Annual Report 1998

Work Group

Theoretical Computer Science

(Prof. Dr. Helmut Alt)

February 1999

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

1. **Members of the Group**

(a) Professor

Alt, Helmut, Dr.

(b) Guest professors

Albers, Susanne, Dr. (April 1st through September 30th)
Trotter, William T., Dr. (DFG - German science foundation (until August 31st))

(c) Assistants, scientific personnel, scholarship holders

Braß, Peter, Dr. habil. (graduate program *computational discrete mathematics* (until September 30th), Heisenberg scholarship holder (since October 1st))
Felsner, Stefan, Priv.-Doz., Dr. (FU)
Hoffmann, Frank, Dr. (FU)
Knauer, Christian (graduate program *computational discrete mathematics* (until March 31st), FU (since April 1st))
Kriegel, Klaus, Dr. (DFG - German science foundation)
Meißner, Lutz (FU)
Morawe, Nicole (FU)
Schönherr, Sven (Esprit Project CGAL (until June 30th), Esprit Project GALIA (since November 15th))
Thiele, Torsten, Dr. (graduate program *computational discrete mathematics*)
Wagner, Frank, Priv.-Doz. Dr. (Heisenberg scholarship holder)
Wenk, Carola (DFG - German science foundation (since April 6th))
Wolff, Alexander (DFG - German science foundation)

(d) Secretary

Heinrich, Hannah (FU)

(e) Coordinator of the graduate program

Felsner, Bettina (DFG - German science foundation)

(f) Student assistants

Hoffmann, Ulrich (DFG - German science foundation (until March 31st))
Kapoor, Vikas (DFG - German science foundation)
Rochusch, Dorothea (DFG - German science foundation (since October 1st))

2. Guests and Lectures

Pavel Valtr
Charles University Prague (April 20th)
Geometric Graphs

Günter Rote
Technische Universität Graz (May 27th)
Gute Triangulierungen für ebene Punktmengen (Good Triangulations for Planar Point Sets)

Angelika Steger
Technische Universität München (May 27th)
Wie hilft der Zufall der Informatik? (How does Randomness help Computer Science?)

Karsten Weihe
Universität Konstanz (May 27th)
Rekonstruktion der Topologie eines CAD-Modells – ein mathematischer Blick auf ein unmathematisches Problem (Reconstruction of the Topology of a CAD-model – a Mathematical Glance at a Nonmathematical Problem)

Raimund Seidel
Universität des Saarlandes (May 28th)
Über die genaue Anfragekomplexität von Punktsuchen in der Ebene (About the Exact Query Complexity of Planar Point Location)

Gerhard Woeginger
Technische Universität Graz (June 3rd)
Algorithmen für das Handelsreisenden-Problem (Algorithms for the Travelling Salesman-Problem)

Dorothea Wagner
Universität Konstanz (June 3rd)
Modelle und Lösungsmethoden für Grapheneinbettungsprobleme (Models and Solution Methods for Graph Embedding Problems)

Torben Hagerup
Universität Frankfurt (June 3rd)
Statische Wörterbücher auf der Wort-RAM (Static Dictionaries on the Word-RAM)

Rüdiger Reischuk
Medizinische Universität Lübeck (June 16th)
Effizientes Lernen von 1-Variable Pattern (Efficient Learning of 1-Variable Patterns)

Konrad Swanepoel
University of Pretoria (June 29th)
Sets in Normed Spaces Satisfying Various Norm Inequalities

Micha Sharir
Tel Aviv University (July 17th - Berliner Algorithmen-Tag)
The Combinatorics of Arrangements of Curves and Surfaces

David Shmoys
Cornell University, Guest at TU Berlin (July 17th - Berliner Algorithmen-Tag)
Approximation Algorithms for the Uncapacitated Location Problem

Hanno Lefmann
Humboldt Universität zu Berlin (July 17th - Berliner Algorithmen-Tag)
Approximating Maximum Independent Sets in Uniform Hypergraphs

Sven Oliver Krumke
Konrad-Zuse-Zentrum f. Informationstechnologie (July 17th - Berliner Algorithmen-Tag)
Upgrading Bottleneck Constrained Forests

Tycho Strijk
Utrecht University (August 14th through September 6th)
Research on Label-Placement Algorithms with Alexander Wolff

Tamal Dey
Indian Institute of Technology, MPI Saarbrücken (November 9th)
On Curve Reconstructions

Raimund Seidel
Universität des Saarlandes (December 7th)
The Exact Query Complexity of Planar Point Location Resolved

3. Projects supported by external grants

- *Graduate program* Computational Discrete Mathematics
  financially supported by the German science foundation (DFG)

Participating scientist:	Helmut Alt (Speaker)
Coordination:	Bettina Felsner
Scholarship holders:	Peter Braß, Dr. PD (until September 30th)
	Christian Knauer (until March 31st)
	Torsten Thiele, Dr.
Duration of the project:	October 1994 through September 2000

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.

