

**Discussion: 11.07. - 13.07.**

## Exercise Sheet 10

### Exercise 10.1: Voronoi Sweepline Algorithm

(4 Punkte)

Consider the Sweep-Algorithm for computing a Voronoi-Diagram. Let there be  $n$  points already passed by the Sweep-Line. Then answer the following two questions:

How many pieces of the wavefront can the bisectore of a single point with the Sweep-Line contribute to the wavefront.

Show that the wavefront has linear  $O(n)$  complexity.

*Hint:* Look up Davenport-Schinzel-Sequence. While not necessary for the proof, it shortens it significantly.

### Exercise 10.2: Voronoi diagram and empty circles

(4 Punkte)

Consider the points on the Voronoi-Diagram of a point set  $S$ .

Show the following:

Let  $x$  be a point on the plane. Then consider the largest empty circle  $C$  around  $x$  with an empty interior. If there is exactly one point  $p$  from  $S$  on  $C$ , then  $x$  lies in the Voronoi-Region of  $p$ . If there are two points  $p$ , and  $q$  on it then  $x$  lies on a Voronoi-Edge between the regions of  $p$  and  $q$ . If there are three points on it, then  $x$  is a Voronoi-vertex.

### Exercise 10.3: Convex Hull and Voronoi Diagram

(4 Punkte)

Show that the points of a point set  $S$  with unbounded Voronoi-Region are exactly the points on the convex Hull of  $S$ .