation. Centro Stefano Franscini, Monte Verità, Ascona, Swit-

- zerland, May 13th through 15th.
- *Unfolding of polygons — recent developments*, Elbe-Sandstones Geometry Workshop. Rynartice, Böhmisches Schweiz, Czech Republic, July 24th through 28th.
  - *Randomized strategies for unique sink orientations of the 3-cube*, Towards the Peak. Workshop on Unique Sink Orientations and Combinatorial Methods for Optimization. La Claustra, San Gottardo Pass, Switzerland, August 24th through 30th.
  - *Der Drei-Distanzen-Satz in höheren Dimensionen, Das Assoziäeder*, 5. ÖMG-Kongress, Jahrestagung der Deutschen Mathematikervereinigung. Vienna, September 16th through 21st.
  - *Wie man die Determinante und die Pfaffiane ohne Division ausrechnet*, University of Bonn, Institut für Informatik, October 22nd.

CAROLA WENK

- *Bounding the Fréchet distance by the Hausdorff distance*, 17th European Workshop on Computational Geometry Freie Universität Berlin, March 26th-28th.
- *Applications of geometric shape matching*, University of Arizona, Computer Science Department, April 17th.
- *Drawing with Fat Edges*, 9th International Symposium on Graph Drawing (GD), Wien, Austria, September.

## 5. Courses, Seminars, Exercises and Laboratories (WS 00/01 und SS 01)

H. ALT, G ROTE, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Lectures of the graduate program Computational Discrete Mathematics*, (winter semester 00/01).

H. ALT, *Einführung in die Theoretische Informatik (Introduction to theoretical computer science)*, course and exercises (winter semester 00/01).

P. BRASS, *Auswählen und Entscheiden (Select and Decide)*, course, (winter semester 00/01).

S. FELSNER, *Mathematik für Informatiker I (Mathematics for computer scientists)*, course and exercises, (winter semester 00/01).

F. HOFFMANN, *Informatik A*, course and exercises, (winter semester 00/01).

F. HOFFMANN, *Geometrische Approximationsalgorithmen*, course and exercises, (winter semester 00/01).

U. KORTENKAMP, *Einführung in die Diskrete Mathematik (Introduction to Discrete Mathematics)*, course and exercises, (winter semester 00/01).

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 00/01).

S. FELSNER, K. KRIEGEL, *Ausgewählte Kapitel der Bioinformatik (Selected chapters of bioinformatics)*, seminar, (winter semester 00/01).

F. HOFFMANN, F. WAGNER, *Algorithmische Optimierung bei der Deutschen Bahn (Algorithmic optimization at the German Railways)*, seminar, (winter semester 00/01).

- H. ALT, C. KNAUER, *Algorithmische Softwarebibliotheken (Algorithmic software libraries)*, laboratory, (winter semester 00/01).
- U. KORTENKAMP, *Programmieren mit Java (Programming with JAVA)*, laboratory, (winter semester 00/01).
- G. ROTE, L. MEISSNER, *Effiziente Algorithmen - Computergraphik( Efficient algorithms - computer graphics)*, laboratory, (winter semester 00/01).
- H. ALT, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Colloquium of the graduate program* Combinatorics, Geometry and Computation, colloquium, (winter semester 00/01).
- H. ALT, G. ROTE, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Lectures of the graduate program* Combinatorics, Geometry and Computation, (summer semester 01).
- H. ALT, L. MEISSNER, *Algorithmen für Fortgeschrittene (Algorithms for advanced)*, course and exercises, (summer semester 01).
- P. BRASS, *Offene Probleme der diskreten Geometrie (Open problems of discrete geometry)*, course, (summer semester 01).
- S. FELSNER, *Mathematik für Informatiker II (Mathematics for computer scientists II)*, course and exercises, (summer semester 01).
- F. HOFFMANN, *Geometrische Approximationsalgorithmen (geometric approximation algorithms)*, course and exercises, (summer semester 01).
- K. KRIEGEL, *Informatik B*, course and exercises, (summer semester 01).
- U. KORTENKAMP, C. KNAUER, *Dynamische Geometrie (dynamic geometry)*, course and exercises, (summer semester 01).
- G. ROTE, *Grundlagen der theoretischen Informatik (basics of theoretical computer science)*, course and exercises, (summer semester 01).
- G. ROTE, STEFAN GESCHKE, *Graphentheorie (graph theory)*, course and exercises, (summer semester 01).
- 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 01).
- H. ALT, C. KNAUER, *Algorithmen für das WWW (Algorithms for the WWW)*, seminar, (summer semester 01).
- H. ALT, L. MEISSNER, *Proseminar über Berechenbarkeits- und Komplexitätstheorie (Proseminar about computability and complexity theory)*, seminar, (summer semester 01).
- S. FELSNER, *Diskrete und algorithmische Geometrie (Discrete and Computational Geometry)*, seminar, (summer semester 01).
- G. ROTE, *Rekonstruktion und Vereinfachung von Oberflächen (Reconstruction and simplification of surfaces)*, seminar, (summer semester 01). U. KORTENKAMP, *Programmieren in Java (Programming in JAVA)*, 4, (summer semester 01).

