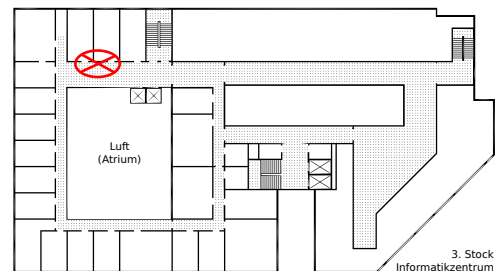


Prof. Dr. Sándor P. Fekete
Phillip Keldenich
Dominik Krupke

Approximation Algorithms Exercise 4 7. Januar 2020

Hand in your solutions until January 22, 2020, 11:30 am. You can hand in your solutions at the beginning of the tutorial or via the homework box in front of room IZ337. Please put your name on all pages.

You can reach at most 50 points on this exercise sheet.



Exercise 1 (Postman):

Given a complete graph $G = (V, E)$ with a metric edge weight function, i.e., edge weights satisfying the triangle inequality, k postmen have to walk such that every edge/street in a given set $E' \subseteq E$ is passed by at least one of them. The start and end vertex for every postman can be freely chosen. We search such a solution with minimum length (sum over all postmen).

- Prove that already for $k = 1$, this problem is NP-hard. Hint: Use the fact that HAMILTONIAN PATH is NP-hard.
- Provide a 2-approximation for arbitrary k . Hint: Use a variant of Kruskal's algorithm.

(20+20 P.)

Exercise 2 (Segment Tour):

Given a set of segments $\mathcal{S} = \{s_0 = (p_0, p_1), s_1 = (p_2, p_3), \dots\}$ in \mathbb{R}^2 , we search for a geometric tour of minimum length that contains all segments in \mathcal{S} . Provide a 3-approximation for this problem.

(20 P.)