

CMSC 754 - Computational Geometry

Lecture 1: Introduction

What is Computational Geometry?

- Subfield of algorithm theory involving discrete geometric structures

- points, lines + line segments, polygons, spatial subdivisions

in 2-dimensional

3-dimensional

low dimensional

high dimensional

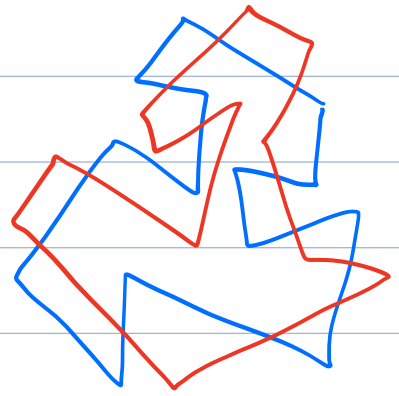
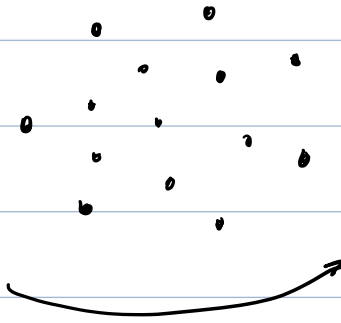


Features:

- Worst-case asymptotic complexity
deterministic + randomized
- Rigorous - provably correct + efficient (in theory)
- Discrete inputs/outputs
- Combinatorial-based analysis
- "Simple" geometry - flat, Euclidean
- low dimensionality

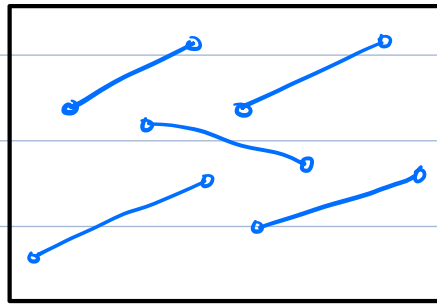
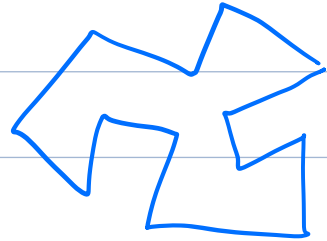
Topics:

- Convex hulls

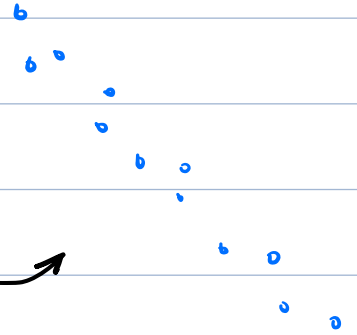


- Intersections

- Triangulations
+ spatial subdivisions

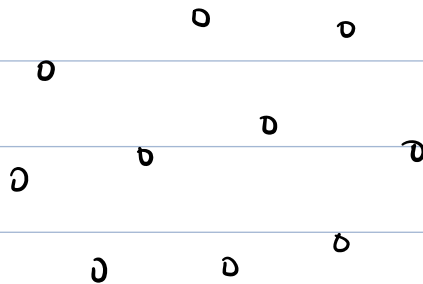


- Point location

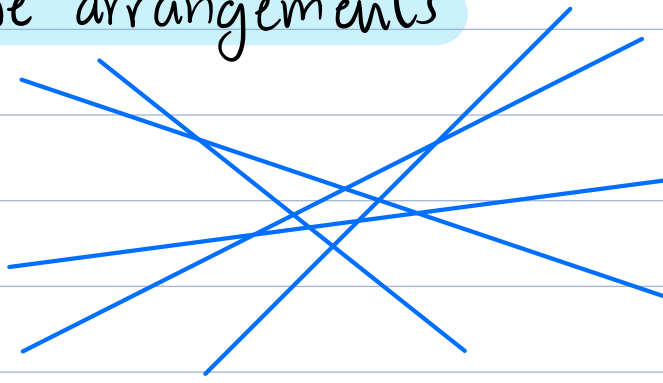


- Linear programming + duality

- Voronoi diagrams + Delaunay triangulations



- Line/hyperplane arrangements



- Search + Data Structures

- Approximation

- ϵ -nets

- ϵ -kernels + coresets

- More? High dimensional geometry
Computational topology