

CMSC 754 - Computational Geometry

Lecture 1: Introduction

What is computational geometry?

- Subfield of algorithm theory involving:

- discrete geometric structures

- e.g. points, lines, line segments, polygons
+ spatial maps + subdivisions

- in 2-dimensional

- or- 3-dimensional

- or- constant dimensional

- or- high dimensional

more

less

- Euclidean space

Features/Limitations:

- Worst-case asymptotic complexity
(deterministic or randomized)

- Exact, correct, rigorous proofs

- Discrete inputs + outputs

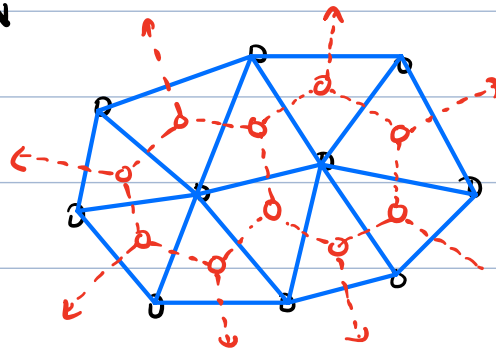
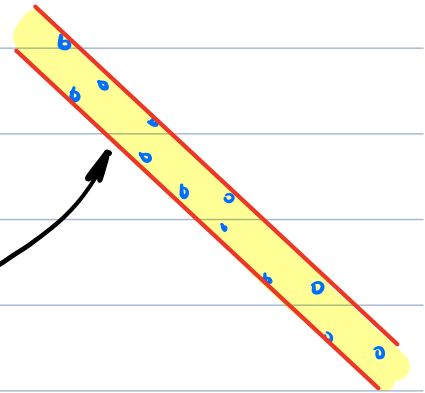
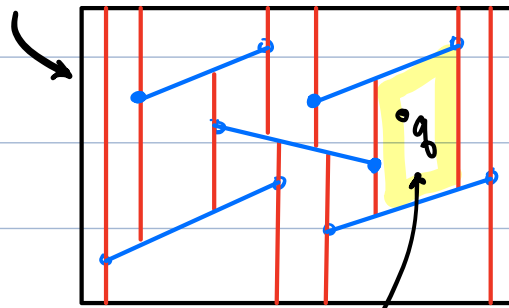
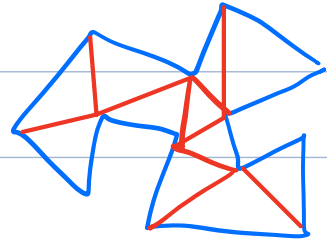
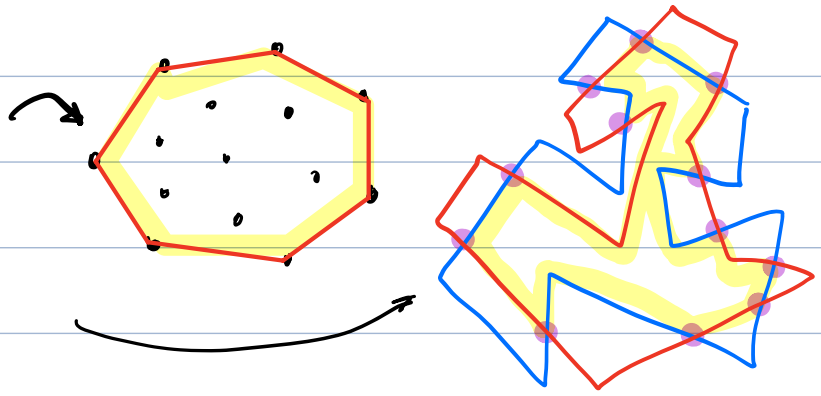
- Combinatorial-based analyses

- Simple geometry (flat vs. curved; Euclidean)

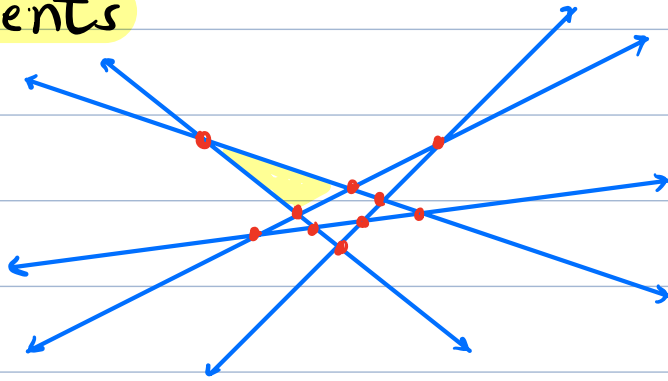
- Low dimensionality

Topics:

- Convex hulls
- Intersections
- Triangulations + spatial subdivisions
- Point location queries
- Linear programming + duality
- Voronoi diagrams + Delaunay triangulations

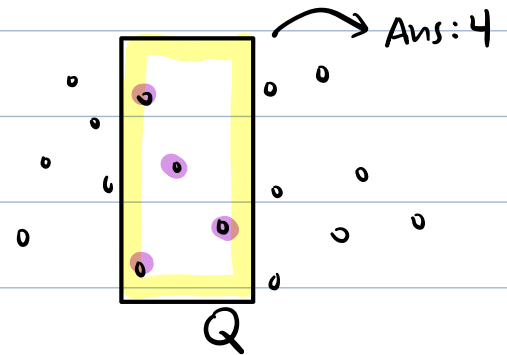


- Line arrangements



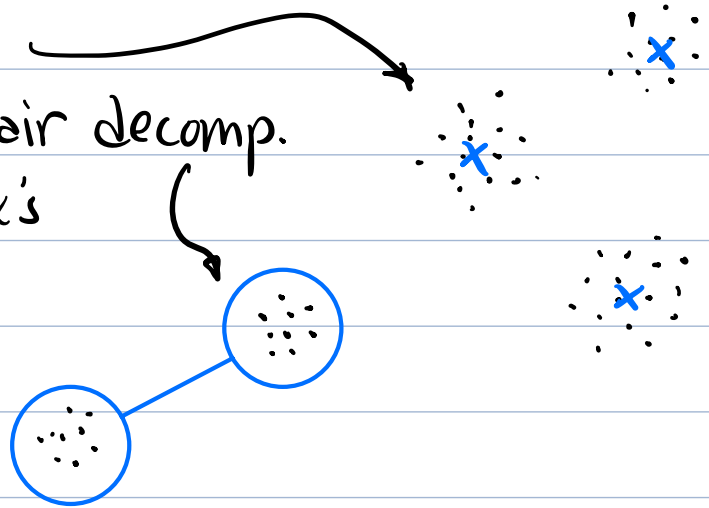
- Search + data structures

- Range searching



- Approximations

- Clustering
- Well-separated pair decomp.
- ϵ -nets + ϵ -approx's
- VC dimension



- Motion planning

- Config. space + config. obstacles
- Minkowski sums + pseudodisks

