

CMSC 754 - Computational Geometry

Lecture 1: Introduction

What is Computational Geometry?

- Subfield of algorithm theory involving discrete geometric structures

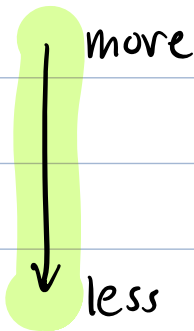
- points, lines + line segments, polygons, spatial subdivisions

in 2-dimensional

3-dimensional

low dimensional

high dimensional

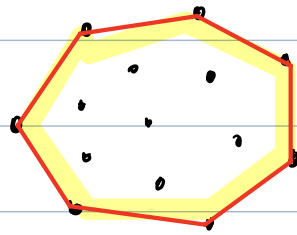


Features:

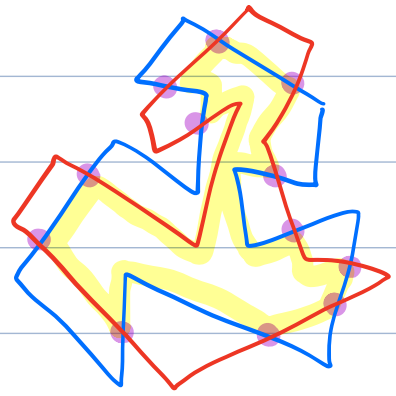
- Worst-case asymptotic complexity
deterministic + randomized
- Rigorous - provably correct + efficient (in theory)
- Discrete inputs/outputs
- Combinatorial-based analysis
- "Simple" geometry - flat, Euclidean
- low dimensionality

Topics:

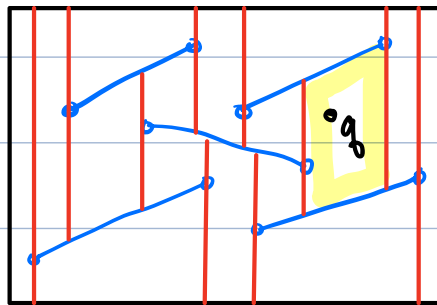
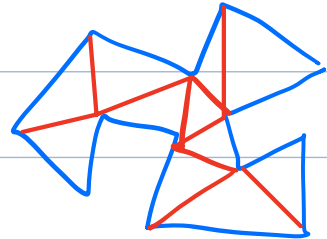
- Convex hulls



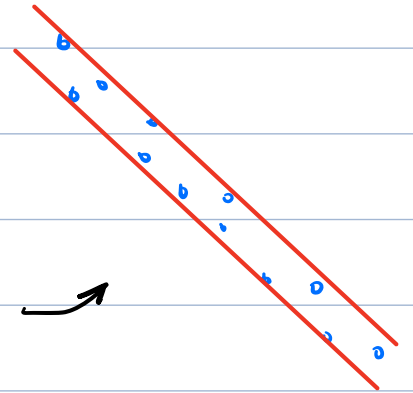
- Intersections



- Triangulations
+ spatial subdivisions

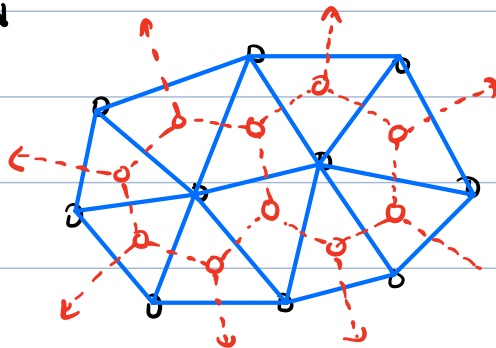


- Point location

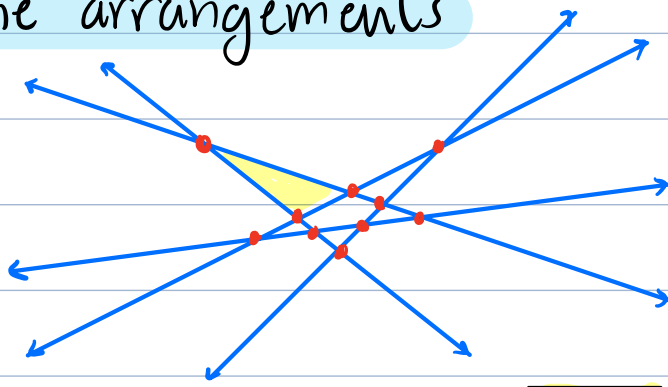


- Linear programming + duality

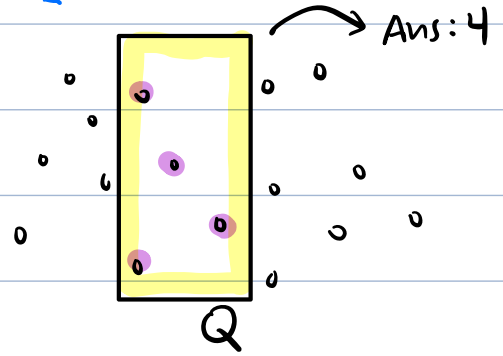
- Voronoi diagrams + Delaunay triangulations



- Line/hyperplane arrangements

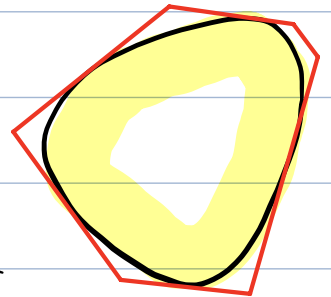


- Search + Data Structures



- Approximation

- ϵ -nets
- ϵ -kernels + coresets



- More? High dimensional geometry
Computational topology