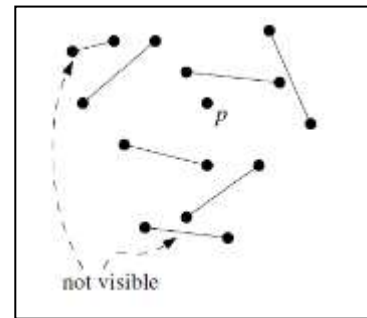


Homework Set - 03 (Total Marks = 20)

1. Let S be a set of n disjoint line segments in the plane, and let p be a point not on any of the line segments of S . We wish to determine all line segments of S that p can see, that is, all line segments of S that contain some point q so that the open segment pq does not intersect any line segment of S . Give an $O(n \log n)$ time algorithm for solving this problem. See the example shown on the right. [5]



2. Let S be a subdivision of complexity n , represented using DCEL data structure, and let P be a set of m query points. Give an $O((n + m) \log(n + m))$ time algorithm that computes for every point in P in which face of S it is contained. [5]

3. Write a formal proof for the following claim: Any polygon with h holes and a total of n vertices (including those defining the polygon and holes), can always be guarded by $\lfloor (n + 2h)/3 \rfloor$ vertex guards. Note that a hole may be surrounded by other holes, and thus it may not be always visible from the boundary of the polygon. [5]

4. Consider an implementation of Hertel-Melhorn (HM) Algorithm for convex-partitioning of a simple polygon P with n vertices. Assume that a triangulation of P is given. Suggest a data structure and the required procedure so that HM-Algorithm can be implemented in $O(n)$ -time. [5]

Submit solutions via Moodle. Due: 27 February 2022, 23:55; Credit: 10%