

Geometric Intersection

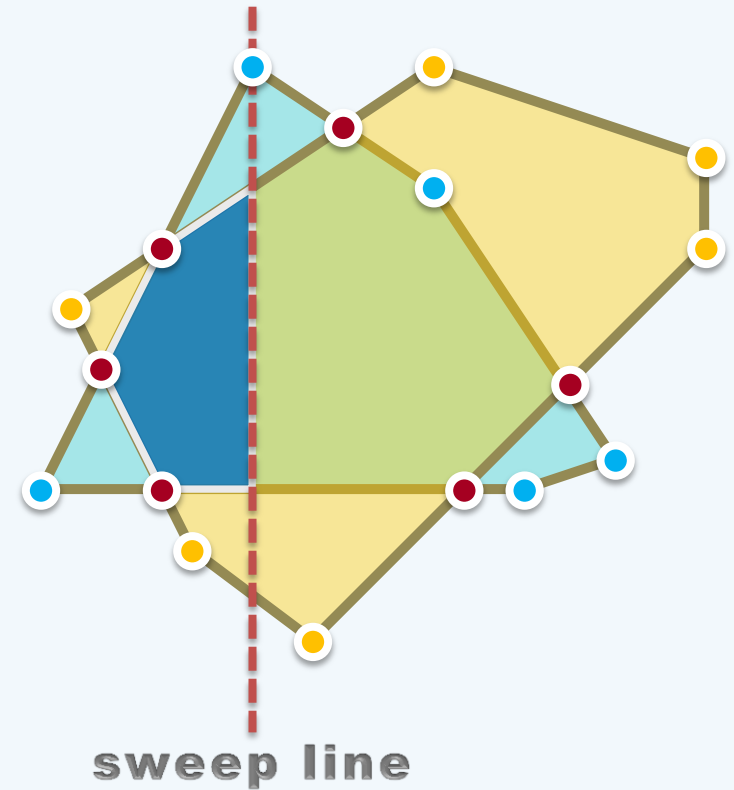
Plane Sweeping

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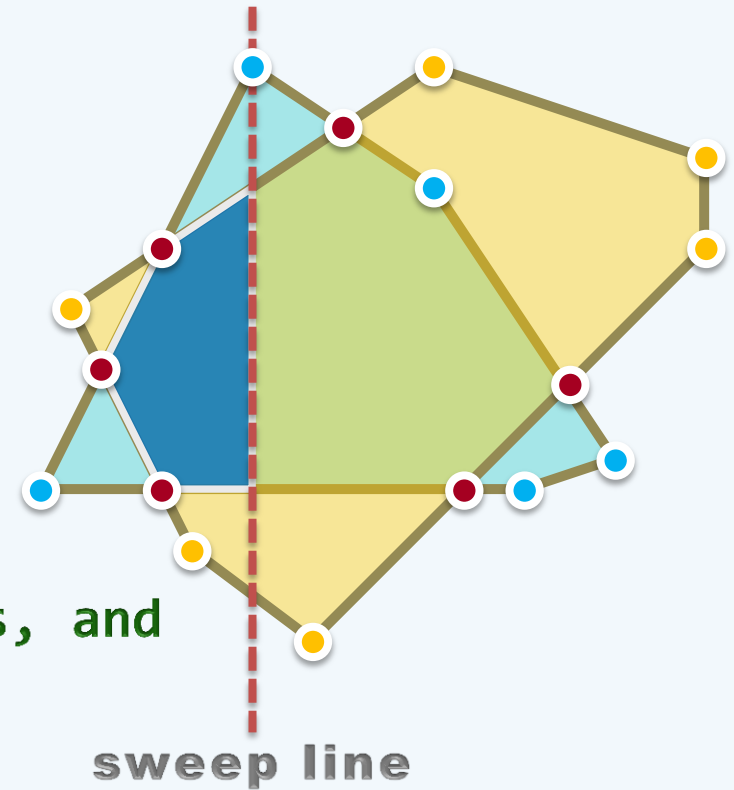
Sweep Line Status

- ❖ Suppose that a vertical line L sweeps over the plane from left to right
- ❖ At any time, By convexity,
 L intersects P and Q in ≤ 4 points, and
 the SLS consists of ≤ 4 points
- ❖ Thus we do not need to store the SLS
 in a complicated data structure
- ❖ In fact,
 a linear array with fixed length is enough
- ❖ This means that
 each operation on the SLS can be performed in a **constant** time



Event Queue

- ❖ Furthermore, we don't even need a PQ for the events
- ❖ The only two events that matter here are the leftmost points of P and Q, and ...
- ❖ To determine the next event point, we just need to
 - check the 4 current edges for intersections, and
 - check the 4 edges for their next endpoints
- ❖ Since there are only a constant number of possibilities, each event can be handled in $O(1)$ time



Complexity

❖ The boundaries of P and Q
intersect at $\leq (n + m)$ points

❖ So we conclude that ...

❖ The plane-sweep algorithm
constructs the intersection
of two convex polygons

in $O(n + m)$ time, where n and m are

the vertex numbers of the 2 polygons resp.

