Matthias Fischer

Paderborn, 8. April 2024
Abgabe: Di., 16. April, 11:15 Uhr

Hausaufgaben zur Vorlesung

# Algorithmische Geometrie

SS 2024

Übungsblatt 1

**Aufgabe 1** (5 Punkte)**:**

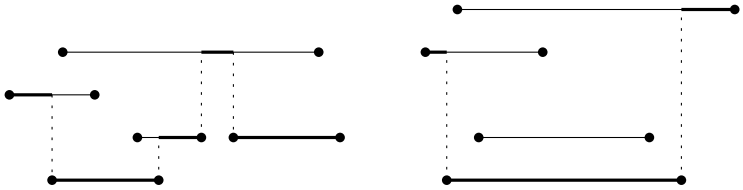

Abbildung 1: Example of a lower contour (the bold marked parts of the line segments).

We have $n$ line segments in the plane. All these line segments are parallel to the $x$-axis, disjoint and all $x$-values are pairwise disjoint. Develop a sweep-algorithm that computes the lower contour of these line segments in time $\mathcal{O}(n \log(n))$ and prove the running time. You can assume that the line segments are in general position. This means that the line segments are disjoint.
The lower contour are the parts of the line segments visible from below. Figure 1 shows an example.

**Aufgabe 2** (5 Punkte)**:**
Look at the running time estimation for the closest-pair algorithm from the lecture:
The update of *MinSoFar* required the comparison of the newly added point $r$ to just a constant number of points within a specific rectangle. Because the Status Structure includes a balanced searchtree, the points located in this rectangle can be found quickly. In this exercise, we assume that the Status Structure only contains an unsorted list without a searchtree.

(a) What is the resulting worst case running time of the whole algorithm?

(b) Construct a scalable input that leads to the worst case running time of (a).

(c) How large do the areas *dead points* and *active points* become during the calculation of the worst case (b)?