- Project CGAL (Constructing a Geometric Algorithms Library)
  financially supported by the European Community within the ESPRIT IV-Program

Participants:	Helmut Alt (project leader)
	Sven Schönherr
Duration of the project:	October 1st 1996 through June 30th 1998

  This is a joint project of seven work groups in Utrecht, Zürich, Berlin, Sophia Antipolis/France, Saarbrücken, Linz and Tel Aviv. The main subject of the project is the implementation of the most important algorithms of computational geometry and the corresponding theoretical research.
  We aim to create a software package for users of geometric algorithms. This is why the project includes the implementation of applications from fields like Geographical Information Systems (GIS), visualization and simulation, CAD/CAM and pattern-analysis and -reconstruction.
  The project is planned to be realized in cooperation with several industrial companies of the participating countries. Our work group joins the implementation of the "Kernel" (elementary geometric objects and algorithms), of optimization algorithms and matching of patterns and shapes.

- Project GALIA (Geometric Algorithms for Industrial Applications)
  financially supported by the European Community within the ESPRIT IV-Program

Participants:	Helmut Alt (project leader)
	Sven Schönherr
Duration of the project:	November 15th 1998 through May 15th 2000

  GALIA ist the continuation project of the project CGAL described before.

- Project Point Pattern Matching for the Analysis of Gel Images
  financially supported by the German science foundation (DFG)

Participants:	Helmut Alt (project leader)
	Klaus Kriegel, Frank Hoffmann, Carola Wenk
Duration of the project:	January 1st 1997 through December 31st 2000

  This project is a joint project of the Institute of Computer Science of Freie Universität Berlin and Deutsches Herzzentrum (German Heart Center) Berlin. The main

topic of research are 2-dimensional gel images, that are produced by high-resolution gelelectophoresis-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. The analysis of the pictures helps to discover molecular and genetic reasons of heart diseases.

Until now, the interpretation of gel images is mainly based on the exact (and time consuming) examination by experienced specialists. The main goal of the project is to design and implement algorithms for the effective, computer supported gel analysis. Central to our investigations are two steps of this procedure, the gel-matching (assignment of corresponding spots from different pictures) as well as the setup and the administration of a 2-D gel protein database.

The matching represents a very important and time consuming prerequisite for the quantitative and qualitative data analysis of protein images. 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 project aims to develop new algorithms for gel matching, based on already known procedures for point pattern matching from computational geometry. Because of the fundamental nature of the task of approximative point pattern matching, every single progress within the work on this problem will also have great importance for various other applications.

- Project Efficient Algorithms for Map Labeling
  financially supported by the German science foundation (DFG)

Participants:	Frank Wagner (project leader)
	Alexander Wolff, Vikas Kapoor
Duration of the project:	June 1st 1996 through May 31st 1999

The contents of the project are the development, the theoretical analysis, the implementation and the experimental application of algorithms for some map labeling problems. The objective is to label a given quantity of objects (points, lines, regions) such that

a) no two labels intersect,
b) the legibility is granted by a sufficient label (font) size,
c) the labeled object can easily be identified.

Based on an algorithm for solving a restricted version of this problem which has already proved to be successful in practical applications, dynamic labeling problems that occur in Geographical Information Systems (GIS) shall be solved together with the users.

- Project Algorithms for Shape Matching and Approximation
  financially supported by the German science foundation (DFG)

Participants:	Helmut Alt (project leader) Christian Knauer, Lutz Meißner, Dorothea Rochusch, Carola Wenk
Duration of the project:	April 1st 1998 through March 31st 2000

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 to be 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 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 setting into practice 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.

4. Publications and Lectures

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

S. Albers. *Improved Randomized On-Line Algorithms for the List Uptdate Problem.* SIAM Journal on Computing, 27:682–693, 1998.

S. Albers. *A Competitive Analysis of the List Update Problem with Lookahead.* Theoretical Computer Science, 197:95–109, 1998.

S. Albers, H. Koga. *New On-Line Algorithms for the Page Replication Problem.* Journal of Algorithms, 27:75–96, 1998.

S. Albers, M. Mitzenmacher. *Average Case Analysis of List Update Algorithms, with Applications to Data Compression.* Algorithmica, 21:312–329, 1998.

H. Alt, U. Fuchs, G. Rote, G. Weber. *Matching Convex Shapes with Respect to the Symmetric Difference.* Algorithmica, 21:89–103, 1998.

H. Alt, M. Godau, S. Whitesides. *Universal 3-Dimensional Visibility Representations for Graphs.* Computational Geometry: Theory and Applications, 9:111–125, 1998.

P. Brass. *On the Diameter of Sets with Maximum Number of Unit Distances.* Geombinatorics, 8:149–153, 1998.

P. Brass. *Extremal Orthoposets without Forbidden Substructures.* Int. J. Theoretical Physics, 38:3–9, 1998.

P. Brass. *Häufige Abstände in endlichen Punktmengen (Frequent Distances in Finite Point Sets).* Jahrbuch Überblicke Mathematik, 1998:66–75, 1998.

P. Brass. *On point Sets with Many Unit Distances in Few Directions.* Discrete Comput. Geom., 19:355–366, 1998.

S. Felsner. *Tolerance Graphs and Orders.* Journal of Graph Theory, 28:129–140, 1998.

B. Gärtner, S. Schönherr. *Exact Primitives for Smallest Enclosing Ellipses.* Information Processing Letters, 68(1):33–38, 1998.

W.T. Trotter, P.C. Fishburn. *Dimensions of Split Semiorders.* Order, 14:171–178, 1998.

