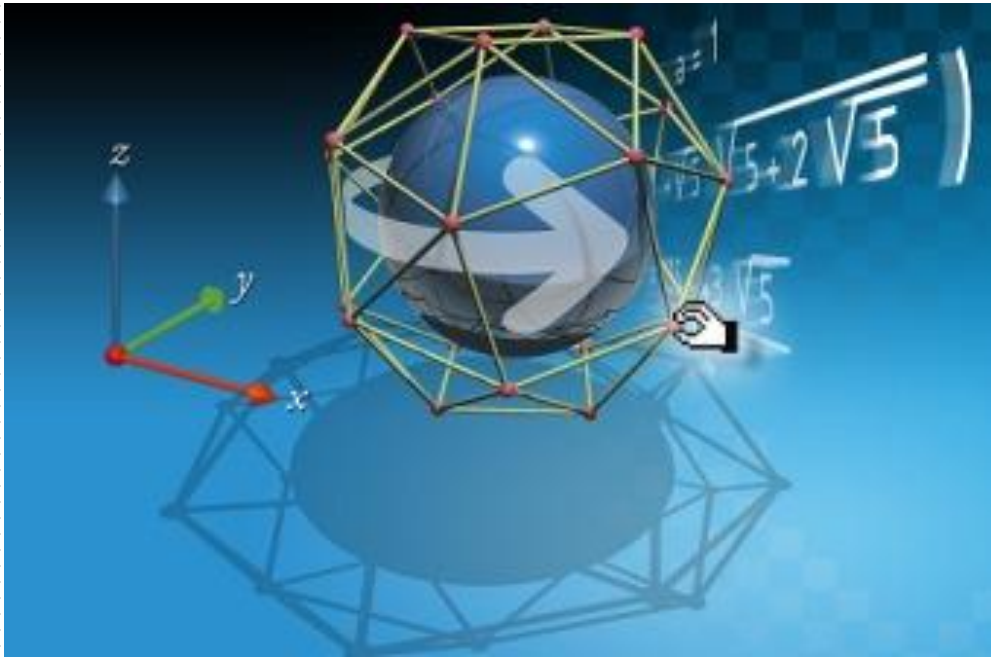


# 기하 계산 연구실 (Geometric Computing Lab.)

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Homepage: <https://geocomp.ssu.ac.kr/>

Laboratory: Room 409, Information Science Building (정보과학관)



# 기하 계산 및 기하 알고리즘 연구

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- 점, 선, 다각형, 원, 다면체, 곡면 등 기하 객체들 (geometric objects)들로 이루어진 문제에 관한 성질 연구 및 계산
  - 효율적인 기하 알고리즘 개발 및 응용
  - 응용분야: Computer Vision / Computer Graphics / Geometric Information System / Solid Modeling / Computer Network / 금속공학, 산업공학, 생물학, 인류학, 경영학
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# 연구주제

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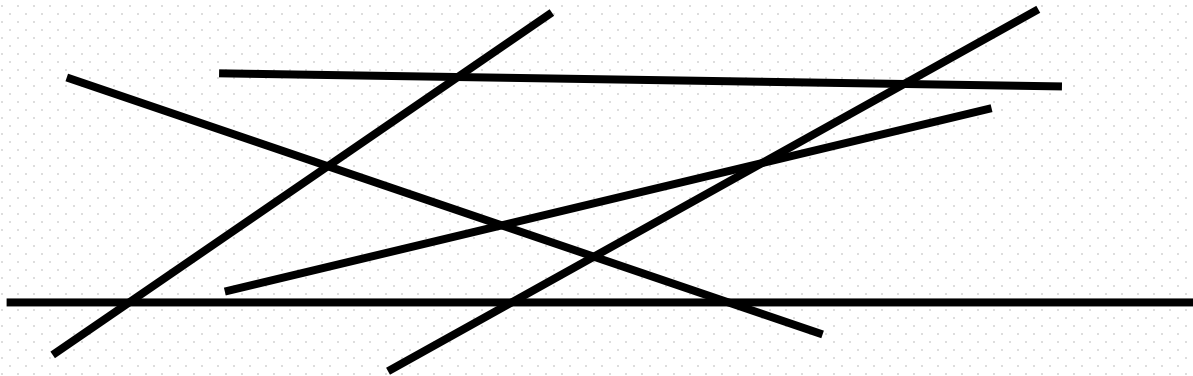
- Robot path planning with obstacles
  - Shortest path under various distances
  - Facility location
  - 2D or 3D Visibility computation
  - Triangulation, Mesh generation
  - Ad-hoc network graph
  - Vehicle routing problem
  - Game level design
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# Example: Segment Intersection

