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Pearls of Algorithms

Winter 2014/15

Exercise sheet 2.2

Exercise 1 Davenport-Schinzel-Sequence

a) Which of the following words are a Davenport-Schinzel-Sequence (DSS)? If a word is a DSS, also determine its (minimum) order.

1. **dada**
2. **hubbabubbabubblegum**

b) Given is the alphabet {**o, k, a, p, i**}. Create a DSS of maximal length of order two.

d) Prove that $\lambda_2(n) = 2n - 1$ holds.

Exercise 2 Sweep Linesegments

Consider the line segment arrangement $\mathcal{A}$ depicted in Figure 1. Use the algorithm presented in the lecture for computing the set of line segment intersections in $\mathcal{A}$, and state in which order the intersection points in $\mathcal{A}$ are

a) discovered and

b) reported by the algorithm.

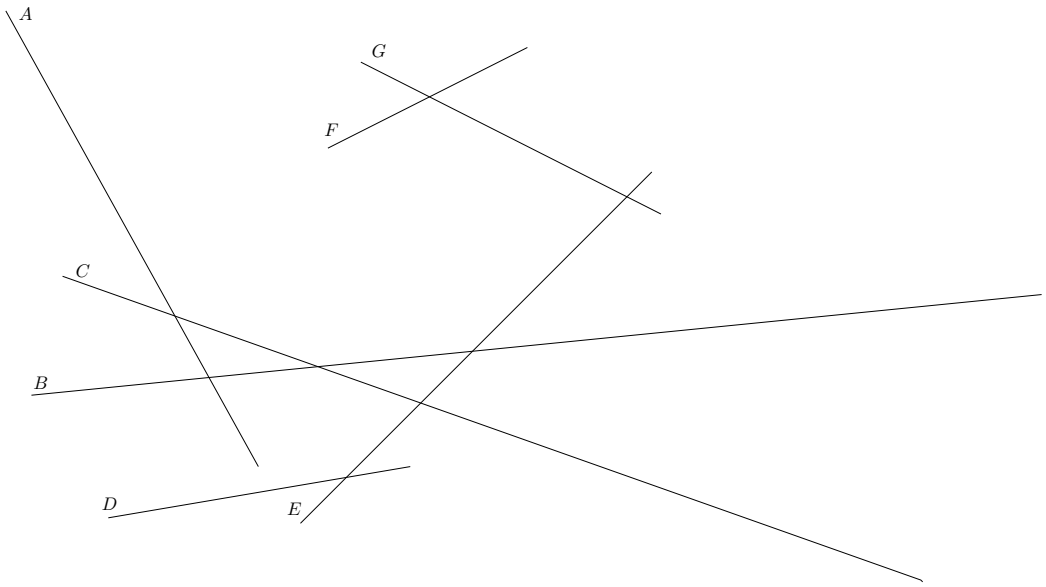

Figure 1: A line segment arrangement

Furthermore, specify how the Sweep-Status-Structure *SSS* looks like at any given time.

Exercise 3 Linesegment intersection

Prove the following fact: For every natural number n and every $k \in \{0, \ldots, \binom{n}{2}\}$ one can find an arrangement of n linesegments which has exactly k different intersections.

Exercise 4 Convex hull

Let S be a set of n points in the plane. Assume we already know that every point from S lies on the boundary of the convex hull of S. Under this assumption can you create an algorithm that computes the convex hull of S in time $O(n)$?