W.T. Trotter, P.M. Winkler. *Ramsey Theory and Sequences of Random Variables.* Probability, Combinatorics and Computing, 7:221–238, 1998.

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

S. Albers, M. Charikar, M. Mitzenmacher. *On Delayed Information and Action in On-Line Algorithms.* Proc. 39th Annual IEEE Symposium on Foundations of Computer Science, pages 71–80, 1998.

S. Albers, N. Garg, S. Leonardi. *Minimizing Stall Time in Single and Parallel Disk Systems.* Proc. 30th Annual ACM Symposium on Theory of Computing (STOC'98), pages 454–462, 1998.

H. Alt, S. Felsner, F. Hurtado, M. Noy. *Point-Sets with few k-Sets.* Proc. ACM Symposium on Computational Geometry 1998, pages 200–205, 1998.

P. Brass. *On Lattice Polyhedra and Pseudocircle Arrangements.* P. L. Butzer, H. T. Jongen, W. Oberschelp, editors, Charlemagne and his Heritage — 1200 Years of Civilization and Science in Europe. Vol 2: Mathematical Arts, pages 297–302. Brepols Verlag, 1998.

S. Felsner, K. Kriegel. *Triangles in Euclidean Arrangements.* Proceedings WG'98, Springer Lecture Notes in Computer Science 1517, pages 137–148, Smolenice, 1998.

F. Hoffmann, C. Icking, R. Klein, K. Kriegel. *Moving an Angle around a Region.* Proceedings SWAT'98, Springer Lecture Notes in Computer Science 1432, pages 71–82, Stockholm, 1998.

F. Hoffmann, C. Icking, R. Klein, K. Kriegel. *The Polygon Exploration Problem: A New Strategy and a New Analysis Technique.* Proceedings WAFR'98, pages 211–222, Houston, 1998.

F. Hoffmann, K. Kriegel, C. Wenk. *Matching 2D Patterns of Protein Spots.* Proceedings SoCG'98, pages 231–239, Minneapolis, 1998.

M. van Kreveld, T. Strijk, A. Wolff. *Point Set Labeling with Sliding Labels.* Proc. 14th Annu. ACM Sympos. Comput. Geom., pages 337–346, June 1998.

S. Schönherr, A. Wolff. MakeIt! – *Generating and Maintaining Makefiles Automatically.* R. Battini, A. A. Bertossi, editors, Proc. Workshop on Algorithms and Experiments (ALEX98), Trento, Italy, pages 165–174. Università di Trento, February 1998.

J. Pach, G. Tóth and T. Thiele. *Three-dimensional grid drawings of graph*, Lecture Notes in Computer Science, pages 47–51, 1998.

(c) Other Publications

A. Fabri, G.-J. Giezeman, L. Kettner, S. Schirra, S. Schönherr. *On the Design of CGAL, the Computational Geometry Algorithms Library.* Technical Report MPI-I-98-1-007, Max-Planck-Institut für Informatik, Saarbrücken, Germany, February 1998.

F. Hoffmann, C. Icking, R. Klein, K. Kriegel. *The Polygon Exploration Problem I : A Competitive Strategy.* Technical Report 241, FernUniversität Hagen, Praktische Informatik VI, 1998.

F. Hoffmann, C. Icking, R. Klein, K. Kriegel. *The Polygon Exploration Problem II : The Angle Hull.* Technical Report 245, FernUniversität Hagen, Praktische Informatik VI, 1998.

M. van Kreveld, T. Strijk, A. Wolff. *Point Set Labeling with Sliding Labels.* Technical Report UU-CS-1998-40, Department of Computer Science, Utrecht University, 1998.

A. Wolff. *The Hardness of Approximating Set Cover.* E. W. Mayr, H. J. Prömel, A. Steger, editors, Lectures on Proof Verification and Approximation Algorithms, volume 1367 of LNCS Tutorial, chapter 10, pages 249–262. Springer Verlag, 1998.

(d) Technical Reports

B 98-01 S. Chaudhuri, K.V. Subrahmanyam, F. Wagner, C.D. Zaroliagis. *On Mimicking Networks.*

B 98-02 P. Brass. *On the Diameter of Sets with Maximum Number of Unit Distances.*

B 98-04 B. Gärtner, S. Schönherr. *Smallest Enclosing Circles – An Exact and Generic Implementation in C++.*

B 98-05 B. Gärtner, S. Schönherr. *Smallest Enclosing Ellipses – An Exact and Generic Implementation in C++.*

B 98-06 S. Felsner, H. Weil. *Sweeps, Arrangements, and Signotopes.*

B 98-07 S. Felsner, J. Gustedt, M. Morvan. *Interval Reductions and Extensions of Orders: Bijections to Chains in Lattice.*

B 98-10 S. Felsner, G. Agnarsson, W.T. Trotter. *The Maximum Number of Edges in a Graph of Bounded Dimensions, with Applications to Ring Theory.*

B 98-11 S. Felsner, W.T. Trotter. *Posets and Planar Graphs.*

B 98-12 S. Felsner, W.T. Trotter. *Dimension, Graph, and Hypergraph Coloring.*

(e) Talks

Susanne Albers

- *Minimizing Stall Time in Single and Parallel Disk Systems*, 30th Annual ACM Symposium on Theory of Computing (STOC'98), Dallas, Texas, May 1998.
- *Integriertes Prefetching und Caching in Magnetplattensystemen (Integrates Prefetching and Caching in Magnetic Disc Systems)*, Lecture of the graduate program *computational discrete mathematics*, Berlin, June 22nd.
- *On Delayed Information and Action on On-Line Algorithms*, Invited talk at the workshop on Online-Algorithms, Udine, September 1998.
- *Better Bounds for Online Scheduling*, Seminar talk at FU Berlin.
- *Algorithms for Robot Navigation*, Seminar talk at FU Berlin.