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Given  $n$  line segments in the plane,

- Does some pair intersect?
- Report all points of intersection



Naïve:  $O(n^2)$

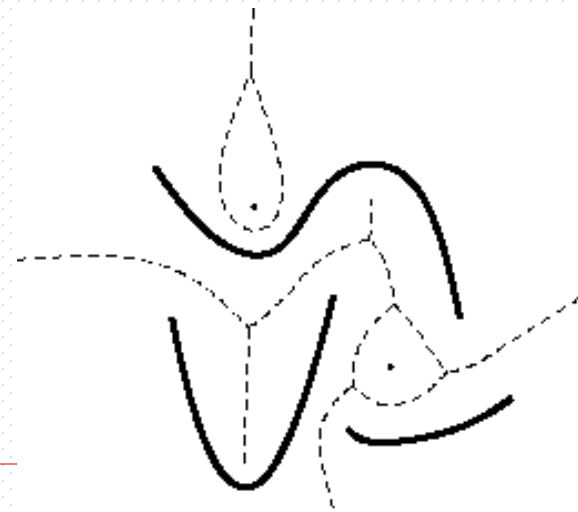
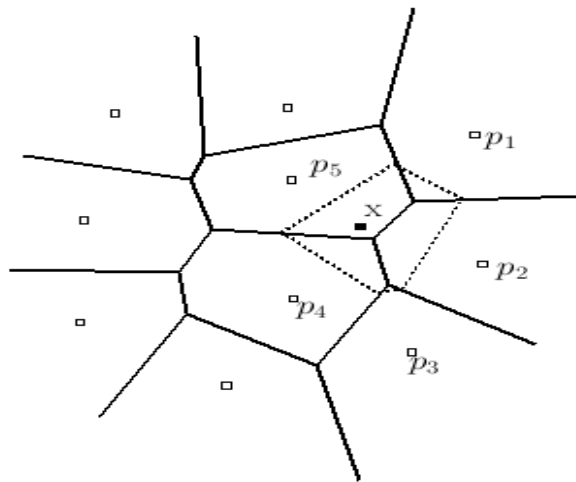
Best:  $O(n \log n)$  detect,  $O(k+n \log n)$  report

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# Example: Post office problem

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- Query: Find the Nearest Post Office from me.
- Algorithm: Construct a variant of Voronoi Diagram
  - VD of points, line segments, circular arcs,..
  - Furthest VD, Order-k VD
  - $L_p$  metric, convex distance, geodesic distance

