

Computational Geometry (Geometriske Algoritmer)

“the pizza meeting”

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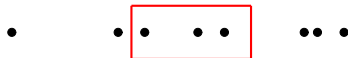
May 13, 2015

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

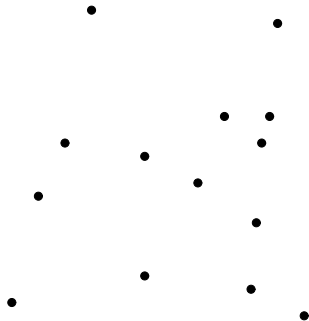
One-Dimensional Data



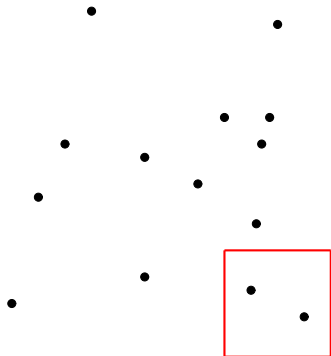
One-Dimensional Data



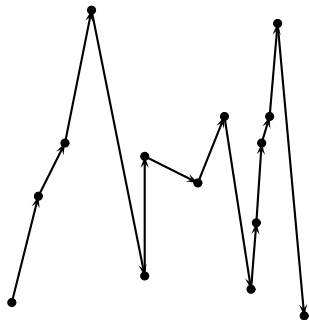
Two-Dimensional Data



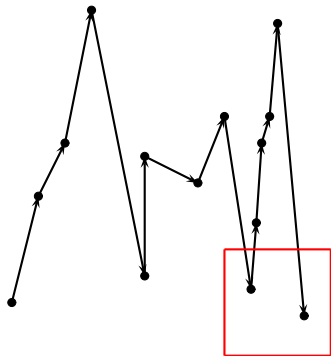
Two-Dimensional Data



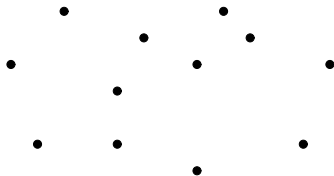
Two-Dimensional Data



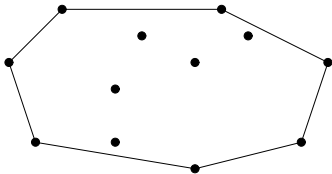
Two-Dimensional Data



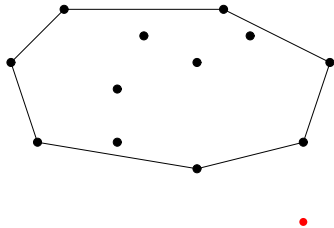
Convex Hull



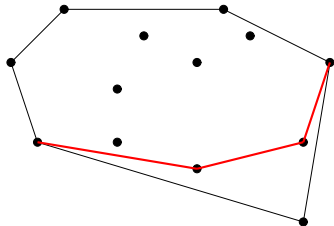
Convex Hull



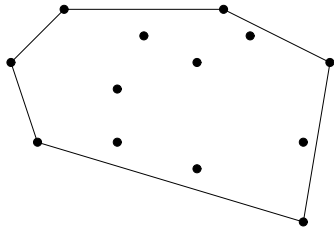
Dynamic Convex Hull



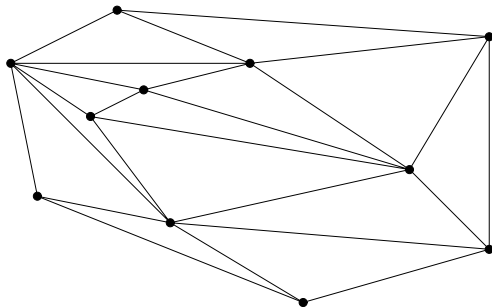
Dynamic Convex Hull



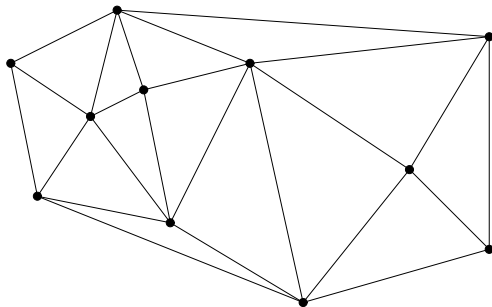
Dynamic Convex Hull



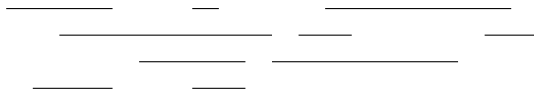
Triangulations



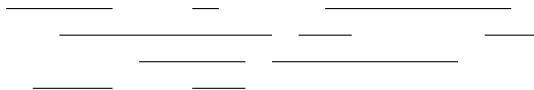
Nice Triangulations



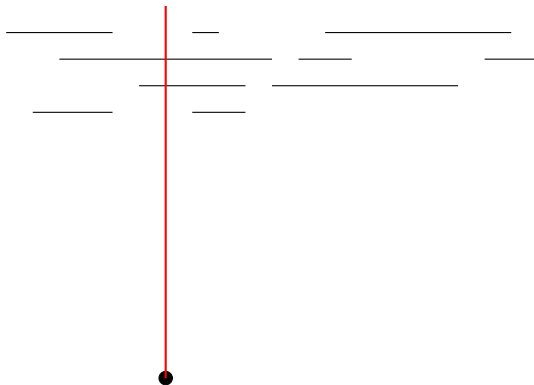
Range Searching



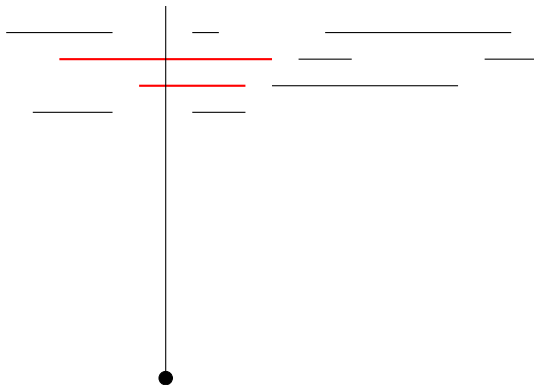
Range Searching



Range Searching



Range Searching



Geometric algorithms are important parts of:

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

Algorithms and Data Structures for Geometric Objects

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

Introduction to (continuation of) important general techniques:

- Line Sweeping
- Fractional Cascading
- Randomization
- Amortization

Analysis of Algorithms and Data Structures

(DM507/DM508, or equivalent)

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

- 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.

- Chalk & blackboard lectures. . .
- Core algorithmic problems (not graphics and games)
- This is *not* math!
- But there will be proofs in every lecture (of correctness and complexity)
- Course language is English, if necessary