Helmut Alt

- *Geometrische Methoden zur Muster- und Formerkennung (Geometric Methods for Pattern and Shape Recognition)*, Computer Science Colloquium, Universität-GHS Paderborn, January 13th.
- *Geometrische Methoden zur Muster- und Formerkennung (Geometric Methods for Pattern and Shape Recognition)*, Computer Science Colloquium, Universität Konstanz, February 10th.
- *Point Sets with few k-Sets*, Seminar, Theoretical Computer Science, ETH Zürich, March 5th.
- *Nearest Neighbor Search in High Dimensions*, Seminar Theoretical Computer Science, ETH Zürich, March 10th.
- *Der nächste Nachbar (The Nearest Neighbor)*, Lecture of the graduate program *computational discrete mathematics*, Berlin, June 29th.
- *Algorithmen - diskret, effizient und praktisch (Algorithms - discrete, efficient, and practical)*, 50th Anniversary Celebration of the Department of Mathematics and Computer Science, FU Berlin, December 5th.

Peter Brass

- *Ein Kongruenztest für d-dimensionale Punktmengen (A Congruence Test for d-dimensional Point Sets)*, ADiMMO-Workshop, Trier, April 6th/7th.
- *Strukturaussagen für Diskrete Extremalprobleme (Structural Results for Discrete Extremal Problems)*, Colloquium - presentation talk for a professorship in discrete mathematics, Universität Marburg, June 10th.
- *On the Number of Cylinders touching a Ball*, Convex and Discrete Geometry, Bydgoszcz, Poland, August 27th through September 3rd.
- *Kreispackungen und Berührgraphen (Disc Packing and Graphs of Touching Pairs)*, Colloquium of the graduate program *computational discrete mathematics*, Berlin, December 7th.

Stefan Felsner

- *Sweeps, Arrangements, and Higher Bruhat Orders*, 14th European Workshop on Computational Geometry, Barcelona, March 27th.
- *Point Sets with few k-Sets*, 14th European Workshop on Computational Geometry, Barcelona, March 27th.

- *Geometry and Young Tableaux*, Fachbereichskolloquium, Marburg, June 3rd.
- *Point Sets with few k-Sets*, 14th ACM Symposium on Computational Geometry, Minneapolis, June 8th.
- *Reduced Decomposition and Young Tableaux*, 5th Czech-Slovak Symposium on Combinatorics, Prague, July 7th.
- *The Linear-Extension Diameter*, International Congress of Mathematicians (ICM '98), Berlin, August 21st.
- *Dimension of Graphs and Posets*, Institute for Theoretical Computer Science, ETH Zürich, September 8th.
- *Reduzierte Dekompositionen und Young Tableaux (Reduced Decompositions and Young Tableaux)*, Colloquium of the graduate program *computational discrete mathematics*, November 9th.
- *Posets and Planar Graphs*, Colloquium on Combinatorics, Braunschweig, November 14th.
- *Reduzierte Dekompositionen und Young Tableaux (Reduced Decompositions and Young Tableaux)*, Department of mathematics, TU Berlin, December 3rd.

Frank Hoffmann

- *New Algorithmic Tools for Comparing 2D Patterns of Protein Spots*, 14th European Workshop on Computational Geometry (CG '98), Barcelona, March 26th.
- *Matching 2D-Patterns of Protein Spots*, 14th Annual Symposium on Computational Geometry (SiCG '98), Minneapolis, June 9th.
- *Matching 2D-Patterns of Protein Spots*, 21. Berliner Algorithmen-Tag, FU Berlin, July 17th.

Christian Knauer

- *The Computation of the Hausdorff Distance between Sets of Line Segments*, Colloquium of the graduate program *computational discrete mathematics*, Berlin, May 11th.

Klaus Kriegel

- *Triangles in Euclidean Arrangements*, 14th European Workshop on Computational Geometry (CG '98), Barcelona, March 27th.
- *Triangles in Euclidean Arrangements*, 24th International Workshop on Graph-Theoretic Concepts in Computer Science (WG '98), Smolenice, June 16th.

Sven Schönherr

- MakeIt! – *Generating and Maintaining Makefiles Automatically*, Workshop on Algorithms and Experiments (ALEX98), University of Trento, Italy, February 9th.

Torsten Thiele

- *Mimicking Networks*, Colloquium of the graduate program *computational discrete mathematics*, Berlin, June 22nd.
- *Point Sets with Distinct Distances and Sidon Sets of Square Numbers*, International Workshop on Discrepancy Theory and Its Applications, Universiät Kiel, September 6th through 9th.

– *Darstellung von Graphen im Raum (Drawing of Graphs in 3-Space)*, Colloquium of the graduate program *computational discrete mathematics*, Berlin, November 17th.