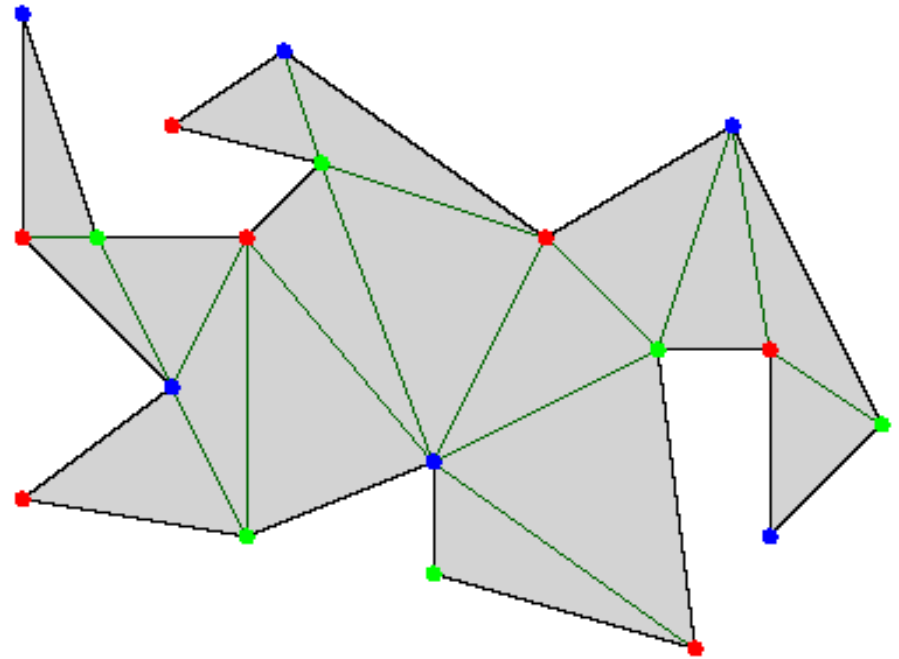
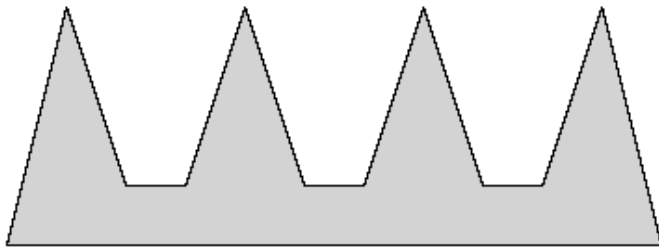


# Example: Camera-Guarding a gallery

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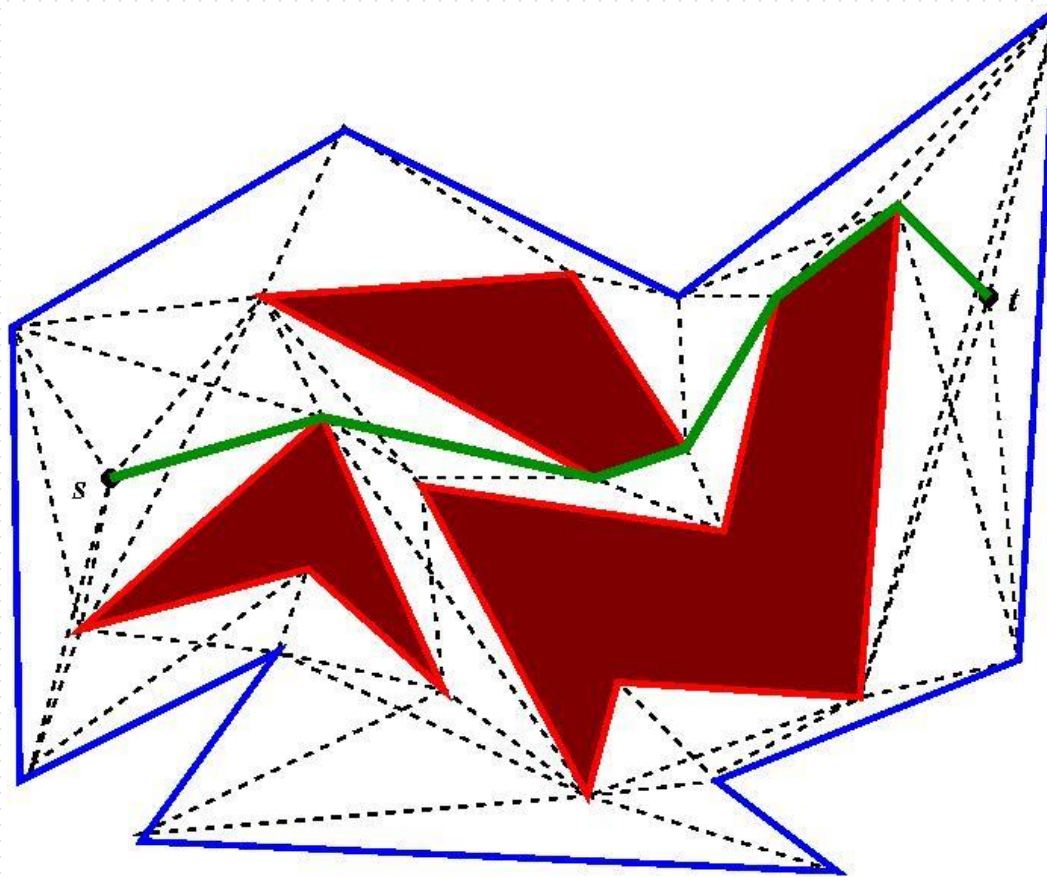
- Art-Gallery Theorem:  
 $n/3$  cameras are always sufficient: a set found in  $O(n \log n)$  time.
- Some  $n$ -gon needs at least  $n/3$  cameras.