H. ALT, G. ROTE, AND OTHER LECTURERS OF THE GRADUATE PROGRAM, *Colloquium of the graduate program* Combinatorics, Geometry and Computation, colloquium, (summer semester 01).

## 6. Organisation of scientific events

17TH EUROPEAN WORKSHOP ON COMPUTATIONAL GEOMETRY, March 26th through 28th.

Organisation: H. Alt, C. Wenk.

This annual conference is an important scientific event in which established researchers from academia, R&D people from industry, research students, and postdocs meet and present their current work, establishing a scientific interaction and international collaboration.

There were 48 short presentations and three invited lectures: Surface Reconstruction By Spatial Neighborhood Graphs, by Heinrich Müller, Universität Dortmund, Unique Sink Orientations of Cubes, by Emo Welzl, ETH Zürich, and A Geometric Basis for Visualizing Time-dependent Volume Data, by Jack Snoeyink, University of North Carolina at Chapel Hill. The whole program can be found at <http://www.inf.fu-berlin.de/~cg01/>. The two-page abstracts of the presentations were published in a booklet. There were 97 participants from many different countries (Germany 32, Spain 13, France 11, the Netherlands 8, Israel 7, North America 8, other European countries 14, Asia 4). Participation of younger scientists was supported by the European Union under the program "Information Society Technologies". A selection of the presented papers will appear in a special volume of the journal *Computational Geometry: Theory and Applications*, edited by Helmut Alt.

The conference dinner took place on top of the Berlin Television Tower. The floor in the restaurant rotates twice an hour allowing the participants - while enjoying the conference dinner - a spectacular view of the surrounding city of Berlin. This raised the spirits of a few participants so much that they presented a special musical interlude on the next day, with lyrics alluding to several memorable events, mishaps, and discussions that had occurred during the conference. After the conference there was an optional excursion including a one hour historic sight-seeing boat trip within Berlin and a two hour visit of the world famous Sanssouci Palace and Sanssouci Park in the nearby city of Potsdam.

DAGSTUHL WORKSHOP ON COMPUTATIONAL GEOMETRY IN SCHLOSS DAGSTUHL, March 18th through 23rd.

Organisation: G. Rote, R. Klein (Fernuniversität Hagen)

## 7. Diplomas

ENNO BREHM.

3-Orientations and Schnyder 3-Tree-Decompositions

Supervisor: Stefan Felsner.

EMANUEL MINETTI.

Über die maximale Anzahl der kürzesten und zweitkürzesten Abstände in einer endlichen Punktmenge in der Ebene.

About the maximum number of shortest and second shortest distances in a finite set of points in the plane.

Supervisor: Peter Braß.

DOROTHEA ROCHUSCH.

Zufällige Erzeugung von Catalan-Strukturen.

Random generation of Catalan-structures.

Supervisor: Stefan Felsner.

CHRISTOF SCHULTZ.

Protein-Spot-Detektion in zweidimensionalen Elektrophorese Gelbildern.

Protein-spot detection in twodimensional electrophoresis gel-images.

Supervisors: Helmut Alt, Klaus Kriegel.

OLIVER TIMM.

Stückweise lineare Approximation von Kurven.

Piecewise linear approximation of curves.

Supervisor: Helmut Alt.

## 8. Miscellaneous

HELMUT ALT

- Speaker of the graduate program *Computational Discrete Mathematics*.
- Member of the editorial board of *ORDER*.
- Member of the departmental council (Fachbereichsrat) mathematics and computer science, FU Berlin.
- Member and vice chair of the program committee for Symposium on Theoretical Aspects of Computer Science, STACS 2002, Antibes, France.
- Guest Editor for a special issue of the journal “Computational Geometry: Theory and Applications” with articles presented at the European Workshop on Computational Geometry, CG01.
- Member of the search committee for a professorate in Algebra.
- Referee for the research focus program (SPP) *Efficient Algorithms for Discrete Problems and their Applications* of the german science foundation (DFG).
- Referee for the habilitation thesis of Dr. Dieter Rautenbach , RWTH Aachen.
- Referee for journals and conferences.

