Computational Geometry

(Geometriske Algoritmer)

"the pizza meeting"

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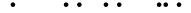
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Overview

- Why an Independent Subject?
- 2 Example Topics
- 3 Applications
- Formal Details
- Disclaimer

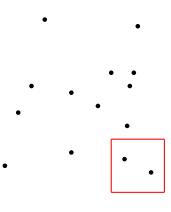
One-Dimensional Data



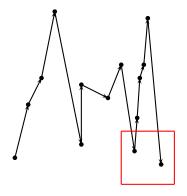
One-Dimensional Data







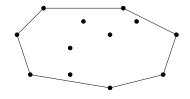




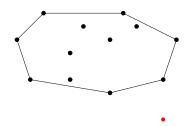
Convex Hull



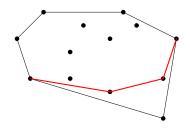
Convex Hull



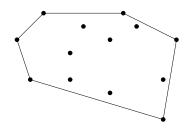
Dynamic Convex Hull



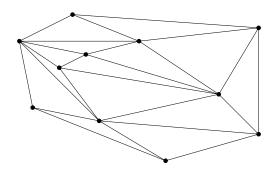
Dynamic Convex Hull



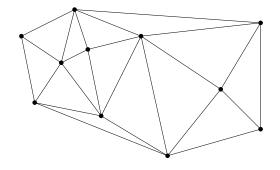
Dynamic Convex Hull



Triangulations

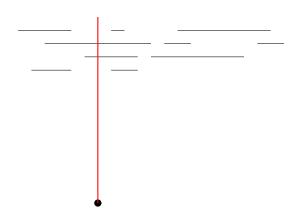


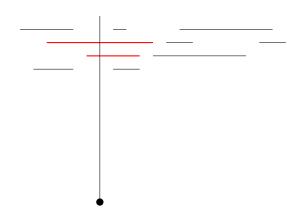
Nice Triangulations











Example Applications

Geometric algorithms are important parts of:

- Computer Graphics
- Geographic Information Systems (GIS)
- Robot Motion Planning
- Design: CAD, VLSI, . . .
- Image Analysis
- Computer Games

Course Content

Algorithms and Data Structures for Geometric Objects

- Triangulations and Voronoi Diagrams
- Interval and Point Searches
- Convex Hulls
- Range Searching
- Motion Planning
- etc.

Course Content

Introduction to (continuation of) important general techniques:

- Line Sweeping
- Fractional Cascading
- Randomization
- Amortization

Prerequisites

Analysis of Algorithms and Data Structures

- Search Trees
- Divide and Conquer
- Asymptotic Notation
- Time and Space Analysis
- Correctness Analysis



Format

- 10 ECTS over one semester
- Obligatory assignment in parts (some individual)
- Oral exam
- 2h lectures, 2h discussion section per week
- Good book: Computational Geometry
 Algorithms and Applications, 3. eds.
 de Berg, Cheong, van Kreveld, Overmars
 Springer, 2008.

Disclaimer

- Chalk & blackboard lectures...
- Core algorithmic problems (not graphics and games)
- Focus on efficient algorithms $O(n \log n)$
- This is not math!
- But there will be proofs in every lecture (of correctness and complexity)
- Course language is English, if necessary