



Assignment 9, Approximation Algorithms Summer term 2017

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<http://www-cc.cs.uni-saarland.de/course/61/>

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Exercise 9.1 (10 Points) Lemma 1 of the lecture shows that in H , the average degree of each active moat is at most 2. Show that it is necessary to argue about the average, i.e., find an instance where some active moats have a degree of at least 3.

Exercise 9.2 (10 Points) Suppose we only run the forward phase and skip the reverse delete phase. Find and analyze an SFP instance that shows that the algorithm does not yield a 2 approximation anymore.

Exercise 9.3 (10 Points) Let $\alpha = 2k$ be the number of singleton sets in \mathcal{S} . (In our case, the singleton sets in \mathcal{S} are the $\{s_i\}$ and the $\{t_i\}$.) Show that the analysis of the approximation ratio can be improved to $2 - 2/\alpha$.

Exercise 9.4 (10 Points) Consider the set $\mathcal{S} = \{S \subset V : S \neq \emptyset\}$, i.e., the set of all subsets except V and \emptyset . Which problem is modeled by this choice of \mathcal{S} ?

Analyze the approximation ratio achieved by the moat growing algorithm.