PETER BRASS

- Referee for *COMB 2001*
- Referee for *SIAM Journal of Discrete Mathematics*.
- Referee for *Stacs 2002*.
- Referee for *Algorithmica*.
- Referee for *International Journal on Computational Geometry and Applications*.
- Referee for *Periodica Mathematica Hungarica*.
- Referee for *Graphical Models & Image Processing*.



## BRITTA BROSER

- Participant of *Computer Algebra in Geometric Computings*, Workshop, Leiden, Netherlands, October 1st through 5th.

## STEFAN FELSNER

- Editor for *ORDER*
- Member of the program committee Euroconference on Combinatorics, Graph Theory and Applications (COMB01) Barcelona, September 12th through 15th.
- Member of the habilitation committee for Stephan Brandt.
- Referee for *COMB 2001*
- Referee for *SIAM Journal of Discrete Mathematics*.
- Referee for *Documenta Mathematica*.
- Referee for *Graphs and Combinatorics*.
- Referee for *Stacs 2002*.
- Referee for *Discrete and Computational Geometry*.
- Referee for *Algorithmica*.
- Referee for *ORDER*.

## LAURA HEINRICH-LITAN

- Referee for *Stacs 2002*.
- Referee for the journal *IEEE Transactions on computers*.

## FRANK HOFFMANN

- Referee for *COMB 2001*.
- Referee for *Stacs 2002*.
- Referee for *Computational Geometry: Theory and Applications*.
- Referee for *Journal of Automata, Languages and Combinatorics*.
- Referee for *Information Processing Letters*.
- Referee for *International Journal on Computational Geometry and Applications*.
- Member of the habilitation committee for Schulze-Kremer.
- Member of the joint committee for bioinformatics at the FU Berlin.

## CHRISTIAN KNAUER

- Participant of *LearnTec 2001*, Karlsruhe
- Participant of *STACS 2001*, Dresden
- Participant of *Dagstuhl Seminar 'Computational Geometry'*,
- Participant of *European Workshop on Computational Geometry 2001*, Berlin Workshop 'Computer Algebra for Geometric Computing', Leiden,
- Referee for *ESA 2001*
- Referee for *Comb 2001*
- Referee for *STACS 2002*
- Member of the EDV-Committee of the Instituts für Mathematik und Informatik, Freie Universität Berlin
- Organisation of CGAL Entwickler Treffen 1/2001, Freie Universität Berlin
- Technical support of the 17th European Workshop on Computational Geometry, Freie Universität Berlin

## KLAUS KRIEGEL

- Lehrstuhlvertretung an der BTU Cottbus, January 1st through March 31st.
- Referee for the dissertation of Oliver Timm.
- Referee for *COMB 2001*
- Referee for *STACS 2002*
- Referee for the journals *Discrete and Applied Mathematics (DAM)* and *Computational Geometry: Theory and Applications*

## ULRICH KORTENKAMP

- Leader of the Workgroup „Anforderungen an DGS“ 19. *Herbsttagung des Arbeitskreises „Mathematikunterricht und Informatik“ der GDM, Dillingen* Participant of *LearnTEC 2001*, Karlsruhe, January 30th through February 2nd. Participant of *Ce-Bit 2001*, Hannover, March 22nd through 28th. Participant of *Internationale Funkausstellung*, Berlin, August 25th through September 2nd. Participant of *ScienceFair 2001* Berlin, September 15th.

## LUTZ MEISSNER

- Referee for *STACS'2002*

## GÜNTER ROTE

- Organization of a Dagstuhl workshop on Computational Geometry in Schloss Dagstuhl, March 18th through 23rd, 2001 (together with Rolf Klein, then of Fernuniversität Hagen)
- Member of the habilitation committee for Stephan Brandt.
- Member of the habilitation committee for Schulze-Kremer.
- Member of the selection committee for the position of professor in network-based information systems
- Coordinator of the Erasmus/Socrates student exchange program for the departments of mathematics and computer science
- Department delegate for the conference of computer science faculties in German universities (Fakultätentag Informatik)
- Referee for International Conference on Computational Science'01, San Francisco, May 2001
- Referee for ICALP'2001, (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, EUROCOMB01, Barcelona
- Referee for 9th Annual European Symposium on Algorithms (ESA'2001)
- Referee for STACS'2002, (19th Annual Symposium on Theoretical Aspects of Computer Science)
- Referee for the journal *Random Structures and Algorithms*
- Referee for the journal *Information Processing Letters*
- Co-Referee for the Ph.D. thesis of József Solymosi (ETH Zürich).
- Referee for the DAAD (Deutscher Akademischer Auslandsdienst, German academic foreign exchange office).