William T. Trotter

– *Geometric Inclusion Orders*, TU Hamburg, January 1998.
– *Graphs and Posets*, Warsaw University of Technology, Warsaw, March 1998.
– *Applications of Probabilistic Methods to Posets*, Adam Mickiewicz University Poznan, March 1998.
– *Intervals, Boxes, Cubes and Spheres*, TU Chemnitz, March 1998.
– *Graphs and Algorithms*, Institute of Systems Science, China, April 1998.
– *Sphere Orders*, Shangdong University, China, April 1998.
– *On-Line Algorithms*, Suzhou University, China, April 1998.
– *Algorithms, Posets and Graphs*, Inner Mongolia National University, China, April 1998.
– *Graphs, Hypergraphs and Partial Orders*, Summer school on discrete mathematics of the graduate program *compuational discrete mathematics*, Chorin, April 26th through 30th.
– *Recent Progress on Graphs and Posets*, Combinatorics Conference, Nanjing, April 1998.
– *Recent Progress in Dimension Theory*, Universität Rostock, May 1998.
– *Posets and Planar Graphs*, TU München, May 1998.
– *Ramsey Theory applied to Partially Ordered Sets*, Dimatia '98, Prague, July 1998.

Frank Wagner

– *Mimicking Networks*, ETH Zürich, April 7th.
– *Der Polyeder der Schnittvektoren (The Cut-Vector Polyhedron)*, ETH Zürich, April 7th.
– *Computing Mimicking Networks*, 25th International Colloquium on Automata, Languages and Programming (ICALP 98), Aalborg, July, 16th.
– *A Combinatorial Framework for Map Labeling*, Annual Symposium on Graph Drawing (GD 98), Montreal, August, 12th.
– *A Combinatorial Framework for Map Labeling*, ETH Zürich, August 27th.
– *Alternative Zeitdifferenzierungsmethoden (Alternative Time-Differenciating Methods)*, Deutsche Bahn, Zentrale Konzernentwicklung Frankfurt, October 21st.
– *Dynamische Algorithmen für dynamische Projekte (Dynamic Algorithms for Dynamic Projects)*, Noon Seminar, TLC Research, Frankfurt, December 8th.

(f) Posters

Helmut Alt, Frank Hoffmann, Klaus Kriegel, Carola Wenk

– Poster presentation – "Identification of Proteins by Point Pattern Matching of Two-Dimensional Gel Electrophoresis Databases" at *Jahrestagung der Humangenetischen Gesellschaft*, October 2nd trhough 4th (together with E. Fleck, H. Oswald, K.-P. Pleissner, S. Wegener).

Peter Brass, Torsten Thiele
- Poster presentation of the graduate program *computational discrete mathematics* on occasion of the 50th Anniversary Celebration of the Department of Mathematics and Computer Science, FU Berlin, December 5th.

5. Courses, Seminars, Exercises and Laboratories (WS 97/98 und SS 98)

H. Alt and other lecturers of the graduate program, *Lectures of the graduate program* computational discrete mathematics, course, (winter semester 97/98).

P. Brass, *Konvexgeometrie (Convex geometry)*, course, (winter semester 97/98).

S. Felsner, L. Meissner, N. Morawe, *Entwurf und Analyse von Algorithmen (Design and analysis of algorithms)*, course and exercises, (winter semester 97/98).

F. Hoffmann, *Einführung in die Theoretische Informatik (Introduction to theoretical computer science)*, course and exercises, (winter semester 97/98).

W. Trotter, *On-line and adversarial algorithms*, course, (winter semester 97/98).

S. Felsner, *Randomisierte Algorithmen (Randomized algorithms)*, seminar, (winter semester 97/98).

S. Felsner, F. Wagner, *Seminar for M.S. and Ph.D. students in theoretical computer science*, seminar, (winter semester 97/98).

M. Aigner, S. Felsner, W. Trotter, *Topics in discrete mathematics*, seminar, (winter semester 97/98).

A. Voisard, F. Wagner, *Geometrische Algorithmen für geographische Informationssysteme (Geometric algorithms for Geographical Information Systems (GIS)*, seminar, (winter semester 97/98).

H. Alt and other lecturers of the graduate program, *Colloquium of the graduate program* computational discrete mathematics, colloquium, (winter semester 97/98).

S. Albers, *Algorithmen und Programmierung II (Algorithms and programming II)*, course and exercises, (summer semester 98).

H. Alt, L. Meissner, *Computer-Graphik (Computer graphics)*, course and exercises, (summer semester 98).

H. Alt and other lecturers of the graduate program, *Lectures of the graduate program* computational discrete mathematics, course, (summer semester 98).

P. Brass, *Darstellende Geometrie und Postscript-Programmierung (Descriptive Geometry and Postscript Programming)*, course, (summer semester 98).

T. Thiele, N. Morawe, *Approximationsalgorithmen (Approximation algorithms)*, course and exercises, (summer semester 98).

E. Welzl, C. Knauer, *Geometrisches Rechnen (Geometric computing)*, course and exercises, (summer semester 98).

H. Alt, S. Felsner, N. Morawe, *Seminar über Algorithmen und Datenstrukturen (Seminar on algorithms and data structures)*, seminar, (summer semester 98).