$\lfloor \frac{n}{3} \rfloor$  Prongs

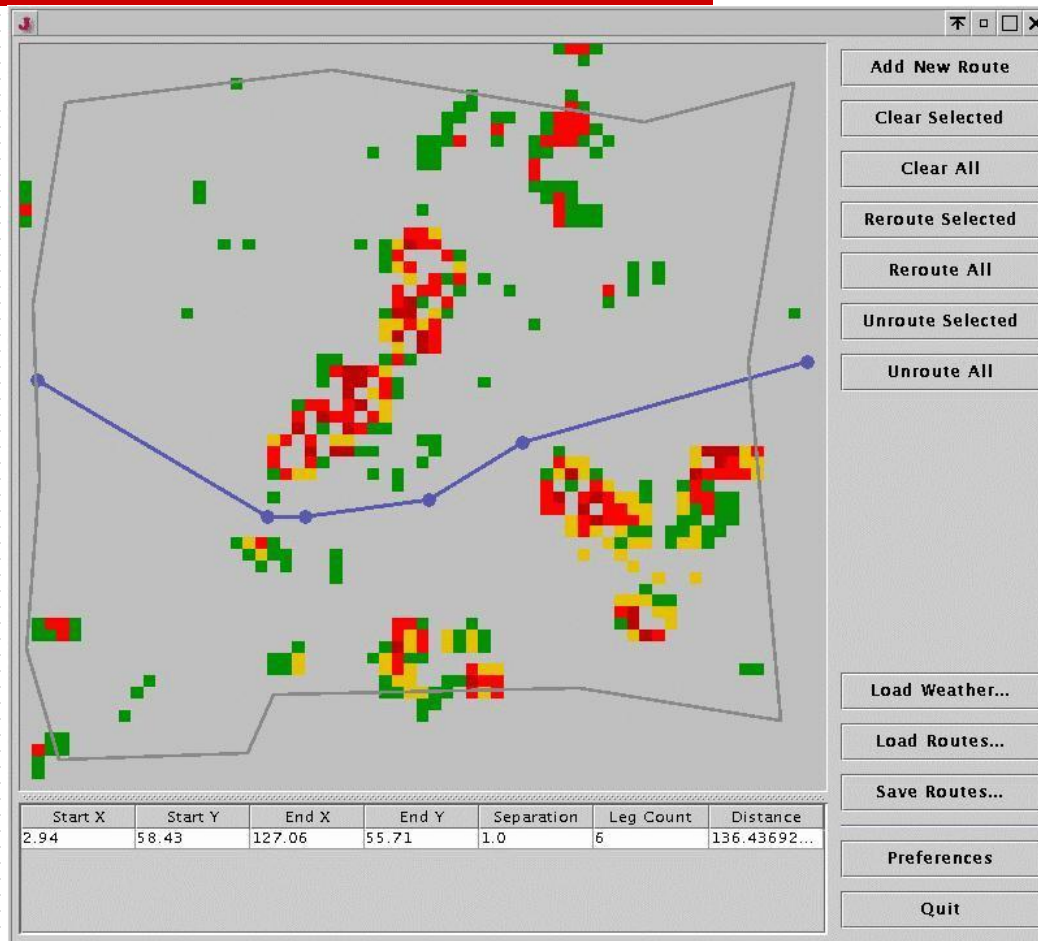


# Example: Shortest path for a mobile robot

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# Application: Weather Avoidance

