Lehrstuhl für Informatik I
Effiziente Algorithmen und
wissensbasierte Systeme
Universität Würzburg

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Homework Assignment #13
Computational Geometry (Winter Term 2016/17)

Exercise 1

The dual of a line segment is a left-right double wedge, as was shown in the lecture.

a) What is the dual of the set of points inside a given triangle with vertices p, q and r? **[3 points]**

b) What type of object in the primal plane would dualize to a top-bottom double wedge? **[3 points]**

Exercise 2

Let P be a simple regular polygon with n vertices. Let Δ_{blue} and Δ_{red} be triangulations of P, each given as a DCEL. We call the intersection points of edges from Δ_{blue} and Δ_{red} *Steiner vertices*. Let k be the number of Steiner vertices.

Give an $O(n + k)$ algorithm to compute a DCEL describing the *overlay* of Δ_{blue} and Δ_{red}, which consists of P, Δ_{blue}, Δ_{red} and the Steiner vertices. **[4 points]**

Exercise 3

Let R be a set of n red points in the plane, and let B be a set of n blue points in the plane. We call a line l a *separator* for R and B if l has all points of R to one side and all points of B to the other side.

a) Give a deterministic algorithm that can decide in $O(n \log n)$ time whether R and B have a separator. **[5 points]**

b) Give a randomized algorithm that can decide in $O(n)$ expected time whether R and B have a separator. **[5 points]**

This assignment is due at the beginning of the next lecture, that is, on February 8 at 10:15. Solutions will be discussed in the tutorial on Friday, February 10, 14:15–15:45 in room SE I.