- Participant of the Workshop on Pseudotriangulations, organized by Ileana Streinu, Bellairs Research Institute, Barbados, January 26th through February 2nd.
- Participant of CG'2001, 17th European Workshop on Computational Geometry, Berlin, March 26th through 28th.
- Participant of Graph Drawing 2001, Vienna, September 24th through 26th.
- Participant of the Workshop on Computer Algebra in Geometric Computing. Lorentz Center, Leiden, the Netherlands, October 1st through 5th.

CAROLA WENK

- Referee for IEEE Transactions on Computers, STACS 2002
- Organization of the 17th European Workshop on Computational Geometry to be held from March 26th through 28th 2001 at Freie Universität Berlin.
- Research stay at the Department of Computer Science at the University of Arizona, USA, April 2001

## Appendix:

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

- January 9th: STEFAN FELSNER  
Infeasibility and the Lucchesi–Younger Theorem
- January 11th: YINFENG XU  
New results on pseudo–triangulations
- January 16th: PETER BRASS  
Another lower bound on Hopcroft’s problem
- January 18th: ULRICH KORTENKAMP  
Lange Schatten von 0/1-Polytopen
- January 19th: GÉRALDINE MORIN  
About a topic from Computer graphics
- January 23rd: ACHILL SCHÜRMAN  
Dichteste endliche Packungen
- January 25th: CHRISTIAN KNAUER  
How to compute the minimum growth rate of polygonal chains
- January 30th: FRANK HOFFMANN  
Gathering of Robots with Limited Visibility
- February 1st: LUTZ MEISSNER  
Bestimmung des Hausdorffabstands von Polygonzügen
- February 6th: GÜNTER ROTE  
Stable matchings, colliding trains, and distributive lattices
- February 8th: ASTRID KAFFANKE  
Multiple Alignment of String Sequences
- February 20th: LAURA HEINRICH-LITHAN  
 $L^\infty$ -Voronoi Diagram in Higher Dimension
- February 22nd: STEFAN FELSNER  
Tales about tilings
- February 27th: CSABA TÓTH  
Guarding disjoint triangles and claws
- March 1st: PETER BRASS  
On the one-sided Hadwiger number
- March 6th: CAROLA WENK  
A lower bound for the complexity generalized Voronoi Diagramms
- March 8th: CHRISTIAN KNAUER  
Counting approximate unit distances in d-space
- March 13th: FRANK HOFFMANN  
A TSP variant in the plane

- April 3rd: LUTZ MEISSNER  
The Sweepline Algorithm for Voronoi Diagrams of Sets of Line Segments
- April 5th: ULRICH KORTENKAMP  
Physics simulations with Cinderella 2.0alpha and other stories from CeBIT 2001
- April 10th: PETER BRASS  
On homothetical copies of a point pattern
- April 12th: ANDREI HUTANU  
(Semi-)Automatic Code Generation for Sparse Linear Algebra in Stochastic Optimization
- April 17th: PETER BRASS  
On homothetical copies of a point pattern
- April 19th: KLAUS KRIEGEL  
An NP-hard version of approximate partial point pattern matching
- April 24th: HELMUT ALT  
Pi - First part
- April 26th: GÜNTER ROTE  
The polytope of pseudotriangulations
- May 3rd: GÜNTER ROTE  
The polytope of pseudotriangulations- Part II
- May 8th: LAURA HEINRICH-LITAN  
External-Memory Nearest Neighbor Search
- May 10th: ARNOLD WASSMER  
Ein Beispiel für beschränkte Geodätenlänge unter beliebigen hyperbolischen Strukturen
- May 17th: CAROLA WENK  
Efficient Continuous Homotopic Wire Routing
- May 18th: JAN SCHRÖTER  
Ein einfacher Algorithmus zur homöomorphen Oberflächenrekonstruktion
- May 22nd: CHRISTIAN KNAUER  
A fast algorithm for computing the detour of a polygonal chain
- May 29th: STEFAN FELSNER  
k-Grid Drawings of Planar Graphs
- May 31st: GÜNTER ROTE  
Expansive motions on a line - yet another associahedron
- June 1st: CIPRIAN BORCEA  
Two complexifications of planar polygon spaces
- June 5th: LUTZ MEISSNER  
Searching in metric spaces
- June 7th : FRANK HOFFMANN  
Bounds for heuristic TSP
- June 12th: CHRISTIAN KNAUER  
The latest news about detours

