# Closest points between convex polygons

## Problem Presentation

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Computational Geometry

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# Content

# Understanding the problem

**Goal**: Propose an algorithm that, given two disjoint convex polygons, P and Q, finds the closest points $p \in P$ and $q \in Q$.

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  - No overlapping Areas
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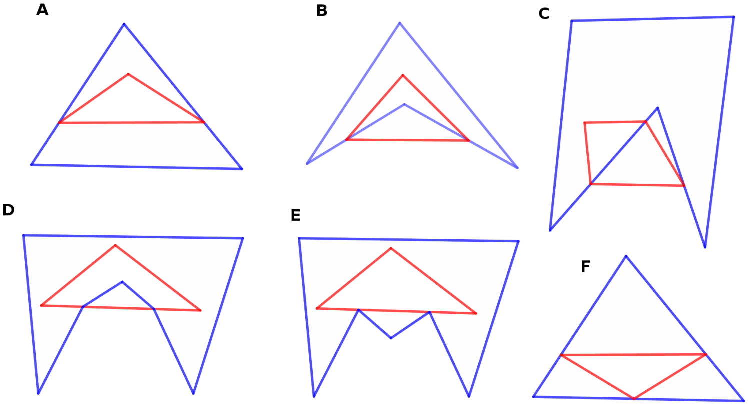
- **Disjoint**
  - No shared Edges or Vertices
  - No overlapping Areas
  - No touching Boundaries
- **Convex**
  - No Interior Angle Exceeds 180°

# Understanding the problem

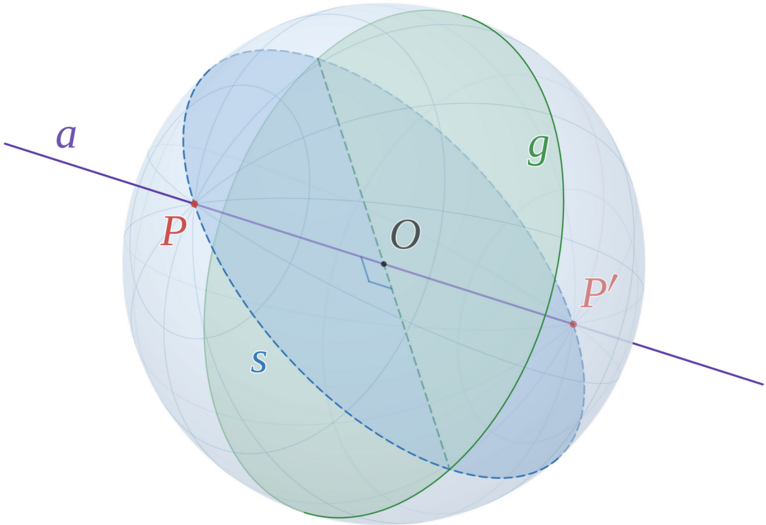


# Content

# Anti-podal points

**Convex polygons anti-podal points**: Antipodal points of two disjoint convex polygons refer to pairs of points, one from each polygon, such that the line segment joining them achieves an extremal property, usually it is either the maximum or minimum distance between the polygons.

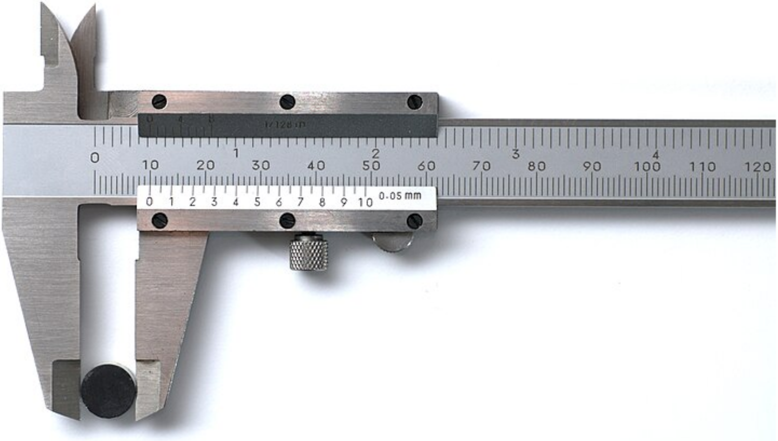
# Anti-podal points



# Rotating Calipers

- **Distances**
  - Diameter of a convex polygon
  - Maximum/Minimum distance between convex polygons
- **Bounding Boxes**
  - Minimum perimeter
  - Minimum area
- **Triangulations**
  - Onion triangulations
  - Spiral triangulations
  - Quadrangulation

# Anti-podal points



# Rotating Calipers

**Aplication**: Imagine each polygon being "held" by a pair of calipers (one on each polygon). As the calipers rotate around the polygon, you track the shortest distance between the two calipers. The first time the calipers align in a way that gives the smallest distance, that will be the closest pair of points.

# Content