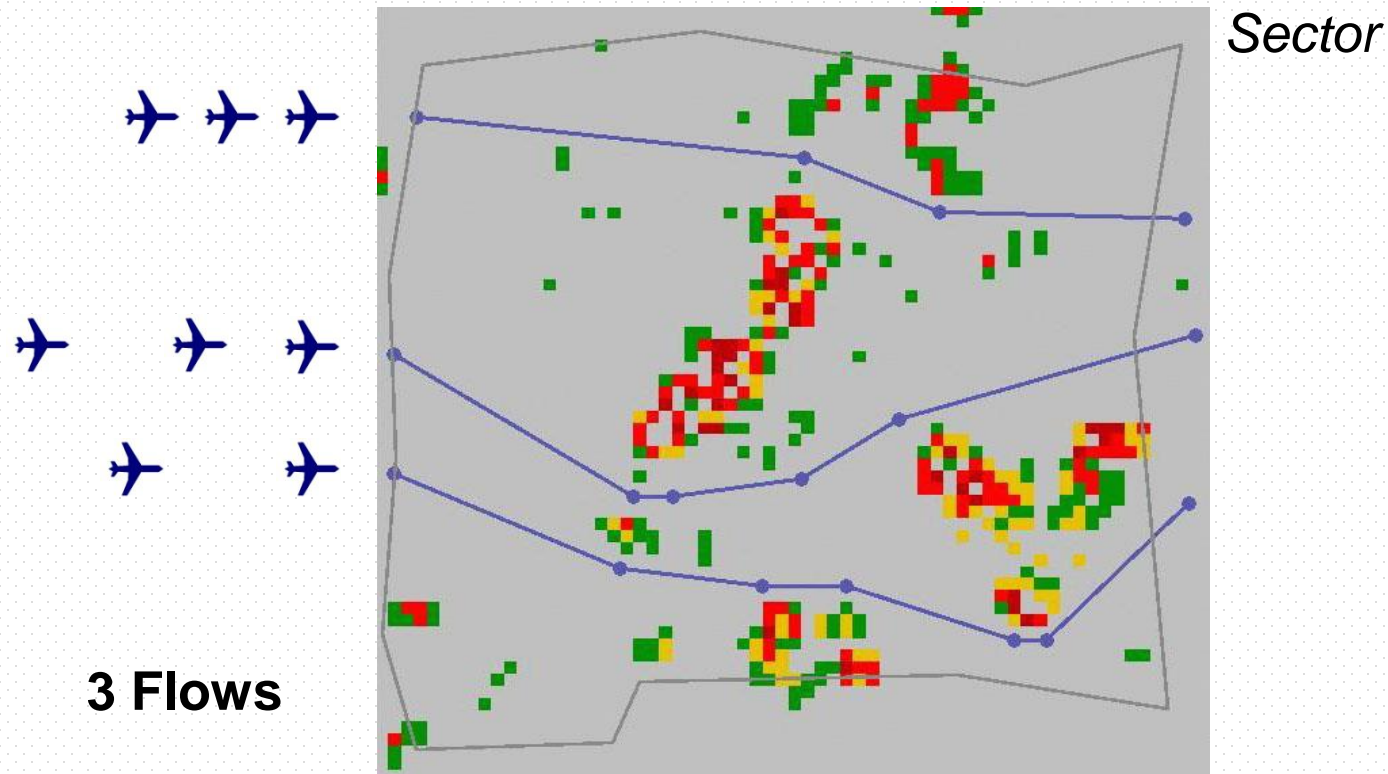


From Lecture notes by Joe Mitchell at Stony Brook



# Weather Avoidance Algorithms for En Route Aircraft

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From Lecture notes by Joe Mitchell at Stony Brook