H. Alt, S. Felsner, F. Wagner, *Seminar for M.S. and Ph.D. students in theoretical computer science*, seminar, (summer semester 98).

F. Hoffmann, C. Knauer, *String Pattern Matching und Anwendungen (String pattern matching and applications)*, seminar, (summer semester 98).

H. Alt and other lecturers of the graduate program, *Colloquium of the graduate program* computational discrete mathematics, colloquium, (summer semester 98).

6. **Organisation of scientific events**

International Congress of Mathematicians (ICM '98):
Organization of the section *Mathematical Aspects of Computer Science* –
H. Alt together with H.J. Prömel, Humboldt-Universität.

21st Berliner Algorithmen-Tag:
Organization: H. Alt, H. Heinrich, Ch. Knauer.

7. **Dissertations**

Michael Godau:
On the Complexity of Measuring the Similarity between Geometric Objects in Higher Dimensions,
Disputation on December 18th: *Parallele Tiefensuche (Parallel Depth First Search)*,
Supervisor: H. Alt.

8. **Diplomas**

Peter Held – July 15th,
Zwei randomisierte Schnittalgorithmen (Two Randomized Cut Algorithms),
Supervisor: F. Wagner.

Ulrich Hoffmann – July 20th,
Exakte L_∞ Nächste-Nachbar-Suche in Hohen Dimensionen
(Exact L_∞ Nearest Neighbor Search in High Dimensions),
Supervisor: H. Alt.

Carola Wenk – April 2nd,
Algorithmen für das Crossdating in der Dendrochronologie
(Algorithms for Crossdating in Dendrochronology),
Supervisor: H. Alt.

9. **Miscellaneous**

Susanne Albers
- Referee for: *FOCS'98, Discrete Applied Mathematics, The Computer Journal, Journal on Graph Theory.*

Helmut Alt
- Speaker of the graduate program *Computational Discrete Mathematics.*
- Deputy speaker of the special interest group 0.1.1 *Algorithms and Data Structures* of the German Association for Computer Science (GI).
- Member of the Editorial Board of *ORDER.*
- Referee for the research focus program (SPP) *Efficient algorithms for discrete problems and their applications* of the german science foundation (DFG).
- Chairman of the search committee for a professorate (C4) in theoretical computer science.
- Chairman of the habilitation committee of Klaus Kriegel.
- Member of the Ph.D. committees of Carsten Grefe and Detlev Stalling, Freie Universität Berlin.
- Chairman of the Ph.D. committee of Michael Godau, Freie Universität Berlin.
- Referee for the Ph.D. thesis of Alon Efrat, Tel Aviv University.

Peter Brass
- Member of the speakers' circle of the *DMV-Special Interest Group* Geometry – operation of their web-site and electronic newsletter.
- Referee for the *Zentralblatt.*
- Contributor to the *Mathematical Genealogy Project.*

Stefan Felsner
- Member of the search committee for a professorate (C4) in theoretical computer science.
- Helping hand at the *International Congress of Mathematicians (ICM '98)*, Berlin, August 18th through 27th.
- Guest of Prof. Dr. Emo Welzl at the ETH Zürich, Switzerland, September 9th through 11th.
- Guest of Prof. Ferran Hurtado at the Universitat Politécnica de Catalunya, Barcelona, Spain, September 26th through October 6th.
- Lecture *Discrete Mathematics* at the pupils' seminar on mathematics at the Freie Universität Berlin, October 12th through 17th.
- Referee for: *IPL, Discrete Mathematics, Discrete Applied Mathematics, ORDER, Approx 98, Focs 98.*

Frank Hoffmann
- Course *Mathematische Methoden der Informatik II (Mathematical methods of computer science II)*, Berufsakademie Berlin (1998).
- Referee for *STACS '99.*
- Member of the search committee for a professorate (C4) in theoretical computer science.

Christian Knauer
- Referee for *International Journal of Computer Vision.*
- Cooperation with the research project *Körper- Gesichts- Zahnform (Shapes of body, face, and teeth)* of Prof. Pfeiffer at Universität Köln.

Klaus Kriegel
- Course *Mathematische Methoden der Informatik II (Mathematical methods of computer science II)*, Berufsakademie Berlin (1998).
- Referee for *STACS '99* and *Parallel Processing Letters*.

Nicole Morawe
- Students' coach during their participation at the *Southwestern European ACM Programming Contest*, Ulm, October 31st/November 1st.
- Referee for *Information Processing Letters*.

Sven Schönherr
- Participant of the *CGAL Design & Implementation Meeting*, Saarbrücken, May 5th through 7th.

Torsten Thiele
- Referee for *Computational Geometry – Theory and Applications, SOCG, Journal of Graph Algorithms and Applications*.
- Member of the Ph.D. committee of Michael Godau, Freie Universität Berlin.

William Tom Trotter
- Managing Editor of *ORDER*.
- Member of the Editorial Board of *Journal of Graph Theory, and Algebra Unversalis*.
- Guest Editor of a special issue of *Discrete Mathematics* devoted to "Partially Ordered Sets".

Frank Wagner
- Research stays at the Department of Theoretical Computer Science at ETH Zürich, Switzerland, April 98 and August 98.
- Since October 1st on leave from the Heisenberg scholar ship for working as a scientific consultant and project leader with the Transport-, Informatik-, und Logistik-Consulting (TLC), Deutsche Bahn Gruppe in Frankfurt.

