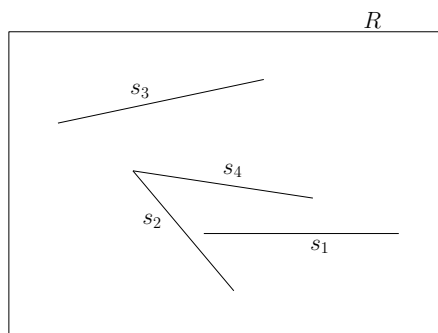


Homework assignment no. 3

1. Given n inequalities $a_i x + b_i y \geq 1$, for $i = 1, \dots, n$, describe an expected linear-time algorithm that finds a point (x, y) (if exists) that (i) satisfies all these inequalities, and (ii) is closest to the origin under the L_1 distance (where $d_1(p, q) = |q_x - p_x| + |q_y - p_y|$).
2. Construct the search structure for the given scene, assuming s_i is inserted in the i 'th iteration, $i = 1, 2, 3, 4$. Draw the structure after each insertion.



3. Let P be a set of n points in the interior of an axis-parallel rectangle R . Assume that the points in P represent the houses in some neighborhood R . One needs to determine the best location for a garbage dump in R . That is, one needs to find a point $g \in R$ that maximizes the expression $\min_{p \in P} \text{dist}(p, g)$. Give an $O(n \log n)$ -time algorithm for finding such a point g .
4. Let P be a set of n points in the plane. Prove that $\text{MST}(P)$ is contained in $\text{DT}(P)$, that is, the edge set of the minimum spanning tree of P is contained in the edge set of the Delaunay triangulation of P .

Submission: January 3, 2019.