Discrete and Computational Geometry Winter term 2016/2017
Exercise Sheet 01
University Bonn, Institute of Computer Science I

Deadline: Tuesday 25.10.2016, until 12:00 Uhr — Discussion: 31.10. - 4.11.

- *Please give your solutions directly to the tutor or put them in the postbox at LBH next to E.01 until the deadline. Write your names well visible and readable on the first page. If your solutions consists of multiple pages, make sure there are well connected.*
- *It is possible to submit in groups of up to three people.*

Aufgabe 1: WSPD and MST (4 Punkte)

Prove or disprove the following proposition:

For every WSPD based on a set S and a separation parameter $s > 4$ it holds: You can construct a MST by choosing for every pair $\{A_i, B_i\}$ of the WSPD the shortest edge $\overline{a_i b_i}$ with $a_i \in A_i$, $b_i \in B_i$.

Aufgabe 2: WSPD Complexity (4 Punkte)

For a WSPD $\{\{A_1, B_1\}, \ldots, \{A_m, B_m\}\}$ of set S let the total number of elements be defined as $Z := \sum_{i=1}^{m}(|A_i| + |B_i|)$.

Prove an upper bound for Z in O-Notation based on $|S|$. Give an example of a WSPD that shows that this upper bound is tight.

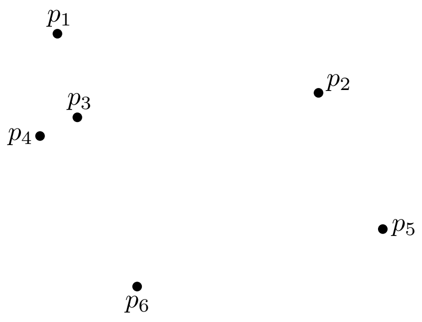
Aufgabe 3: WSPD Construction (4 Punkte)

Consider the point set $S \subset \mathbb{R}^2$ depicted twice below. Use the algorithm presented in the lecture to construct a WSPD of S, given the separation ratio $s = 1$.

Start with computing the split-tree, and draw the resulting bounding boxes.

Use these bounding boxes to construct the WSPD. You may assume that the procedure FindPairs(v,w) only verifies if the two point sets S_v and S_w are well separated with respect to circles, whose center points are located at the center of the corresponding bounding box.

1)



2)