Carola Wenk
- Helping hand at the *International Congress of Mathematicians (ICM '98)*, Berlin, August 18th through 27th.

Alexander Wolff
- Referee for: *Software Practice & Experience, International Journal of Computational Geometry & Applications, Compuational Geometry: Theory and Applications*

Appendix:

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

January 6th: Helmut Alt
Nearest Neighbor Search in High Dimensions

January 8th: Ulrich Hoffmann
Nächste-Nachbar-Suche in hohen Dimensionen
(Nearest Neighbor Search in High Dimensions)

January 13th: Christian Knauer
Reference Points for Affine Mappings do not exist

January 15th: Bernd Gärtner
Abstract Objective Functions on the 3-Cube

January 16th: Stefan Felsner
Old Proofs for Theorems about Arrangements

January 20th: Torsten Thiele
Improvements on the Erdős-Szerkeres Theorem

January 22nd: Martin Mielich
Binary Space Partition Trees

January 27th: Klaus Kriegel
Minimum Cycle Cover of Graphs is NP-Complete

January 29th: Alexander Wolff
Computing the Medial Axis of a Polygon - Slow and Fast

January 30th: Stefan Felsner
Path Coupling and Random Linear Extensions

February 3rd: Peter Brass
Probleme mit Spiegeln (Problems with Mirrors)

February 5th: Sven Schönherr
Make It! – Generating and Maintaining Makefiles Automatically

February 12th: Nicole Morawe
Gray Codes and Catalan Families

Februray 17th: Frank Hoffmann
The Angle Hull of a Convex Region

February 19th: Frank Wagner
The History of Natural Languages

February 26th: Christian Knauer
A Separation Bound for Radical Expressions

March 5th: Klaus Kriegel
Über die Kantenzahl in zufälligen planaren Graphen
(On the Number of Edges in Random Planar Graphs)

March 10th: Tom Trotter
Fasern und Co-Fasern in endlichen geordneten Mengen
(Fibres and Cutsets in Finite Ordered Sets)

March 12th: Marcus Jürgens
Datenstrukturen für OLAP-Daten (Data Structures for OLAP-Data)

March 17th: Torsten Thiele
On Mimicking Networks

March 19th: Stefan Felsner
Vortex Free Tournaments (Wirbelfreie Turniere)

March 26th: Frank Wagner
On Mimicking Networks

March 31st: Peter Held
Minimale Schnitte durch Baumpackungen (Minimal Cuts by Treepacking)

April 2nd: Nicole Morawe
Gray-Codes, Part III

April 7th: Astrid Kaffanke
Höherdimensionale Suchbäume für gewichtete Regionen
(Higher Dimensional Search Trees for Weighted Regions)

April 9th: Alexander Wolff
Besser surfen (How to surf better)

April 14th: Peter Brass
Über Kreisanordnungen und numerische Integration
(About Disc Arrangements and Numerical Integrations)

April 16th: Frank Hoffmann
Hamiltonian Cycles in Solid Grid Graphs, Part I

April 21st: Frank Hoffmann
Hamiltonian Cycles in Solid Grid Graphs, Part II

April 23rd: Sven Schönherr
Floating Point Filters with Interval Arithmetic

April 28th: Lutz Meissner
Operation endlich erzeugter Halbgruppen auf Graphen
(Operation of Finitely Generated Semigroups on Graphs)

April 30th: Stefan Felsner
Conway's Thrackle Conjecture

May 5th: Susanne Albers
Verbesserte Schranken für Online-Scheduling (Improved Bounds for Online-Scheduling)

May 7th: Christian Knauer
Somewhere $P = NP$ and somewhere else $P \neq NP$

May 12th: Lars Knipping
Vereinfachung von Polygonzügen
(Approximating Polygonal Chains with Minimum Link Paths)

May 14th: Helmut Alt
Die erwartete Laufzeit zur Bestimmung des kürzesten Vektors
(The Expected Runtime for Determining the Shortest Vector)

May 26th: Tom Trotter
Graph Coloring and Posets

June 2nd: Klaus Kriegel
Induzierende Wege für Linienarrangements
(Induced Paths in Line Arrangements)

June 11th: Torsten Thiele
0/1-Programme und ihre Relaxierung (0/1-Programs and their Relaxation)

June 18th: Peter Brass
Die Berührzahl von Zylindern und Kugeln
(The Kissing Number of Cylinders and Spheres)

June 25th: Michael Godau
Hausdorffabstände im R^d (Haussdorf Distances in R^d)

June 30th: Michael Godau
Hausdorffabstände im R^d – Teil II (Haussdorf Distances in R^d, Part II)

July 2nd: Nicole Morawe
Polygon-Zerlegungen und Young-Tableaux
(Polygon Decompositions and Young Tableaux)

July 7th: Harald Baier
Public-key-Kryptosysteme mittels elliptischer Kurven
(Public-Key Cryptosystems using Elliptic Curves)

July 9th: Alexander Wolff
A Unified Approach to Labeling Graphical Features

July 14th: Lutz Meissner
Randomisierte Suche des nächsten Nachbarn in metrischen Räumen
(Randomized Nearest Neighbor Search in Metric Spaces)

July 16th: Tom Trotter
Discovering Outerplanar Graphs

July 21st: Carola Wenk
Partial Surface Matching by Using Footprints

July 23rd: Christian Knauer
Wie kann man Polynome schneller auswerten als Horner?
(How to Evaluate Polynomials Faster than Horner?)

