# Homework assignment no. 3

1. Let R be a set of n points in the plane, and let B be a set of n blue points in the plane. A line l is a *separator* for R and B if all points of R lie on one side of l and all points of B lie on the other side of l. Describe an algorithm for deciding in expected $O(n)$ time whether there exists a separator for R and B.

2. Construct the search structure for the given scene, assuming s_i is inserted in the i'th iteration, $i = 1, 2, 3, 4$. Draw the structure after each insertion.
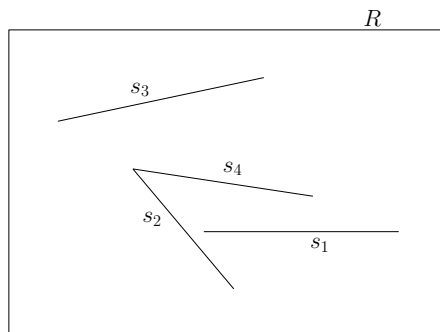
3. The Gabriel graph of a set $\mathcal{P}$ of points in the plane consists of all edges pq, $p, q \in \mathcal{P}$, such that the circle with diameter pq does not contain any point of $\mathcal{P}$ in its interior.

   (a) Prove that the Delaunay triangulation of $\mathcal{P}$ contains the Gabriel graph of $\mathcal{P}$.

   (b) Prove that pq is an edge of the Gabriel graph if and only if pq intersects the Voronoi edge between $\mathrm{Vor}\,(p)$ and $\mathrm{Vor}\,(q)$.

   (c) Show that the Gabriel graph can be computed in $O(n \log n)$ time.

Submission: January 19, 2016.