

□ WS14:Algorithmische Geometrie

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Nachrichtenforum



Course Data

Course size: 5 ECTS (2 SWS)

Time & place: – Lectures on Wednesdays, 10:15–11:45, room SE I
– Tutorials on Fridays, **14:00-15:30**, room SE I

Target group: Master Computer Science, Master Mathematics, Master Computational Mathematics

Lecturers: [Alexander Wolff](#) (lectures), [Philipp Kindermann](#) and [Benedikt Budig](#) (tutorials)

~~Oral exam at the end of the semester~~

Exam: **Written exam on Wednesday, February 11th 2015.** The exam will take place in **HS4** of the "naturwissenschaftlicher Hörsaalbau", from **10:00 to 12:00**. You are not allowed to use any auxiliary resources during the exam except **one, one-sided, handwritten DIN A4 page** with your notes. Please be on time and bring your student id.



Course Description

In many areas of computer science – for example, in robotics, computer graphics, virtual reality, and geographic information systems (GIS) – it is necessary to store, analyze, generate, and manipulate spacial data. This course deals with algorithmic aspects of these tasks. We will study techniques and concepts that help to design and analyze geometric algorithms and data structures. Each technique and each concept is exemplified at a problem from one of the above application areas.

Objectives

At the end of this course, participants should be capable to decide which algorithms or data structures are appropriate to solve a given geometric problem computationally. Participants should also learn to analyze new problems and come up with efficient solutions based on the concepts and techniques that are taught in the course.

Literature


- Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars: *Computational Geometry: Algorithms and Applications*. Springer-Verlag, 3rd edition, 2008
[Web site with pseudocode for all algorithms](#)
- Rolf Klein: *Algorithmische Geometrie: Grundlagen, Methoden, Anwendungen* (in German). Springer-Verlag, 2nd edition, 2005
- Ketan Mulmuley: *Computational Geometry: An Introduction Through Randomized Algorithms*, Prentice Hall, 1st edition, 1993





Lecture Slides





Lecture #01 (08.10.2014): Convex Hull


-  [Lecture #01 \(08.10.2014\): printer-friendly version](#)


-  [Chan's algorithm \(Discrete & Computational Geometry, 16\(4\):361-368, 1996\)](#)


-  [Lecture #02 \(15.10.2014\): Line Intersection by Plane Sweep](#)


-  [Lecture #02 \(15.10.2014\): printer-friendly version](#)


-  [Lecture #03 \(22.10.2014\): Guarding Art Galleries and Triangulation Polygons](#)


-  [Lecture #03 \(22.10.2014\): printer-friendly version](#)


-  [Lecture #04 \(29.10.2014\): Linear Programming \(update 30.10., 20:35\)](#)


-  [Lecture #04 \(29.10.2014\): printer-friendly version](#)


-  [Lecture #05 \(05.11.2014\): Orthogonal Range Queries](#)


-  [Lecture #05 \(05.11.2014\): printer-friendly version](#)


-  [Lecture #06 \(12.11.2014\): Point Location](#)


-  [Lecture #06 \(12.11.2014\): printer-friendly version](#)


-  [Lecture #07 \(26.11.2014\): Voronoi Diagram](#)


-  [Lecture #07 \(26.11.2014\): printer-friendly version](#)


-  [Lecture #08 \(03.12.2014\): Delaunay Triangulation](#)


-  [Lecture #08 \(03.12.2014\): printer-friendly version](#)


-  [Lecture #09 \(10.12.2014\): Convex Hull in 3D](#)


-  [Lecture #09 \(10.12.2014\): printer-friendly version](#)


-  [Lecture #10 \(17.12.2014\): Motion Planning, Minkowski Sum, and Union Complexity](#)


-  [Lecture #10 \(17.12.2014\): printer-friendly version](#)


-  [Lecture #11 \(07.01.2015\): Simplex Range Searching](#)


-  [Lecture #11 \(07.01.2015\): printer-friendly version](#)


-  [Lecture #12 \(14.01.2015\): Arrangements and Duality](#)

-  [Lecture #12 \(14.01.2015\): printer-friendly version](#)

-  [Lecture #13 \(21.01.2015\): Binary Space Partitions and Autopartitions](#)


-  [Lecture #13 \(21.01.2015\): printer-friendly version](#)


-  [Lecture #14 \(28.01.2015\): Seidel's Triangulation Algorithm](#)


-  [Lecture #14 \(28.01.2015\): printer-friendly version](#)


-  [Seidel's algorithm \(Computational Geometry: Theory and Applications 1:51–64, 1991\)](#)


Exercises


-  [Homework Assignment #1](#)


-  [Homework Assignment #1 \(submission\)](#)


-  [Homework Assignment #2](#)


-  [Homework Assignment #2 \(submission\)](#)


-  [Homework Assignment #3](#)


-  [Homework Assignment #3 \(Submission\)](#)


-  [Homework Assignment #4](#)

-  [Homework Assignment #4 \(Submission\)](#)

-  [Homework Assignment #5](#)

-  [Homework Assignment #5 \(Submission\)](#)

-  [Homework Assignment #6](#)

-  [Homework Assignment #6 \(Attachments\)](#)



Homework Assignment #6 (Submission)



Homework Assignment #7



Homework Assignment #7 (Submission)



Homework Assignment #8



Homework Assignment #8 (Submission)



Homework Assignment #9



Homework Assignment #9 (Submission)



Homework Assignment #10



Homework Assignment #10 (Submission)



Homework Assignment #11



Homework Assignment #11 (Submission)



Homework Assignment #12



Homework Assignment #12 (Submission)



Homework Assignment #13



Homework Assignment #13 (Submission)



Homework Assignment #14



Homework Assignment #14 (Submission)

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