- June 14th: PETER BRASS  
Rekonstruktion von Geraden aus Punkten
- June 19th: HELMUT ALT  
Approximative clustering
- June 21st: KLAUS KRIEGEL  
On the NP-completeness proof of PLANAR-3SAT
- June 26th: STEVE WISMATH  
(More) Straight-Line Drawings on Restricted Integer Grids in Two and Three Dimensions
- June 28th: CAROLA WENK  
Covering a Shape by Ellipses
- July 3rd: SANDRA STEINBRECHER  
Informationstheoretisch sichere Authentikation als Einsatzfeld universellen Hashings
- July 5th: OLIVER TIMM  
Stückweise lineare Approximation von Polygonzügen
- July 10th: HEE-KAP AHN  
The Reflex-Free Hull
- July 12th: DARKO DIMITROV  
Quadric-Based Polygonal Surface Simplification
- July 17th: DIETER RAUTENBACH  
Combinatorial Reconstruction Problems
- July 19th: IRINA ARWEILER  
Phylogenetische Bäume Teil I
- July 31st: FRANK HOFFMANN  
Guillotine Subdivisions
- August 2nd: STEFAN FELSNER  
 $N^3$ -Einbettungen und planare Graphen
- August 7th: LAURA HEINRICH-LITAN  
A Replacement for Voronoi Diagrams of Near Linear Size
- August 9th: LILIANA GRIGORIU  
Transformation System Semantics and Compositionality of Algebraic Petri Nets
- August 28th: CHRISTIAN KNAUER  
Computing the Hausdorff Distance of simple polyhedral surfaces in 3-space
- August 30th: PETER BRASS  
Das Flächenzentrum eines konvexen Polygons
- September 4th: KLAUS KRIEGEL  
On art galleries with interior walls
- September 6th: LUTZ MEISSNER  
Die Größe der Rubik-Gruppe
- September 18th: HELMUT ALT  
Lower Envelopes of Convex Functions

- September 20th: STEFAN FELSNER  
Pseudoline Arrangements: Duality, Algorithms and Applications
- September 27th: FRANK HOFFMANN  
Guillotine Subdivisions II
- October 2nd: CAROLA WENK  
On two Fréchet related distance measures
- October 4th: PETER BRASS  
Teilmustererkennung mit Vorverarbeitung
- October 9th: ULRICH KORTENKAMP  
The d-Step conjecture for Oriented Matroids
- October 11th: KLAUS KRIEGEL  
Applications of Color Coding
- October 16th: GÜNTER ROTE  
Pushing Disks Apart: Proof of the Kneser/Poulsen Conjecture
- October 18th: GÜNTER ROTE  
Pushing Disks Together: Proof of the Kneser/Poulsen Conjecture
- October 23rd: CHRISTIAN KNAUER  
Computing the Hausdorff distance of simple polyhedral surfaces in 3-space
- October 25th: LUTZ MEISSNER  
State Complexity of Regular Languages
- October 30th: OLIVER SANDER  
Mesh simplification for finite element applications
- November 1st: GÉRALDINE MORIN  
Analytic functions in CAGD
- November 6th: LARRY FIELD, UNIV. OF CANTERBURY  
Can mesh warping help to understand stretch receptor distortion?
- November 8th: RAFFAELE GIANCARLO, UNIV. DI PALERMO  
2-dimensional data structures for pattern matching
- November 20th: MARTIN KUTZ  
Four-Way Light Switch Installations are Optimal
- November 22nd: DARKO DIMITROV  
New Quadric Metric for Simplifying Meshes with Appearance Attributes
- November 27th: FRITZ EISENBRAND, TU-BERLIN  
0/1 Optimization and 0/1 Primal Separation Are Equivalent
- November 29th: LAURA HEINRICH-LITHAN  
Computing the center of area of a convex polygon
- December 4th: FRANK HOFFMANN  
Illuminating simple polygons with  $\pi$ -floodlights
- December 6th: CAROLA WENK  
Finding streets in a map

December 11th: GÜNTER ROTE

Sequence roundings and the randomized simplex algorithm on 3-polytopes

December 13th: OLIVER SANDER

Adaptive Triangulierungen

December 18th: FRANK HOFFMANN

Illuminating simple polygons with  $\pi$ -floodlights

December 20th: PETER BRASS

Symmetry testing for non-convex polyhedral objects