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Approximation Algorithms

Homework sheet 6 (Deadline 27.06.19 12:00 – before the lecture starts.)

All exercises must be done individually. Feel free (and encouraged) to discuss among each other but each solution must be written independently. Two or more submissions found with exactly the same solution on any of the exercises will be awarded no points for the entire exercise sheet. The same holds in case of directly copying from any other source.

Exercise 1 (8 points) Exercise 3.9 from [WS].

Exercise 2 (8 points) Consider the proof for the PTAS for ETSP from lecture 6. This proof started by rounding the instance by moving every input point to the center of a 1×1 square of a grid in which the point is contained. The total side length of the bounding box of the grid was $\frac{n}{\varepsilon}$.

Later, we used that every portal is crossed at most twice by an optimal portal respecting tour. Moreover, we used that there is always an optimal tour that is not self-intersecting.

- a) Show that an optimal tour T after the rounding step can be transformed into an optimal tour T' for the original instance, such that $\text{Len}(T') \leq (1 + \varepsilon)\text{Len}(T)$.
- b) Show the correctness of the cutting argument in both the portal crossing and the self-intersection claims.

Exercise 3 (8 points) Exercise 10.1 from [WS].