Topic: Point Location & Triangulation

Given a planar subdivision (straight lines only)

![Graph of a planar subdivision with vertices labeled 1 to 12 and edges connected to form regions]

Doubly Connected Edge List (DCEL)

Build a data structure that supports queries of the following kind:
“Find a point \( p = (x', y') \), which region contains \( p \).”

Parameterized by # vertices, # regions

Problem size corresponds to representation of this planar subdivision
Ray Shooting

Given a set of edges (say non-intersecting) build a data structure to support queries of the following type:

"If we shoot a ray, which segment does it hit first?"

In the dynamic version, segments can be inserted/deleted.

Our goal is to obtain

1. Linear space data structure
2. Logarithmic query time
3. Preprocessing (construction) time
Vertical slabs

Arbitrary Planar Subdivisions can be partitioned into vertical slabs, such that two linear searches suffice for planar point location (vertical ray shooting). However, space can be \( \Omega(n^2) \). (Suppose no two vertices lie on the same vertical line)

"Persistent data structure" for storing similar lists