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)
Exam:

Oral exam at the end of the semester

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 spatial 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

  Web site with pseudocode for all algorithms

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 #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


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)
English (en)
Español - Internacional (es)
Français (fr)
Italiano (it)
Português - Portugal (pt)
Svenska (sv)
Türkçe (tr)
Русский (ru)
آ랍 (ar)

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