July 28th: Helmut Alt
Geometric Applications of a Randomized Optimization Technique I

July 30th: Helmut Alt
Geometric Applications of a Randomized Optimization Technique II
August 4th: Bernd Gärtner
Abstrakte Zielfunktionen und der Random-Facet Simplex- Algorithmus I
(Abstract Objective Functions and the Random-Facet Simplex-Algorithm, Part I)

August 6th: Bernd Gärtner
Abstrakte Zielfunktionen und der Random-Facet Simplex- Algorithmus II
(Abstract Objective Functions and the Random-Facet Simplex-Algorithm, Part II)

August 11th: Stefan Felsner
Reduzierte Dekompositionen und Young Tableaux I
(Reduced Decompositions and Young Tableaux, Part I)

August 13th: Stefan Felsner
Reduzierte Dekompositionen und Young Tableaux II
(Reduced Decompositions and Young Tableaux, Part II)

September 1st: Alexander Wolff
Labeling Points with Circles

September 3rd: Nicole Morawe
Gray-Codes für ZickZackLinien mit gleichem Flächeninhalt
(Gray-Codes for Zigzaglines with Equal Area)

September 8th: Klaus Kriegel
Bestimmung von Polygonen durch Winkel und Cross-Ratios
(Determination of Polygons by Angles and Cross-Ratios)

September 10th: Susanne Albers
Algorithmen für Roboter-Navigation (Algorithms for Robot Navigation)

September 15th: Peter Brass
Punkte und Geraden (Points and Straight Lines)

September 17th: Carola Wenk
Hausdorffabstände zwischen Punkten, Strecken, Dreiecken
(Haussdorf-Distances between Points, Line Segments, and Triangles)

September 22nd: Torsten Thiele
Orthogonales Graphzeichnen im Raum (Orthogonal Graph Drawing in 3-Space)

September 24th: Frank Hoffmann
Das Graphisomorphieproblem (The Graph Isomorphism Problem)

September 29th: Helmut Alt
Fly Cheaply: On the Minimum Fuel-Consumption Problem

October 1st: Frank Hoffmann
Isomorphietest für Graphen beschränkter Valenz
(Testing Isomorphism of Graphs and Bounded Valence)

October 6th: Christian Knauer
On an Open Problem of Susanne's highschool teacher

October 8th: Artur Andrzejak
Reverse Search für k-Mengen (Reverse search for k-sets)

October 13th: Peter Brass
10 Variationen zum Satz von Helly (10 Variations of the Theorem of Helly)

October 15th: Alexander Wolff
Schnelles Suchen in Schnittgraphen von achsenparallelen Strecken
(Fast Search in Intersection Graphs of Axis Parallel Line Segments)

October 20th: Stefan Felsner
Posets kleiner Weite und Graphen kleiner Dilworth-Zahl
(Posets of Small Width and Graphs of Small Dilworth Number)

October 22nd: Lutz Kettner
Designing a Data Structure for Polyhedral Surfaces with C++ Templates

October 27th: Lutz Meissner
Nächste-Nachbar-Suche mit *vp*-Bäumen (Nearest Neighbor Search with *vp*-Trees)

October 29th: Klaus Kriegel
Geometrische Graphen mit wenigen disjunkten Kanten
(Geometric Graphs with Few Disjoint Edges)

Novmeber 1st: Carola Wenk
On the Union of Jordan Regions

November 5th: Helmut Alt
Approximatives Punkt-Pattern-Matching (Approximate Point Pattern Matching)

November 10th: Clemens Hendler
Cliquenüberdeckung von Boxgraphen (Clique Covering of Box Graphs)

November 12th: Torsten Thiele
Besser suchen (Improved Searching)

November 13th: Laura Heinrich-Litan
OBDDs partiell symmetrischer Boolescher Funktionen
(OBDDs of Partial Symmetric Boolean Functions)

November 17th: Bernd Gärtner
Ein Reinfall mit Pseudozufallsmatrizen (A Failure with Pseudo Random Matrices)

November 19th: Vikas Kapoor
A Generic Design Concept for Geometric Algorithms

November 24th: Christian Knauer
Matching Shapes with respect to the Symmetric Difference

November 26th: Alexander Wolff
Labeling Lines: Work in Progress

December 1st: Sven Siebert
Quadriken im R^3 (Quadrics in R^3)

December 3rd: Nicole Morawe
Topologische Kombinatorik, Algebraische Topologie und Grapheneigenschaften
(Topological Combinatorics, Algebraic Topology, and Graph Properties)

December 8th: Peter Brass
Interpolation von Kurven und Funktionen (Interpolation of Curves and Functions)

December 10th: Stefan Felsner
Aztekische Diamanten (Aztec Diamonds)

December 15th: Klaus Kriegel
Simpliziale Zerlegungen und Graphfärbungen
(Simplicial Decomposition and Graph Coloring)

December 17th: Frank Hoffmann
Searching Street Polygons Optimally